Proceedings e report

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Electronic Imaging & the Visual Arts

EVA 2014 Florence

7 – 8 May 2014

edited by
Vito Cappellini

PROGRAM

Electronic Imaging & the Visual Arts

'The Foremost European Electronic Imaging Events in the Visual Arts'

Forum for Users, Suppliers & Researchers

The key aim of this Event is to provide a forum for the user, supplier and scientific research communities to meet and exchange experiences, ideas and plans in the wide area of Culture & Technology. Participants receive up to date news on new EC and international arts computing & telecommunications initiatives as well as on Projects in the visual arts field, in archaeology and history. Working Groups and new Projects are promoted. Scientific and technical demonstrations are presented.

Main Topics

- ♦ 2D – 3D Digital Image Acquisition
- ♦ Leading Edge Applications: Galleries, Libraries, Education, Archaeological Sites, Museums & Historical Tours
- ♦ Mediterranean Initiatives in Technology for Cultural Heritage: Synergy with European & International Programmes
- ♦ Integrated Digital Archives for Cultural Heritage and Contemporary Art
- ♦ Management of Museums by using ICT Technology: Access, Guides, Documentation & Other Services
- ♦ The Impact of New Mobile Communications on Cultural Heritage and Modern Arts Area
- ♦ Semantic Webs
- ♦ Human - Computer Interaction for Cultural Heritage Applications
- ♦ Copyright Protection (Watermarking & Electronic Commerce)
- ♦ Culture and *e-government*
- ♦ Activities and Programmes for *e-learning*
- ♦ Application of Digital Television
- ♦ 3D Developments and Applications in the Cultural Heritage Area
- ♦ Digital Theater
- ♦ Cultural Tourism & Travel Applications
- ♦ Art and Medicine

WHO SHOULD ATTEND

THE CULTURAL SECTOR: The Visual Arts Community including Museums, Libraries, Archaeological Sites, Educational Institutions, Commercial Galleries and Dealers, Auction Houses, Artists & Collectors

THE HI-TECH INDUSTRY SECTOR: Multimedia Systems, Image Acquisition & Analysis, Data-bases, Display & Printing, ICT Industry, Telematics & Systems Manufacturing, On-line Information Services

MEDIA & RELATED SECTORS: Publishing, Press, Film, Television, Photography, Printing, Advertising, Graphics Design, Consumer Media

IMAGING SYSTEMS RESEARCHERS: Imaging Systems, 3-D Acquisition, Reconstruction & Representation Systems, Information Sciences

TOURISM & TRAVEL SECTOR: Tourism Agencies & Operators, Travel Agencies

THE GOVERNMENT SECTOR: Ministries of Culture and other Institutions involved in Cultural Heritage, Ministries of Industry, Education, Research and Science, Regional Governments

Chairman: Vito Cappellini – Florence University
Co-Chairman: James Hemsley – EVA Conferences International
vito.cappellini@unifi.it   jrhemsley@hotmail.com

EVA 2014 Florence Advisory Committee includes:

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Alberto Del Bimbo, Centro per la Comunicazione e l'Integrazione dei Media - Università di Firenze ~
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EVA Conferences Organiser: Monica Kaayk, acinom_5@hotmail.com

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EVA Organiser: Centro per la Comunicazione e l'Integrazione dei Media (MICC) -
Università degli Studi di Firenze
Viale Morgagni 65 – 50134 Firenze, Italy
Tel.: (+39) 055 2751391 - Fax: (+39) 055 2751396
E-mail: eva2014florence@gmail.com
Web pages ~   http://iapp.det.unifi.it/uploads/documents/highlights/Programme.pdf

For general information: **Prof. Vito Cappellini & Secretariat**
Centro per la Comunicazione e l'Integrazione dei Media (MICC)
  Viale Morgagni, 65 - 50134 Firenze, Italy
  Tel.: (+39) 055 2751391 – Fax: (+39) 055 2751396
  E-mail: vito.cappellini@unifi.it

For information on the Exhibition: CENTRICA S.r.l.
Piazza della Madonna della Neve, 5 - 50122 Firenze - Italy
 Tel.: (+39) 055 24 66 802 – Fax: (+39) 055 20 09 785
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PROGRAM

1 - CONFERENCE

Wednesday, 7 May: 14,15 – 18,45
Thursday, 8 May: 9,00 – 19,00

2 - WORKSHOPS

Wednesday, 7 May: 9,00 – 13,00
Thursday, 8 May: 9,00 – 13,00

3 - SPECIAL EVENTS

Wednesday, 7 May: 20,00 **–** 22,45

4 - TECHNICAL EXHIBITION

Wednesday, 7 May: 15,00 – 18,45

1 - CONFERENCE

Wednesday, 7 May

ROOM A

Chairmen:	*Vito Cappellini, Florence University*
	James Hemsley, EVA Conferences International

14,15 *Opening:*   *Alberto Tesi,*
                Rector University of Florence
            Cristina Acidini,
                Superintendent Polo Museale Fiorentino
            Fabio Donato,
                University of Ferrara, Italian Representative in Horizon
                2020 – SC6 Committee
            Franco Lucchesi,
                President Opera di Santa Maria del Fiore, Florence
            Enrico Del Re,
                Director Dipartimento di Ingegneria dell'Informazione,
                University of Florence
            Marco Luise,
                University of Pisa, Co-Chairman ICASSP 2014

15,45   Coffee Break

16,00   **SESSION 1 – STRATEGIC ISSUES**
Chairman: *Paolo Blasi, Università di Firenze, Italy*

"e-Infrastructures and Research Infrastructures for Digital Culture Heritage"	Rossella Caffo Istituto Centrale per il Catalogo Unico delle Biblioteche Italiane, Rome, Italy
"High Quality Archive Project for Polo Museale Fiorentino: Developed Activities"	Cristina Acidini[1], Vito Cappellini[2], Takayuki Morioka[3], Marco Cappellini[4] [1]Polo Museale Fiorentino, Florence, Italy [2]MICC - University of Florence, Italy [3]DIS Project, Hitachi Ltd., Yokohama, Japan [4]CEO Centrica S.r.l., Florence, Italy
"Linking a bipolar world: new jobs to bring ICT to Museums"	M. Mazura EMF – Forum of e-Excellence, Brussels, Belgium

ROOM A

17,15   **SESSION 2 – EC PROJECTS AND RELATED NETWORKS & INITIATIVES**
Chairman: Margaretha Mazura, EMF – Forum of e-Excellence, Brussels, Belgium

"On Defining the Virtual Museum: a V-Must Research Project"

Susan Hazan[1], Sorin Hermon[2]
[1]New Media & Internet Office,
The Israel Museum,
Jerusalem
[2]Science and Technology for Archaeological
Research Center, The Cyprus Institute,
Cyprus

"Feeding The Digital Humanities: The DM2E and Judaica Europeana Projects"

Dov Winer
Judaica Europeana,
European Association for Jewish Culture, London,UK
and MAKASH Advancing ICT Applications, Israel

"Enriching the Web of Data with Artworks: Burckhardtsource.org experience"

Francesca Di Donato, Susanne Muller
EUROCORR Project,
Scuola Normale Superiore,
Pisa, Italy

"Hyperspectral imaging for non-invasive diagnostics on polychrome surfaces: the latest advances of research at the IFAC-CNR laboratories"

Costanza Cucci, Andrea Casini,
Marcello Picollo, Lorenzo Stefani
"Nello Carrara" Institute of Applied Physics, Italian
National Research Council (IFAC-CNR),
Sesto Fiorentino, Florence, Italy

"HDR Images for Cultural Heritage Documentation"

Andrea de Polo
Cultural Heritage Consultant @ Fratelli Alinari
Photo Archive,
Florence, Italy

Thursday, 8 May

ROOM A

9,00   **INTERNATIONAL FORUM ON "CULTURE & TECHNOLOGY**
Chairman: Vito Cappellini, Università di Firenze, Italy

The structure of the FORUM is presented.
Actual developments and perspectives are outlined:

- Cooperation Groups
- Proposed Projects
- Funding Opportunities
- European Commission Plans
  (HORIZON 2020)

Opening:	- *Pierluigi Rossi Ferrini, Vice-President Ente Cassa di Risparmio di Firenze* - *Alberto Del Bimbo, Director Centro per la Comunicazione e l'Integrazione dei media, Firenze, Italy*
Speakers Include:	- *Enzo Valente, Director GARR Consortium* - *Umberto Donati, Director Fondazione Italia - Giappone* - *Marco Aluigi, Vice-Director Fondazione Meeting per l'amicizia fra i popoli, Rimini, Italy* - *Alessandra Maggi, President Istituto degli Innocenti, Firenze, Italy*

11,00   Coffee Break

11.15   SESSION 3 – 2D - 3D TECHNOLOGIES & APPLICATIONS
Chairman: Andreas Bienert, Staatliche Museen zu Berlin, Berlin, Germany

"THz- Arte Project for non-invasive analysis of Cultural Heritage"	K. Fukunaga[1], M. Picollo[2], G.P. Gallerano[3], [1]National Institute of Information and Communication Technology (NICT), Koganei, Tokyo, Japan [2]"Nello Carrara" Institute for Applied Physics of the National Research Council (IFAC-CNR), Sesto Fiorentino, Florence, Italy [3]ENEA – Centro Ricerche Frascati, Frascati, Rome, Italy
"Conserving Digital Images Into the 23rd Centrury – a New Case Study"	Graham Diprose[1], Mike Seaborne[2] [1]London College of Communication, University of the Arts London, London, UK [2]Museum of London, London's Found Riverscape Partnership, London, UK
"A Place of Faith and Devotion and its Contemporary Re-Reading, the Digital Survey and Interpretation of the San Vivaldo "Jerusalem" Area near Florence"	C. Mastroberti, R. Pacciani, G. Verdiani Dipartimento di Architettura, Università degli Studi di Firenze, Florence, Italy
"Architecture and sculpture: a digital investigation about the Cellini's Perseo basement from the Loggia dei Lanzi to the Bargello Museum"	Pablo Rodríguez-Navarro Departamento de Expresión Gráfica Arquitectónica, Universitat Politècnica de València, València, Spain
"The baroque altar and the liturgical furnishings in the 3D reconstruction and reframing: suggestion for a new layout of the Museums Diocesani"	A. De Gloria, L. Magnani, V. Fiore, S. Rulli Dept. D.I.R.A.A.S., Università degli Studi di Genova, Genova, Italy
"Super Multiview and Free Navigation by FTV"	Masayuki Tanimoto Nagoya Industrial Science Research Institute, Nagoya, Japan

13,15   Lunch Break

ROOM A

14,15   **SESSION 4 – VIRTUAL GALLERIES – MUSEUMS
AND RELATED INITIATIVES**

Chairman: Takayuki Morioka, DIS Project, Hitachi Ltd., Yokohama, Japan

"Image Digitisation in ICARUS"	D. Jeller Digitisation / IT, International Centre for Archival Research, Vienna, Austria
"Using a Creative Evolutionary System for Experiencing the Art of Futurism"	Steve Di Paola, Sara Salevati School of Interactive Arts & Technology, Simon Fraser University, Vancouver, Canada
"Structuring Wild-Style: Developing a Research Database and Connected Web Archive for Historical Graffiti"	Elisabeth Lindinger Research Center for Culture and Computer Science, HTW University of Applied Sciences, Berlin, Germany
"Preservation of Cultural Heritage as Double Historicity: its Substance and the Importance of Existing**"**	Sara Penco Restorer and Ideator of the "Penco System", Rome, Italy
"A New Cognitive Approach to Art Experience: Priming, EEG-Based Virtual Reality, and Digital Storytelling"	Raffaella Folgieri[1], Annalisa Banzi[2], Diletta Grella[3] [1]Dipartimento di Economia, Management e Metodi Quantitativi, Università degli Studi di Milano, Italy [2]Centro Studi sulla Storia del Pensiero Biomedico, Università Bicocca, Monza, Italy [3] Journalist and Digital Storyteller, Italy
"Investigation of the activity based teaching method in e-learning musical harmony course"	P. Pistone[1], A. Shvets[2], [1]Dept. of Arts, Faculty of Humanities, Michel de Montaigne Bordeaux 3 University, Bordeaux, France [2]Dept. of Culture Sciences, Faculty of Humanities, Maria Curie-Sklodowska University in Lublin, Lublin, Poland

16,15   Coffee Break

ROOM B

SESSION 5 – ACCESS TO THE CULTURE INFORMATION
Chairman: James Hemsley,   EVA Conferences International, UK

"London's Digital Culture: Artists &
Designers, Public Service Media &
'Livecasting'"

James Hemsley[1], Nick Lambert[1], Lizzie Jackson,[2]
[1]VASARI Research Centre, School of Arts,
Birkbeck, University of London,
London, UK
[2]Ravensbourne, Greenwich Peninsula,
London, UK

"Learning is a Way to Access to Treasure
of Museums"

Elena Gaevskaya
Faculty of Arts,
Saint - Petersburg State University,
Saint-Petersburg, Russia

"Online Edition EMA – The Letters of Erich
and Luise Mendelsohn 1910-1953"

Andreas Bienert
Staatliche Museen zu Berlin - Stiftung Preußischer
Kulturbesitz,
Berlin, Germany

"Networked Museum, Concept, Design,
 Technology and Experiments"

Shinji Shimojo[1], Masaki Chikama[2],
Kaori Fukunaga[2], Eiji Kawai[2], Hisako Hara[3],
Jin Tanaka[4,], Takayuki Morioka[5],
Vito Cappellini[6]
[1]Cybermedia Center, Osaka University,
Ibaraki, Japan
[2]National Institute of Information and Communications
Technology,
Keihanna/Koganei, Japan
[3]Osaka Electro-Communication University,
Shijonawate, Japan
[4]KDDI Corp,
Japan
[5]DIS Project, Hitachi Ltd.,
Yokohama, Japan
[6]MICC – DINFO, University of Florence,
Florence, Italy

"Crowdsourcing – New Possibilities and
Limitations for Image Archives"

Nicole Graf
Image Archive,
ETH Zurich, ETH-Bibliothek,
Zurich, Switzerland

"Solution for Cultural Experience
in Places of Elective Supermodernity
(NeoLuoghi)"

F. Spadoni[1], R. Rossi[1], F. Tariffi[2],
[1]Rigel Engineering S.r.l.,
Livorno, Italy
[2]Space S.p.A.,
Prato, Italy

"Multimedia guides based
on augmented reality technologies"

Tatyana Laska, Sergey Golubkov
Institute of Arts, Saint – Petersburg State University,
Saint-Petersburg, Russia

2 - WORKSHOPS

Wednesday, 7 May

ROOM B

WORKSHOP 1   **INTERNATIONAL COOPERATION**

9,00 – 13,00   *Chairmen:*   *Ugo Di Tullio, University of Pisa and Italy Film Investments, Italy*
James Hemsley, EVA Conferences International

The general aspects of international cooperation in Cultural Heritage are presented. The impact of new technologies in the field is considered, outlining the more suitable ones for cooperative plans.

The importance of Virtual Heritage for better cooperation among the Nations in the World is considered.

Projects currently developed in different parts of the World are presented.

The importance of coordination and promotion by International Organization (as by UNESCO) is outlined.

European Commission programs and initiatives are presented, with particular reference to new Plan HORIZON 2020. Collaborative activities in Europe are in particular described.

Speakers include: *- Maria Luisa Stringa, Centro UNESCO di Firenze, Italy*
- Paolo Del Bianco, Istituto Internazionale Life Beyond Tourism, Firenze, Italy
- Nikolay Borisov and Vera Slobodyamek, Center of Design and Multimedia, St. Petersburg State University, Russia
- Carlo Quinterio, Film Producer, Firenze, Italy
- Walter Ferrara, Museum Advisory Board, V-MUST (Virtual Museum Transnational Network), Firenze, Italy
- Agata Lo Tauro, MIUR – Liceo Scientifico Galileo Galilei, Catania, Italy

ROOM A

WORKSHOP 2   **INNOVATION AND ENTERPRISE – INNOVAZIONE E IMPRESA**

(Italian Language)
9,00 – 13,00

Chairman: *Francesco Chirichigno,*
Roma

Technological requirements in the Cultural Heritage field are outlined and opportunities for Italian SME's working in the field, using new technologies, are presented.

Regional and national applied research Programs in Italy are described.

Activities by National Organizations and Firms working in the area of Telecommunications, Informatics, Optoelectronics, Environment and Infomobility are presented.

Funding by European Commission is considered, with particular reference to multimedia and telematics for Cultural Heritage, Environment and Education (*e-learning*). Special consideration is given to the new EC Plan HORIZON 2020.

Initiatives regarding the "know-how" transfer from Research Organizations to the Industrial Sector are described.

Organizations and Companies present their activities and experiences.

Invited Speakers:	*Marco Bellandi,*	*Pro-Rettore al Trasferimento Tecnologico, Università degli Studi di Firenze*
	Laura Castellani,	*Responsabile Settore Infrastrutture e Tecnologie, Regione Toscana*
	Enrico Bocci,	*Responsabile Commissione Regionale Servizi Innovativi e Tecnologici, Confindustria Toscana*

Speakers include:
- *Luigi Perissich, Confindustria Servizi Innovativi e Tecnologici, Roma*
- *Claudio Tasselli, Sezione Servizi Innovativi e Tecnologici, Confindustria Firenze*
- *Edoardo Calia, Istituto Superiore Mario Boella, Torino Wireless*
- *Giovanni Gasbarrone, Business – Sales Top Clients and Public Sector, Industry Marketing, TELECOM ITALIA*
- *Daniele Corsini, CABEL*
- *Paola Castellacci, VARGROUP*
- *Riccardo Bruschi and Luca Bencini, T.T. Tecnosistemi, Prato*
- *Vannino Vannucci, Vannucci Piante, Pistoia*
- *Andrea del Re, Studio Legale Del Re – Sandrucci, Firenze*
- *Franco Guidi, NEUMUS, Firenze*
- *Donata Cappelli, LATTANZIO Business Advisory, Roma*

Thursday, 8 May

ROOM B

WORKSHOP 3   e. CULTURE CLOUD
"An infrastructure for Cultural Content"

9,30-13,00   *Chairman: Dirk Petrat, Free ad Hanseatic City of Hamburg, Ministry of Culture, Hamburg, Germany*

Opening: *Chairman Dirk Petrat*

Introduction: *Mathias Müller-Using, Dominik Anweiler, Nordpol+ - Agentur fur Kommunikation GmbH, Hamburg*

Speakers present:
- *added value from the perspective of cultural content owners*
- *added value from the perspective of users*
- *added value from the international perspective*
- *necessary steps for implementation*

Panel Discussion

Closing

3 - SPECIAL EVENTS

Wednesday, 7 May   20,00 – 22,45

RECEPTION at Grand Hotel Minerva
Concert by Iuri Ricci
Multimedia Presentation of Art and Science

4 - TECHNICAL EXHIBITION

Wednesday, 7 May: 15,00 – 18,45

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Piazza della Madonna della Neve, 5 - 50122 Firenze - Italy
Tel.: (+39) 055 24 66 802 – Fax: (+39) 055 20 09 785
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EVENT OF INTEREST

ICASSP 2014 - 4-9 May, 2014 - Florence, Italy
www.icassp2014.org/home.html
IEEE - Signal Processing Society -
ICASSP is the World's largest and most comprehensive technical conference focused on signal processing and its applications. The conference will feature world-class speakers, tutorials, exhibits, and thematic workshops.

PROCEEDINGS

STRATEGIC ISSUES

e-INFRASTRUCTURES AND RESEARCH INFRASTRUCTURES FOR DIGITAL CULTURAL HERITAGE

Rossella Caffo
Istituto Centrale per il Catalogo Unico delle biblioteche italiane
rosa.caffo@beniculturali.it

Abstract

The paper describes the possibilities that e-infrastructures offer for services and research in the cultural heritage sector and the latest European experiences, coordinated by The Central Institute for the Union Catalogue of Italian Libraries (ICCU) of the Italian Ministry of Cultural Heritage, Activities and Tourism on how the two communities of e-infrastructure providers and cultural heritage institutions could better cooperate in the future with the necessary strong involvement of the wider research communities.

The perspective for the future is to exploit the potential of digital technologies to transform research concerning cultural heritage and to ensure that research on digital cultural heritage is at the forefront of tackling crucial issues such as intellectual property, cultural memory and identity, communication and creativity in a digital age. Innovation, creativity and public interest in cultural heritage has been in the vanguard of the development of a European e-infrastructure for digital cultural heritage which will connect the research communities that are operating in closing and interconnected fields.

The task of establishing a dialogue and a relationship between the cultural sector, the research sector and the e-infrastructures in Europe is a challenging job because they are differently organized from country to country. For this reason, some European Ministries of Culture, governmental agencies and cultural institutions that have been cooperating in the last ten years in the field of digitization of cultural heritage and online access under the leadership of ICCU, decided to launch a new approach to the DCH sector in order to bring it on the "wave" of the e-Infrastructures. The launch of this dialogue was firstly realized with the DC-NET Project and then renewed with INDICATE and DCH-RP Projects that investigated political and technical domains concerning the relation between the DCH sector and e-Infrastructures.

ICCU participates also in two important initiatives of Research Infrastructures that are operating in DCH sector: ARIADNE and DARIAH. ARIADNE aims to create an European infrastructure concerning the archaeological data to facilitate the access and the research of information within archives from different European countries; DARIAH (Digital Research Infrastructure for the Arts and Humanities) is currently establishing gateways to existing technologies used in the humanities, including repositories and digital curation, authentication and authorization and others. Once those gateways are established, large and diverse communities will be able to explore the emerging, e-Infrastructure based research environments for the humanities.

HIGH QUALITY ARHIVE PROJECT
FOR POLO MUSEALE FIORENTINO:
DEVELOPED ACTIVITIES

Cristina Acidini, Superintendent Polo Museale Fiorentino, Florence, Italy

Vito Cappellini, President MICC - University of Florence, Italy

Takayuki Morioka, Director DIS Project, Hitachi Ltd., Yokohama, Japan

Marco Cappellini, CEO Centrica S.r.l., Florence, Italy

SUMMARY

The Project on "High Quality Digital Archive for Polo Museale Fiorentino", developed by MICC – University of Florence, Hitachi Ltd. and Centrica S.r.l., with supervision by Superintendent Cristina Acidini, is continuing its activities along the planned lines. Many important art-works of Polo Museale Fiorentino have been digitized at very high resolution:

1. Leonardo da Vinci, Annunciazione, Uffizi
2. Leonardo da Vinci, Adorazione dei Magi, Uffizi
3. Leonardo da Vinci, Battesimo di Cristo, Uffizi
4. Michelangelo, Tondo Doni, Uffizi
5. Tiziano, Venere d'Urbino, Uffizi
6. Caravaggio, Bacco, Uffizi
7. Caravaggio, Medusa, Uffizi
8. Piero della Francesca, Dittico di Urbino, Uffizi
9. Bronzino, Ritratto di Eleonora di Toledo, Uffizi
10. Botticelli, Madonna del Magnificat, Uffizi
11. Botticelli, Primavera, Uffizi
12. Botticelli, Nascita di Venere, Uffizi
13. Giotto, Madonna di Ognissanti, Uffizi
14. Raffaello, Madonna del Cardellino, Uffizi
15. Raffaello, Madonna della seggiola, Palatina
16. Lega, Il Canto dello Stornello, Museo d'Arte Moderna
17. Fattori, Libecciata, Museo d'Arte Moderna
18. Correggio, Adorazione del Bambino, Uffizi
19. Andrea Del Sarto, Madonna delle Arpie, Uffizi
20. Paolo Uccello, Battaglia di San Romano, Uffizi
21. Giovanni Bellini, Allegoria Sacra, Uffizi
22. Filippo Lippi, Madonna col Bambino e Angeli, Uffizi

Several technological improvements have been added since the starting of the Project.

Some activities developed in last year are described in the following, regarding in particular Exhibitions held in Japan.

From 2013 to 2014, Exhibitions were held in Japan under the Project "Uffizi Virtual Museum" (hereafter "UVM"): Exhibition in the Kyoto University Museum, Exhibition in Knowledge Capital, Osaka and Presentation in a Hitachi Company Convention.

For UVM Exhibition held in the Kyoto University Museum from 16 January to 24 March 2013, already presented in the paper for EVA 2013, results of questionnaire for the visitors to the Museum were analyzed. The total number of Visitors was 17.179 for 50 open days. The Museum asked each Visitor to answer the questionnaire and 4.066 actually did. Some interesting results were: 51% answers is "interested in Italian Arts"; 33% answers have been to Uffizi Gallery; 78% answers, including those who have been there before, desire to visit Uffizi Gallery; more than half of answers found it new to explore the details of paintings by "Masterpiece Navigation" and by "Digital Theater".

Further high-definition digital data of UVM were presented in a Tiled Display Environment, which has been developed by NICT (National Institute of Information and Communications Technology) in Knowledge Capital located in front of Osaka Station. NICT conducted gallery talks and night museum tours using a Tiled Display, and also organized on 17 June 2013, in cooperation with MICC – Florence University, an Art Lecture by Dr. Cristina Acidini, Superintendent of Polo Museale Fiorentino, regarding "Art and Science" through the Internet connection between Osaka and Florence University Incubator (see other paper in the Conference).

In occasion of the 50th anniversary Convention held by Hitachi IT Users' Association in Tokyo (May 2013) high definition digital data of Uffizi Virtual Museum were projected to five 130 inch screens. Visitors experienced life-size painting images on screens and also enjoyed watching details of each painting.

Finally Demonstrations of "Uffizi Virtual Museum" have been done in Italy, in particular in Milan in September 2013 and in Hamburg-Germany in January 2014. These last Demonstrations were quite important, because they were connected to new European Commission Plans (in particular HORIZON 2020), which enclose significant resources for Technology & Culture (*e.Culture*).

"Linking a bipolar world: new jobs to bring ICT to Museums"

M. Mazura

EMF – Forum of e-Excellence
Brussels, Belgium
mm@emfs.eu

Abstract:

New technologies offer a broad panoply of opportunities to museums but it is not easy to know which technology is prone to yield the desired impact. The world of museums is in many cases technology-adverse – out of tradition, or for lack of knowledge or money or both. This hampers the transition of museums towards cultural heritage hubs of the 21th century. Based on studies and results from networking events carried out within EU projects, this presentation develops scenarios in which new professions act as mediators between the fast-evolving world of ICT and museums.

INTRODUCTION

Cultural heritage is one of the main assets of Europe, recognized already in 1974 by the European Parliament in an initial resolution for Community action to preserve Cultural heritage, and followed through to the 2010 Digital Agenda and the Innovation Union Communication. It is virtually a field of unlimited possibilities, and combined with the use of new technologies, it has the potential to become an important sector to leverage Europe's economic and societal goals in the frame of the Europe2020 strategy [1].

Information and Communication Technologies (ICT), on the other hand, become invariably facilitators for easier content management, preservation and storage, new experiences of content and overall, a ubiquitous, unlimited access to content. ICTs are the drivers of innovation along all production and service value chains and subsequently, drivers of economy. It is not a coincidence that the economic drivers of Europe, SMEs (small and medium sized enterprises) are amongst the most innovative developers of ICT. However, these two worlds are separated by an abyss that shows the high-tec, often considered futuristic world on one side, and the traditional, past times and old values preserving world on the other. But instead of speaking about two worlds, it is preferable to call it a "bipolar world": The double-entente of the word bipolar is well suited for the actual situation: it is bipolar in the sense of opposite, but also, like in magnets, attracting each other. Because together, they can create the magic of unifying the beauty of technology with the beauty of culture [2].

THE CHALLENGES

In order to link antagonistic people or views, it is necessary to "speak their language" and to identify sources of problems that need to be overcome. For this purpose, open-minded communicators that have an in-depth knowledge of the situation are necessary. These mediators need to know both sides, and have an overview knowledge of the state-of-the art that allow to propose effective and efficient solutions. But these are emerging professions that are neither defined, nor standardized, and there are hardly any dedicated curricula within relevant disciplines.

Challenges at Museum Level

Museums often suffer from a lack of visitors, which has its repercussion in reduced income (or most often reduced subventions). To become more appealing, in particular to the younger "born digital" generation, new paths need to be opened. This is a challenge that several cultural heritage institutions are facing, not only traditional-style museums. The use of new technologies cannot only solve this problem and attract virtual visitors, but can also raise general interest about the institution and contribute to the border-less promotion of it. But somebody needs to know about it, think "out of the box" and start the cumbersome way of convincing all involved to "make a difference" while at the same time realising that "not one hat fits all". These apparent trivia are, alas, at the core of the problems to introduce ICT for the benefit of cultural heritage sites and objects.

In a recent workshop [3], stakeholders from both "worlds" met and discussed the problem areas. For museums, there are the following obstacles to implement a proactive ICT strategy:
- Traditional mind-set together with lack of information that result in fear: fear of giving away assets (digital images on the Internet that will be copyright infringed); fear of having to cope with yet other complex issues (for staff that is notoriously underpaid); fear of losing one's collection (as they become known to a broad public); fear of transparency (on-line articles are open to broad discussion, by all kind of people, not only researchers and scientists).
- Lack of funding that results in an excuse for not adopting an ICT strategy: as museums are most often public institutions, public money becomes scarcer with the economic crisis. Hence, many directors prefer to "keep all as is" to make sure that the money they need, they actually get, and not demanding more. The term "business model" does usually not enter the museum vocabulary.
- Bad experience with implemented technologies: outside a real ICT strategy, it is easy to implement tools and solutions that are not at all adequate for the needs of the museum, its collection, its audience or the results is wants to achieve. In addition, training of staff and maintenance costs of the technical equipment are often neglected when deciding on ICT.
- Lack of involvement of all stakeholders needed: Apart from a top-level decision taken by a director, the implementation, specifications etc. must come from those that do them (e.g. architects) and those that will have to work with them (e.g. curators). This internal information and communication flow is hardly ever extant.

However, most of these obstacles can be overcome by objective information and targeted advice that takes into account the actual situation of the cultural heritage institution. But who can give such advice?

Challenges at ICT providers level

ICT providers are either companies (often SMEs) or research institutions (that do applied research). In both cases, representatives tend towards talking in technology terms; which is legitimate, given the fact that this is what they sell. However, it is very difficult for "techies" to address people from other sectors or disciplines. Main obstacles are:

- Presentations are provider-centred, not user-centred (in this case, user would be a museum or cultural heritage institution);
- They present technologies, not solutions. Hence, it is difficult for non-technology people to understand the potential benefit;

- Often, these solutions are tailor-made for one specific institution, hence expensive and not easily adaptable to other scenarios;
- Very divers technologies can apply to cultural heritage: from (relatively simple) mobile apps to highly sophisticated augmented reality or 3D solutions. This does not help when looking for a suitable ICT choice.

Technology providers are not yet accustomed to deal with a divers clientele. They need as much as the user an intermediary that transports the right message to the right client or client group. A pooling of needs from the user side would reduce costs while making interactions interoperable (e.g. virtual exchange of objects, access to DB etc.).

SUGGESTED SOLUTIONS

The bipolar world needs to be addressed for the benefit of both sides – and adjacent stakeholders: apart from ICT providers (economic impact) and museums (cultural impact; but also economic through a better use of their cultural assets), there are huge side effects when ICT is well implemented: social inclusion (for far away regions that do not have easy access to museums; for disabled people; for economically disadvantaged); other growth sectors like tourism; other cultural benefits like cultural preservation (through 3D models; DB; digital archives).

The problem is: Who can support these needs for information, communication and advice? Curricula in the arts disciplines only recently include some ICT for museological purpose; ICT curricula usually do not touch upon use case scenarios or vertical application cases. The buzz words "new skills for new jobs" are catching two flies with one stroke: combating unemployment and solving the dialogue problem between technology and cultural heritage. A recently started project [4] looks into this area. Partners from 6 countries suggested so far 3 eJob and skills descriptions that may lead to promising curricula in this field: The more general

- *Cultural ICT Specialist or Ambassador* who acts as facilitator between ICT solutions and content holders like museums**.** S/he provides advice on the development of an ICT strategy that will boost interaction with the visitors and offers guidelines how this strategy can be implemented in the most effective and efficient manner. The Cultural ICT Specialist foresees the impact of technological solutions that will meet the needs of the internal teams s/he works with, notably the PR and marketing department and eventually, the curators for (permanent or temporary) exhibitions.

And more specifically, the

- *Interactive Cultural Experience Developer* who is responsible for the development and design of interactive and multimedia content, related to the museum exhibitions, on-line and off-line; and the
- *Digital Cultural Asset Manager,* an expert in cultural issues, responsible for the organization, preservation and promotion of the digital or digitized cultural content in a museum [5].

While there are not yet harmonized trainings at European level, 2014 will see two summer stages held by experts in June in Slovenia and September in Greece and that are open and free to potential "ambassadors" (see http://www.ecultobservatory.eu/content/ecult-ambassadors).

CONCLUSIONS

Any kind of intermediary, be it called ambassador or cultural ICT specialist, will have to foster the interaction between all stakeholders. Six key words were identified [6] that need to be carefully considered when approaching ICT and museums:

DIALOGUE: no matter at which level, a dialogue is needed to convince, to find the correct tools and the correct people. Interdisciplinary discussions are necessary to tap on the potential opportunities ICT offers to cultural heritage and to create win-win situation.
TARGET AUDIENCE: not only visitors but also on-line audiences play an increasing role in the profiling of a cultural heritage institution. Communication needs are different, if we speak to a knowledgeable "amateur", a professional, a researcher or a visitor.
TECHNOLOGY STRATEGY is necessary before engaging in introducing technological solutions and answering the crucial questions: why – how – when – for whom; budgetary implications need to be considered.
TECHNICAL SUPPORT STAFF needs to be inside the museum and staff needs to be incentivised to follow continuously courses that familiarise them with technology. Often, multi-functional staff is needed rather than technical experts.
INTEROPERABILITY of technologies is needed, not only for hardware but also for digitised formats.
Finally, the MONEY issue needs to be discussed. Cultural heritage people have the tendency to stand above this (while always lacking money). However, valorisation of collections through technology may fill a financial gap – business or, if preferred, benefit models need to be developed.

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EC PROJECTS
AND RELATED NETWORKS
& INITIATIVES

ON DEFINING THE VIRTUAL MUSEUM: A V-MUST RESEARCH PROJECT

Susan Hazan (PhD)[1], Sorin Hermon (PhD)[2]
[1]The Israel Museum
Jerusalem
[2]Science and Technology for Archaeological Research Center
The Cyprus Institute
Susan.hazan@gmail.com
Sorin.hermon@gmail.com

ABSTRACT

This paper describes the research carried out by V-Must[i], an EC funded Network of Excellence with a goal to theorise and define the term virtual museum (VM) as it is enacted in theory and in practice. The Network has been active in identifying and mapping tools and services that define and support VM's and what it means for the heritage sector to acknowledge the virtual for a practice that is essentially dedicated to the material object in an incontestably physical space. Consequently, it proposed a working definition of the VM.

INTRODUCTION

One of the ways to conceptualise and define the virtual museum is to draw a straight line from the physical museum to its digital counterpart. In this way we can identify what it is that the two entities share in common, as well as to be able to sift out what it is that defines the virtual. Only then can we begin to consider what it means for a museum that has no counterpart in the physical world, yet emulates the characteristics of a museum – albeit – as a *Museum without walls*[ii].

There has been much discussion in academia and practice as to the definition of the virtual museum, and just as much debate on the term itself. The term Virtual Museum has become as ubiquitous as to rend it almost redundant; including the multiple terms that are now in common use. The V-Must Network has been focusing on theorizing, and defining the Virtual Museum (VM) and now proposes that VM's are usually, but not exclusively delivered electronically when they may be denoted as online museums, hypermuseum, digital museum, cyber museums, or web museums (see Wikipedia article on Virtual Museums[iii]).

Therefore we have since revised our own definition of the Virtual Museum that gradually evolved out of a series of workshops, public debates, and intense online discussion. Our terms of reference were clarified as we drilled down into the concepts and functionality of VM's in more detail; and reflected on the basic components of the VM as explored in our early research.

DRAWING ON THE CHARACTERISTICS OF THE MUSEUM; ENHANCING AND AUGMENTING THE MUSEUM EXPERIENCE

The term Virtual Museum, in fact, been used to describe a wide range of activities that are all somehow loosely concerned with this overarching concept. Both the VM that acts as the digital footprint of a physical museum, as well as those VM's that have no reference to the physical world; all draw on the strengths of the term museum. In practice the VM has become as familiar to the public as the bricks and mortar building has, as trustworthy custodians of collections in a permanent (online) location orchestrated for the display of the collections together with direct access to their embedded knowledge systems that are available to all 24/7.

Essentially, the core function of a VM can be loosely described as a location of rich content – often reflecting unique and precious objects or works of art – collections that have been assembled and displayed, yet in contrast to their physical counterparts, once liberated

from their materiality are poised to open up new potential for novel kinds of experiences. A Virtual Museum can tell a story; it can inspire you to tell your own story; it can take you to places that no longer exist, or help you gather objects that are meaningful to you. This paper reflects on the collections have been assembled, presented, and disseminated over electronic platforms; representing artistic expression, re-enacting a forgotten archaeological period, or creating a historical setting that come together in a cohesive whole to distinguish what it means to be VM.

QUALITIES OF THE VM; PERSONALISATON, INTERACTIVITY AND RICHNESS OF CONTENT

The expression 'responsive design' is a term that we are hearing about more and more, and we argue that this concept directly relates to the very essence of VM's and the ways that they can respond to their audiences through digital platforms. Architects and engineers are experimenting with motion sensors that respond to the presence of the people moving within the environment; adjusting, for example, the room's temperature and triggering pre-synched systems to prompt ambient lighting. This approach to physical spaces is now referred to as responsive architecture[iv] where embedded systems sense presence, and motion and prompt the environment to adjust in return. Physical spaces essentially enter into conversation with the people who occupy them, responding to them in real time and accommodating them accordingly.

In a networked world, other kinds of systems need to develop different responsive solutions to deliver rich content to arrange of platforms (large screens, pc's, mobile phones, tablets, etc.). These systems also react in real time; applying the same kind of responsive principle to optimize the viewing experience – easy reading and navigation with a minimum of re-sizing, panning, and scrolling – across a wide range of screen-sizes (from desktop computer monitors, to tablets, to mobile phones). This approach assures efficient delivery of content to all users, whatever their choice of platform.

The V-Must Network draws on the responsive approach to explore the kinds of interactions that are now possible as the VM engages with their audiences. The responsive approach, when applied to the Museum, not only represents direct access to rich content; exhibitions, collections, events and educational activities, but also means provoking a response from the museum to facilitate conversation and novel kinds of engagement in ways not previously possible in the physical gallery.

To explore the VM in the context of the responsive museum, we draw on the practice of new museology; not as a specific turning point in the history of museums, but rather as a marker of the on going, re-evaluation of the museum in relationship with its audiences.[v] New Museology at times has implied a radical re-organisation of museum agendas, such as a move from an elitist, undemocratic space towards a more democratic space, the prioritising of the visitor rather than the object, or the reclaiming, or re-territorising of the museum as a space that could be owned by the community.[vi] We argue that VM offers golden opportunities to break from the corresponding 'old' agendas, with the potential to modify traditional ideologies or institutional agendas through new platforms of delivery to enable the inclusion of new voices joining in the conversation, and new level of engagement and immersion located beyond the museum wall. Once granted access to the rich collections, visitors may personalise their experience, actively re-use the content for their own goals and discover spaces to contribute their own content to join into the conversation.

We argue, therefore that the virtual museum (VM) in fact opens up new possibilities to harness, and to enact reciprocal, user-driven scenarios, as well as setting up new opportunities for the remote visitor to be able to interact with the physical, or non-physical museum in novel ways. The premise of response therefore, represents one of the underlying principles that determines the essentiality of a VM.

PUBLIC ACCESS; KNOWLEDGE SYSTEMS AND THE SYSTEMATIC, AND COHERENCT ORGANISATION OF THEIR DISPLAY

As we argue above, when the material object - artwork or archaeological artifact - is confronted in the physical gallery it is described by the institutional voice that is often both opaque and totalising. In reading the narratives we are assured that this is THE story. How could such a persuasive history possibly be seen as less than irrevocable, especially when such impressive physical evidence punctuates it? However, when the museum narrative is located online, this knowledge base represents one resource amongst many, and in a knowledge society, these histories may now be read as but one of the myriad histories, now available over the (global) internet. We may, choose in the end to collate our knowledge from more than one source, and move from site to site, collecting units of fragmented knowledge as a *bricoleur* from museums, libraries and the media; indiscriminately gathering information where ever we find it. In contrast, however, to harvesting resources from generic sites, once the term 'museum' is evoked, users sense that the content discovered there would be authentic and reliable. In whatever mode we travel electronic highways, when encountering the VM, we are confident that we will discover rich thematic content that has been refined through practiced curatorship, and burnished for professional display.

The Semantic Web approach addresses the notion of multiplicity of resources by associating multiple coinciding ontologies (i.e. 'multiple overlapping truths')[vii]. This methodology grants a more comprehensive approach to reflect on the multicultural nature of cultural heritage (CH) objects, which often already have "multiple truths[viii] *a priori* embedded within them." Taking advantage of Semantic Web associations, new kinds of sophisticated developments and collaborations are now combining assets in novel and impressive ways.

According to the British Museum's site *Semantic Web Endpoint*, the 'semantic' element of the technology means that data is structured in such a way that allows the discovery of connections and relationship between data from different sources that would be difficult, if not impossible, to discover with traditional technologies. As there are currently 2,074,288 objects available in the British Museum's online database with 766,576 with one or more images they argue when objects are associated with their semantic attribute this helps us improve our understanding, and knowledge of objects and events even further. Clearly, the VM can function more effectively when it is driven by semantic articulation, however, these ontologies are not yet employed by institutions worldwide, but, as the field develops, users will be able to conduct intuitive searches on large data sets to retrieve meaningful results.

Over recent years we have witnessed an exponential increase in tools facilitating technical and semantic interoperability, efforts in standardizing metadata, and new systems for encoding archives based on rendering implicit knowledge explicit[ix]. In the early days of the VM, an uncontrolled development of ontologies, i.e. a formalized and reusable knowledge based on entity, property and relationships, was followed by a recent phase; now dedicated to the realignment, or mapping, of emergent ontologies, specifically created over recent years for the CH sector.

Efforts have been also directed towards the development of semantic repositories for digital (3D) data, a substantial component of VMs[x] and the totalizing, and often immersive experience of 'entering into' a CH space. Work still has to be done however for better understanding the (perhaps sometimes subtle) difference between digital collections, online archives and virtual museums[xi], [xii]. The V-Must research breaks down the different kinds of museums typographically, drawing on content, experiences, and interactions that are already available as VM's worldwide in order to define not just the term VM, but the whole field of virtual museology.

LONG-TERM PRESERVATION AND COMITMENT TO PUBLIC ACCESS

The Internet now offers a full range of subject/object positions for the remote visitor, and, as Livingstone and Lievrouw[xiii] remind us, the term 'audience' can be understood to mean many different kinds of engagement: 'playing computer games, surfing the web, searching databases, responding to e-mail, visiting a chat room, shopping online, and so on. Etymologically, the term "audience" only satisfactorily covers the activities of listening and watching' (2002: 10-11). As Livingstone and Lievrouw note, in the same way that the Internet has redefined the role of the audience in the context of television viewing, the role of the museum visitor has now been extended to include a wide range of kinds of interaction with the online museum. VMs have emerged in many ways. When interacting with an art museum electronically, the visitor will have a different set of expectations than they would when they take a virtual walk through a simulated historical site. When replying to questions posed by a science museum, or exploring scenarios developed by curators from ethnographic museum users will be engaged in subtly different ways.

The V-Must research sets out the different kinds of museums typographically, drawing on content, experiences, and interactions that are played out in VM's worldwide. The term 'culture' can be interpreted in different ways and may be mobilized for different agendas. Drawing on the UNESCO treaty, the Convention concerning the Protection of the World Cultural and Natural Heritage, which, according to the UNESCO portal, 'seeks to encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity'[xiv]. Taking over the stewardship of cultural and natural heritage on behalf of society, the museum then assumes full responsibilities to collect, conserve and display culture, and to make it available and accessible to the public as exhibitions[xv]. Accessibility is key here, and we argue that the VM is committed to intellectual accessibility in exactly the same way that the physical museum translates these abstract ideas into action when the cultures of exhibition are projected in the gallery as thematic narratives.

The traditional museum organises the narratives into thematic order through a scholarly interpretation of the physical objects, and, as these narratives develop so the taxonomic ordering of knowledge emerges. The VM then replicates, or re-formulates these narratives, providing additional layering of engagement, interaction and accessibility; now made possible through digital response. As reflected in these practices it is clear that custodial responsibility to the online collection, or interaction with the narrative demands an equally professional management of the virtual artifacts, as do the material objects in order to ensure their safekeeping for future generations. This, we argue represents an additional function of the VM and is encapsulated in the very notion of a VM and essentially defines it's validity and veracity.

DEFINING THE VM

As we have argued above, the VM can perform as the digital footprint of a physical museum, or can act independently. We will now argue that the core notion of the term 'museum' is intrinsically driven by the authoritative status as bestowed by ICOM in its definition of a museum, including their obligation to develop and maintain discrete (virtual) areas that present the collection for display to grant public access to them.

The International Council of Museums (ICOM) defines the museum, as follows:

A museum is a non-profit making, permanent institution in the service of society and of its development, and open to the public, which acquires, conserves, researches, communicates and exhibits, for purposes of study, education and enjoyment, material evidence of people and their environment.

ICOM Statutes, adopted by the Eleventh General Assembly of ICOM, Copenhagen, 14 June 1974[xvi]

In this way, the museum affirms its institutional mission not only to collect and conserve collections, but also to display them, and in doing so expresses its obligations to facilitating study, education and enjoyment of the material collection. The ICOM definition fundamentally acknowledges the material collection as the core of the mission, and recognises how the museum, in contrast to the world of television, theatre and advertising, prioritises the tangible artefact. However, in addition to the material artefact, the museum is also defined as a space that communicates its messages to its audience, and, in this bid to impart the message, it overlaps with other media and traditional communication apparatuses in many ways.

Over the last decade, the museum has evolved to broaden its professional mandate, and is beginning to welcome a wider-ranging spectrum of museum practices into the institutional mission. The departure from 'tangibility' as the exclusive rationale of the object-driven museum is reflected in debates over the last decade in the museum community, where the introduction of 'intangibility' is indicative of the expanding museum mission. A UNESCO meeting held in March 2001 adopted the provisional definition of intangible cultural heritage and endorsed the concept of 'learned processes' as a vital component of the [intangible] museum. Giovanni Pinna, Chairman of ICOM-Italy, and Member of the ICOM Executive Council defined the intangible museum as:

Peoples' learned processes along with the knowledge, skills and creativity that inform and are developed by them, the products they create, and the resources, spaces and other aspects of social and natural context necessary to their sustainability; these processes provide living communities with a sense of continuity with previous generations and are important to cultural identity, as well as to the safeguarding of cultural diversity and the creativity of humanity (Pinna 2003: 3)[xvii].

The auxiliary or supporting texts, which had been incidental to the primary object, were now being promoted by ICOM as primary texts, and museum professionals were encouraged to integrate them accordingly into museum practice. Intangible expressions, however, demanded the introduction of new disciplines for collecting and display, and three categories of intangible cultural heritage were set out to describe their parameters. In spite of this statement, the implications of these processes were still somewhat ambiguous and demanded further explanation and additional professional support.

The new concepts of intangibility were instituted into the museum community in several ways. ICOM celebrates International Museum Day on May 18 every year. The theme selected by the Advisory Committee for 2004, as well as the theme for the 2004 triennial conference, was intangible heritage, acknowledging that although the concept of heritage has been dominated by its tangible embodiments, intangible heritage is no less a vital ingredient of every civilisation (Pinna 2003: 3). The term 'intangible' in the museum context required more than a little explanation, even before the idea of digital creativity was to be grafted onto the (already complex) idea of intangibility.

These principles presented new challenges for museums and museum practitioners, and, in addition to the guidelines set out in the special ICOM News: Museums and Intangible Heritage, 2003, the ICOM General Conference in Seoul, which took place in the autumn of 2004, specifically focused on intangibility. Intangibility was not a novel concept for ethnographic or anthropological museums, but the prioritisation of intangible elements was a significant action. The innovation actively encouraged the display of intangible elements. However, *how* they were to be displayed was another question. It fell to the museums themselves to preserve the 'traces' of the performances and they took over responsibility for documenting all kinds of performed intangible heritage such as oral history, folk life, religious ceremonies, and storytelling. The link between living heritage and documentation, therefore, was forged by the following amendment to the definition of the museum, where digital processes soon became the preferred modality for documentation.

In the July of 2001, the 20th General Assembly of ICOM association amended the statutes (as quoted above) in Barcelona, Spain, to include in the museum definition:

Cultural centres and other entities that facilitate the preservation, continuation and management of tangible or intangible heritage resources (living heritage and digital creative activity).

(ICOM Statutes amended by the 20th General Assembly of ICOM, clause viii).

Combining the idea of digital creativity with the core notion of 'the museum' was critical, as it provided us with a institutional foundation to set the stage to formally acknowledge the integrity of the VM for the museum community. Bringing together the different threads of our research as described above, and after much discussion, we would like to share with you – for the first time – our proposed definition of the Virtual Museum.

A virtual museum is a digital entity that draws on the characteristics of a museum, in order to complement, enhance, or augment the museum experience through personalization, interactivity, and richness of content. Virtual museums can perform as the digital footprint of a physical museum, or can act independently, while maintaining the authoritative status as bestowed by ICOM in its definition of a museum. In tandem with the ICOM mission of a physical museum, the virtual museum is also committed to public access; to both the knowledge systems imbedded in the collections and the systematic, and coherent organization of their display, as well as to their long-term preservation.
V-Must Thematic Network, March 2014

We look forward to entering into discussion with you, our collegial reader who may wish to join in the conversation in the future, because, as our field develops, this necessitates future theorising and further reflection on the core notion of the Virtual Museum, while acknowledging the fluidity of our unfolding, yet speedily developing professional sector.

Watch this space!

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FEEDING THE DIGITAL HUMANITIES: THE DM2E AND JUDAICA EUROPEANA PROJECTS

Dov Winer

Scientific Manager, Judaica Europeana

European Association for Jewish Culture, London, UK

and MAKASH Advancing ICT Applications, Israel

dov.winer@gmail.com

Abstract – ICT support for humanities scholarship can benefit from: (1) Increased availability of relevant digitised contents through digital libraries initiatives. (2) The development of tools that enable researchers to enrich and analyse such contents and integrate them in their scholarly workflow. (3) Virtual Research Environments that integrate contents, tools and infrastructures in specific communities of practice. Judaica Europeana seeks to enhance Jewish Studies by integrating such developments with the support of DM2E. It aggregated more than 5 million digital cultural objects while DM2E built tools and communities that enable humanities researchers to work with manuscripts in the Linked Open Data Web.

INTRODUCTION

We live now in a ubiquitous ICT environment that has a deep impact in the way research in the Humanities – History, Literature, Philosophy, Archaeology, and the Arts – is carried out. Here we review initiatives that are concerned with the provision of digitised contents and adequate computerized tools so to enable scholars to operate in such environment. Our content focus relates to a specific area - that of Jewish Studies. We conclude this review arguing that a critical element for the effectiveness of such contents and tools is the establishment of Virtual Research Environments informed by the know-how required for the successful operation of Communities of Practice (CoP).

DIGITAL HUMANITIES

Digital humanities projects are using tools like 3-D mapping, electronic literary analysis, digitization, and advanced visualization techniques in interdisciplinary research that aims to shed new light on humanities research. With online publishing and virtual archives, creators and users experiment and interact with source materials in ways that yield new findings, while also facilitating community building and information sharing.

The concept of scholarly primitive has been very productive in the development of digital humanities tools. This concept was first introduced by John Unsworth [1] to refer to "some basic functions common to scholarly activity across disciplines, over time, and independent of theoretical orientation." He suggests the following primitives: Discovering, Annotating, Comparing, Referring, Sampling, Illustrating, Representing. Other initiatives have adopted this concept and refined it for their purposes. They include the Bamboo Project Scholarly Practice by Mazover (2008-2013) [2]; the OCLC Scholarly Information Practices by Palmer et. al (2009) [3] ; the report by Blanke and Hedges (2013) [4] on building institutional infrastructure for the humanities at King's College London; and the ongoing work of the Virtual Competence Center of DARIAH by Constantopoulos and Munson (2013) [5].

The project Digital Manuscripts to Europeana (DM2E) defined the requirements for the tools it is developing to support scholarly work in a Semantic Web Linked Data environment building upon the above mentioned approaches as well as upon previous work of Bamboo and Research Space. DM2E incorporates the model for the scholarly work flow developed by Stefan Gradmann [6, 7]. Data from Europeana as well as from other sources (including the

original digitised content in the case of DM2E) are made part of a digital curation workflow enabling a number of specialized functions that cannot reasonably be implemented in a generic, multi-purpose platform like Europeana. This includes functions such as semantic annotation, text collation, text mining, data linking, combining digital content and metadata and augmenting scholarly knowledge based on further contextualising objects in the Linked Data cloud [8]. The technical platform provided by task 3.2 of WP3 in DM2E is now fully operational – see tutorial [9] and support such functionalities. The two tools at the heart of the DM2E scholarly environment are **Pundit** and **Ask**. **Pundit** is a semantic annotation tool that enables researchers to create annotations in Linked Open Data. **Ask** is a web service that enables people to create and query notebooks based on annotations made in Pundit.

AGGREGATED JEWISH CONTENT

Judaica Europeana sought to achieve four main goals: provide substantial digitised resources for Europeana; increase the reuse of such resources; disseminate the use of standards assuring the compatibility of digital contents to Europeana requirements and demonstrate semantic interoperability; and involve the relevant community of knowledge to demonstrate the added value of digital access in the thematic domain for scholarship and curatorial purposes. The project originally focused on the theme of "Cities": Jewish urban expressions may be outlined graphically from a community core to individual expressions: the ways Jewish communities managed their internal affairs (mutual help, education, politics, theatre, music, newspapers); through the Jewish expression in the urban landscape, occupations and enterprises seen by their neighbors as characteristic of Jews; and finally, in their fully individual expression as celebrities. These plentiful expressions of cultural creations are well documented in thousands of photos, films, books, pictures, documents, texts, works of art, monuments, archaeological excavations, buildings, and cemeteries from all over Europe. Judaica Europeana aggregated so far more than five million cultural heritage objects from institutions in Europe, North America and Israel. Judaica Europeana focus now is in developing means for the enrichment of its metadata enabling the intelligent contextualization of the digitized objects grounded on the extraordinary potential of the new Europeana Data Model (EDM).

Europeana is pioneering the application of a new concept of the Web that enables the seamless integration of heterogeneous databases in one searchable space of Linked Data. It extends the web of documents to a web of data. This technology applies web-based standards for encoding datasets and linking them to other published datasets, so that applications can exploit data from many different sources.

The Europeana Data Model (EDM) [10] is a schema for structuring the data that Europeana is ingesting, managing and publishing. The EDM not only supports the full richness of the content providers' metadata, but also enables data enrichment from a range of third party sources. For example, a digital object from Provider A may be contextually enriched by metadata from Provider B. It may also be enriched by the addition of data from authority files held by Provider C, and a web-based thesaurus offered by Publisher D.

Judaica Europeana developed a detailed work program - Winer [11, 12] - for expressing relevant vocabularies in the required format and employing them in the Europeana context. These vocabularies have the potential for enriching the metadata descriptions of the digitized resources providing contextual meanings for objects that otherwise may lack any substantial significance for the user. Vocabularies concerning Names, Places, Periods, General interest and Regional interest vocabularies are described and the tasks to be carried outlined. Some parts of the Thesaurus of the Israel Museum Jerusalem are already operational and there is ongoing work by Dr. Kai Eckert [13] from the University of Mannheim in publishing the YIVO Encyclopedia of Jews in Eastern Europe as RDF/Linked Data and using it to enrich the metadata already uploaded to Europeana.

VIRTUAL RESEARCH ENVIRONMENTS (VRE)

Christopher Brown [14], programme manager of Digital Infrastructure at JISC defines VRE as comprising a set of online tools and other network resources and technologies interoperating with each other to facilitate or enhance the processes of research practitioners within and across institutional boundaries. A key characteristic of a VRE is that it facilitates collaboration amongst researchers and research teams providing them with more effective means of collaboratively collecting, manipulating and managing data, as well as collaborative knowledge creation.

Michael Fraser [15] defines Virtual research environments (VREs) as comprising digital infrastructure and services which enable research to take place. The VRE helps to broaden the definition of e-science from grid-based distributed computing for scientists with huge amounts of data to the development of online tools, content, and middleware within a coherent framework for all disciplines and all types of research. A VRE is best viewed as a framework into which tools, services and resources can be plugged.

Guus van den Brekel [16] key recommendations for VRE development suggest that they should be built Bottom-up and with a focus on researcher's **needs** and specific research communities

Carusi and Reimer (2010) [17] argue that fundamentally, the most important point to have emerged from their comprehensive study on VREs is that they need to be conceptualised as **community building projects rather than technology projects**. Another of their conclusions is that VREs have the potential to benefit research in all disciplines at all stages of research. The access to data, tools, computational resources and collaborators that VREs facilitate leads to **faster research results** and **novel research directions**.

DARIAH [18] the Digital Research Infrastructure for the Arts and Humanities is now seeking to develop the DARIAH VRE. They state that since nearly every research project requires an amalgamation of specific types of scholarly data in combination with generic or specific tools for data querying, enrichment, and exploration, it is of utmost importance to provide facilities for the definition and implementation of a virtual research environment (VRE). Such environments are constructed upon the technical means provided by the e.infrastructure and based on a closed collaboration between scientists.

These diverse experiments and probings of VREs allocate a critical role to the collaborative and social elements as the main factors in a VRE eventual success or failure. We argue then that the development of a VRE should be oriented by an appropriate conceptualization of Communities of Practice (CoP) and the way they evolve and are maintained.

Wenger (1998) [19] defines Communities of Practice as groups of people who share a concern or a passion for something they do and who interact regularly to learn how to do it better. He stresses that a community is a Community of Practice only if it has the following three dimensions. First, *mutual engagement* defines the community of practice with a certain shared domain for the common engagement. It enables engagement of diverse members of the community who possess mutual relationships among themselves. Second, *joint enterprise* suggests that it be important to set the common regulations in the community. Members of the CoP should cooperate and help each other, and share information. The underlying rules can be represented or realized in various templates and their operations to support such dimension. Third, a *shared repertoire* is provided to and created by the community members. The practice is an important factor in the CoP and its results in form of resources, experiences, multimedia, stories, and tools etc. can be shared among the community members.

Klamma et al. (2005) [20] wrote, based on Wenger [19] that Communities of Practice (CoP) of scholars are characterized by common conventions, language, tool usages, values

and standards. The development of a common practice which defines the community comprises the negotiation of meaning among the participants as well as the mutual engagement in joint enterprises and a shared repertoire of activities, symbols and artifacts. A CoP is inseparable from issues of (individual and social) identity. Identity is mainly determined by negotiated experience of one's self in terms of participation in a community and the learning process concerning one's membership in a CoP.

Klamma [20] adds further that systems supporting CoP should aim at providing scholars with a flexible (online) environment to create, annotate and share media-rich documents for their discourses by relying on metadata standards. Those standards allow scholars to create exchange and collaborate on multimedia artifacts and collections between communities across disciplines and distances. For the purpose of comparing different approaches in developing systems that support CoP, Klamma details the requirements for such systems. These include: (1) **Collective hypermedia artifact repository** (2) **Transcription and semantic enrichment of data**. Collaborative learning is encouraged by annotations accessible to and possibly transcribed by other scholars. (3) **Search and retrieval** – all the processes of retrieval, manipulation and management should be accessible as objects in the repository. (4) **Community management** – flexible, providing with access rights on different levels and for different roles. (5) **Personal and group collections**. The need for fluid archives on personal and group level, which can be navigated, sorted and annotated by community members. (6) **Hypermedia and interrelation graphs.** The expression of the full context and complexity of objects requires the visual representation of knowledge by hypermedia graphs. (7) **Ontologies**. These are applied for information brokering and provide users with content deemed the most suitable in a particular context.

Ralf Klamma [21] lists as features of CoP: (1) Situated Learning: Learning is a function of the activity, context and culture in which it occurs (i.e. it is situated) (2) Informal and Co-located: The gradual acquisition of knowledge and skills learned from experts in the context of their everyday activities. (3) Group Knowledge: Knowledge is mediated through social interaction and collaboration in the group (4) Legitimate Peripheral Participation (LPP): Novices move from peripheral to full participation as they gain legitimacy in the group. He then defines a CoP in the following terms: (1) What it is about: The activity/body of knowledge that the community has organized itself around - a joint enterprise. (2) How it functions: How people are linked through their involvement in common activities - mutual engagement. (3) What it produces: The set of resources the members of a CoP build up over time - their shared repertoire. He refers to Participation, Reification and Community Awareness as critical elements in CoP; Knowledge Management (KM) in form of CoP implies in (1) Turning utterances and data into needs and knowledge (2) Finding out what is really happening in your organization.

Such awareness that organizational development and other social technologies are critical in achieving well functioning Communities of Practice has lead to the development of guides e.g. one offered by EDUCAUSE [22] that integrates the experiences of several higher education institutions. Gilbert Probst and Stefano Borzillo [23] offer a analyse why communities of practice succeed and why they fail.

CONCLUSION

The Europeana projects Judaica Europeana and Digitised Manuscripts for Europeana have dramatically advanced the availability of two critical resources able to support Digital Humanities in Jewish Studies: relevant digitised contents and cutting edge semantic web tools based on the concept of scholarly primitives. The enrichment of such resources enabling their best use in the DM2E environment has been defined with the identification or relevant vocabularies and encyclopedias and their ongoing publication as RDF/Linked Data.

The main challenge ahead is to engage the relevant communities of practice that deal in Jewish Studies and should be the primary target population for using these twinned resources. This challenge should be informed by the social technologies identified as crucial for the proper functioning of Virtual Research Environments within a Communities of Practice approach.

ACKNOWLEDGEMENTS

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Enriching the Web of Data with Artworks
Burckhardtsource.org experience

Francesca Di Donato

francesca.didonato@sns.it

Susanne Muller

susanne.muller@sns.it

EUROCORR Project
Scuola Normale Superiore
Pisa, Italy

Burckhardsource.org is a semantic digital library created within the project "The European correspondence to Jacob Burckhardt" funded by the European Research Council and coordinated by the Scuola Normale Superiore of Pisa, which aims to create a critical edition of the correspondence to the Swiss art historian. One of the aims of the project is to answer to philological questions through new technologies. The letters to Jacob Burckhardt reconstruct one of the most important matches of the nineteenth century. Written by about four hundred correspondents in German, Italian, English and French, the letters cover a time span ranging from 1842 to 1897 and witness a period filled with major cultural transformations. In particular, the correspondence witnesses the debate on the emergence and consolidation of art history as a discipline separate from the history and archaeology. The proposed presentation will be focused on a specific issue related to this thematic, i.e. the semantic annotation of works of art cited in the correspondence, showing then a few visualizations of the critical edition performed thanks to the use of Pundit, an innovative tool for annotating web contents based on Linked Data technologies.

Hyperspectral imaging for non-invasive diagnostics on polychrome surfaces: the latest advances of research at the IFAC-CNR laboratories

Costanza Cucci, Andrea Casini, Marcello Picollo, Lorenzo Stefani

"Nello Carrara" Institute of Applied Physics - Italian National Research Council (IFAC-CNR)

Via Madonna del Piano, 10 - 50019 Sesto Fiorentino (Florence), Italy

E-mail(s): c.cucci@ifac.cnr.it; a.casini@ifac.cnr.it; m.picollo@ifac.cnr.it; l.stefani@ifac.cnr.it

Abstract – This paper reports the more significant achievements of the long-standing research activity carried-out at the laboratories of IFAC-CNR on the development high-performance hyper-spectral scanner and its application to the study of polychrome artworks. The last version of the IFAC-CNR scanner is intended to provide 2D hyper-spectral data on the extended 400-1700 nm range, so as to strongly improve the capability of pigment discrimination, and to increase the possibility of visualizing the underlying features of the polychrome surfaces.

INTRODUCTION

In the last decades Hyperspectral Imaging (HSI) has been increasingly applied for documentation and non-invasive investigation of polychrome surfaces [1-9]. HSI techniques consist on the acquisition of a series of reflectographic images of a given surface, which is imaged at different wavelengths across an extended spectral region (typically the Vis-NIR range). The peculiarity of HSI systems if the capability of capturing sequences of quasi-monochromatic images, acquired on almost contiguous narrow spectral bands (with a bandwidth of few nanometers). The data-set acquired, named file-cube, contains both spatial and spectral information. From each pixel of the imaged area it is possible to extract highly resolved reflectance spectra, usable for analytical purposes. Moreover, elaborated images and maps may be obtained by using statistical methods of data analysis (e.g. PCA), where hidden characteristics (retouches, *pentimenti*, etc.) and distribution of materials can be visualized. Whereas high spatial resolution is crucial to provide high-quality images usable for documentation and archiving, the high spectral resolution is essential for discrimination and identification of pictorial materials.

At the laboratories of IFAC-CNR a new prototype of a high-performance hyper-spectral scanner has been recently assembled, tested and applied to real cases [7,9].

The last version of the IFAC-CNR hyperspectral scanner includes two different spectrographic heads working in the 400 - 900 nm and 900 - 1700 nm ranges, respectively. The novelty introduced with the latest design relies in the extension of the operative range up to 1700nm, so as to strongly improve the capability of materials identification as well as the possibility of revealing hidden features. The system operates with both high spatial and spectral sampling rates, thus providing data with a spectral resolution of about 2.5 nm in the Vis and 10 nm in NIR range, and high- resolution images (about 300ppi).

The latest results obtained using the new high resolution VIS-NIR IFAC-CNR scanner along with selected examples will be presented.

EXPERIMENTAL

The IFAC-CNR hyper-spectral scanner (Fig.1) is a customized system based on push-broom technology and it has been assembled starting from commercial optical and mechanical modules [2,3,7,9]. The latest version of the prototype includes two interchangeable spectrographic heads, based on prism-grating-prism (PGP) line-spectrographs by Specim®. The model ImSpector V10E, coupled with an ORCA-ER camera (672 x 512 pixels, by Hamamatsu), is mounted on the VIS spectrographic head to operate in the 400-900nm,

whereas the model ImSpector N17E, coupled with a Xeva 1.7-640 camera (640 x 512 pixels, by Xenics®) is mounted on the NIR head to operate in the 900-1700nm spectral range. In both cases telecentric optical objectives (supplier Opto-Engineering) are used to focus the target image on the slit focal plane. Thanks to recourse to telecentric optics, the geometrical distortions due to unevenness of imaged surfaces are eliminated, thus ensuring high quality images also when defects in the supports (ancient canvas or warped panels) are present. Depending on the spectral region of interest, the VIS scan head, or the NIR one, or both may be used.

Figure 1. IFAC-CNR hyper-spectral scanner.

The illumination system is common for both the spectrographic modules and it consists of a 3200 K 150-Watt QTH-lamp connected to two Schott-Fostec fiber-optic line-lights, with fused silica cylindrical focusing lenses. These fiber-optic illuminators are fixed to the scan-head and symmetrically project their beams at 45° angles with respect to the normal direction at the imaged surface (2x45°/0° illumination/observation geometry).

The illumination system has been designed in order to maximize the spectral quality, by guaranteeing, at the same time, the absolute safeness for the object under examination. Indeed, many polychrome surfaces, especially those constituted by photosensitive materials, may undergo damaging effects if overexposed to radiation in the Vis-NIR range. Laboratory tests have been conducted to establish the best operational conditions by measuring the total light exposure corresponding to a typical scanning session. Based on these tests a maximum illumination intensity of about 23.000lux on the illuminated surface, and total light exposure of about 2700 lux.hrs were calculated. The UVa fraction in the light from the fiber-optic

illuminator was estimated to be 32 μW/lumen. These values for lighting conditions are totally compatible with the recommended limits for lighting of museum objects.

The optical module, including the spectrographic head and the in-built illumination system, is mounted on a mechanical structure consisting of two high precision movements along to orthogonal axis the vertical-plane parallel to the painting surface. The structure dimension makes it possible to scan an area of about 1 x1 m^2 in a sole measurement session. The scan is performed by acquiring a sequence of adjacent vertical scans of strips of about 6.5 cm width slightly overlapped at the edges. The acquisition is performed in free-run mode, with 0.8 mm/sec and 1.5 mm/sec scan speed for the NIR and Vis heads, respectively. The spatial sampling is 9.2 points/mm in the NIR and 11.4 points/mm in the VIS, thus providing high resolution images. Laboratory tests were performed using different calibration lamps to assess the actual spectral resolution of the system in operational conditions. Results showed that spectral resolution is 2.5 nm in the 400-900nm spectral range and 8 nm in the 900-1700nm range. Due to the both elevate spectral and spatial sampling rates, hyperspectral data cubes may easily reach huge dimensions (of order of several tens of GB), thus opening non-trivial questions on data processing, storage and treatment.

The hyperspectral scanner is provided with a customized software interface, developed at IFAC-CNR, which allows management and display of the acquired hyper-spectral data, with visualization of spectra, or 2D elaborated images. Recently the software interface has been properly modified and readapted for presentation of the data in the extended 400-1700nm range. Dedicated software has been developed to process the acquired hyper-spectral cubes including different functions such as spectral and spatial sub-sampling, the rebuilt of a unique data-set starting from the separate NIR and VIS data-cubes, etc. Moreover, since under certain circumstances hyper-spectral data-cubes may exceed the dimensional limits allowed by the home-made software interface, it is also possible to process data using commercial software platforms, such as ENVI.
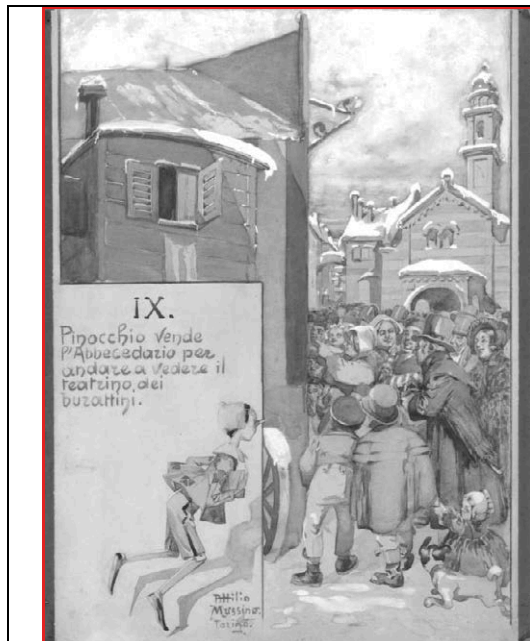

| Figure 2. Visible image reconstructed from hypespectral data of the painting *Pinocchio vende l'abbecedario per andare a vedere il teatro dei burattini.* | Figure 3. 880 nm image of a detail from the plate in Fig. 2. |

CASE STUDIES

The first reported case study is a tempera-on-paper drawing, which is part of a set of illustrations prepared by Attilio Mussino (1878–1954) in 1908 for a new edition of Pinocchio published by Bemporad. At the present, an iconographic collection of the puppet with original drawings from various historic editions of Pinocchio is present in the archives of Giunti Editore S.p.A. in Florence. In figure 2, the visible image of the plate IX, *Pinocchio vende l'abbecedario per andare a vedere il teatro dei burattini* (approx. 34 cm × 47 cm), reconstructed from the acquired set of almost monochromatic images, is reported. Eight vertical scans with an overlap of approximately 5% were registered to obtain the full scan of this drawing. Here, the file-cube (approx. 27 GB) covered the 400-900 nm range thus the capability to detect under-drawings and *pentimenti* was comparable to the traditional black and white IR photographic technique. The excellent spatial resolution together with a good gray level dynamic of the so obtained images is well represented by the extracted near infrared image at 880 nm (Fig. 3).
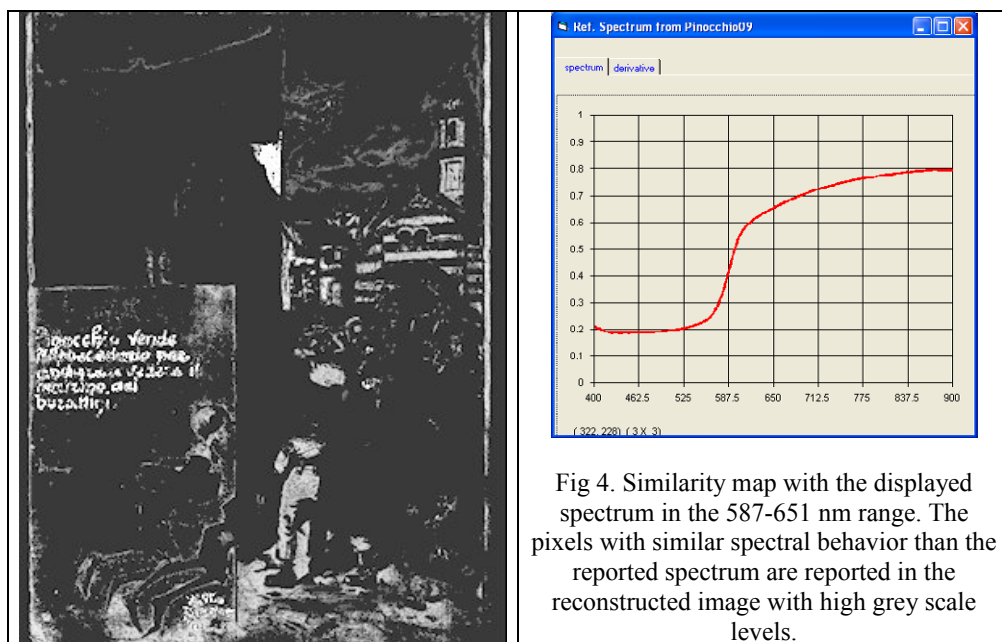
Fig 4. Similarity map with the displayed spectrum in the 587-651 nm range. The pixels with similar spectral behavior than the reported spectrum are reported in the reconstructed image with high grey scale levels.

Several computational methods can be applied to the great amount of hyper-spectral data so as to map the spatial distribution of the different materials. As an example, the discrimination between vermilion and red ochre or red lakes used to depict different red areas of the drawing was done applying a similarity map in the 587–651 nm range; here, only the lightest red areas obtained with vermilion were separated from the other red parts (Fig. 4).

The second case study was instead focussed on a panel painting. In this case HSI was applied with the aim of revealing the preparatory under-drawing and acquiring high quality images for documentation purposes. In Figure 5 a detail of the image extracted from the file-cube at 1350 nm on the 15th century panel painting *Annunciazione* from the *San Martino a Mensola* Church in Florence is displayed [10]. From the figure is clearly highlighted how the finest traits of the preparatory drawing can be revealed providing the curators and conservators with useful data on the artist's technique.

Figure 5. A detail of the high-resolution image at 1350 nm extracted from the hyper-spectral data acquired on the 15th century panel painting.

CONCLUSIONS

From the above examples it can be said that the IFAC-CNR scanner acquired hyper-spectral data in the 400-1700 nm range that are characterised by high resolutions on both spectral and spatial dimensions, thus providing multiple information, extractable using different approaches in data-elaboration processes.

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HDR IMAGES FOR CULTURAL HERITAGE DOCUMENTATION

by Andrea de Polo
Cultural Heritage Consultant @ Fratelli Alinari Photo Archive
Andrea.depolo@gmail.com

Abstract

One of the limitations of digital sensors is their inability to record details in both the brightest highlights and darkest shadows simultaneously. Some vendors are pioneering cameras with the ability to snap off several exposures in a row, and then combine them to produce an optimized, "HDR" image.

But even photographers who wish to create more traditionally-photographic types of images can benefit greatly from capturing wide dynamic range scenes. After all, we see the world around us in a very wide dynamic range, so why shouldn't we take advantage to photograph it that way as well?

Today HDR has become a very popular technique to enhance photographs. This paper is investigating how HDR can be applied successfully not only with traditional modern digital photography but also applied to the tonal mapping and image reproduction from historical 19th and early century traditional photos. Specific recommendation and demonstration are shared with the participants to the conference.

Main paper

HDR stands for High Dynamic Range and it is one of the most used techniques in photography today. It is essentially a combination of methods used to achieve a larger exposure range that represents both light and dark areas equally. More often than not, no matter what the exposure settings on your camera are, a single picture is unable accent all the details due to the different light distribution. HDR photography overcomes that by combining several pictures with different exposure settings to produce an image that shows all areas in full detail.

The idea for this technique has been circling the photography world for a very long time. The fact is that Gustave Le Gray used two separate negatives, one with a short exposure and another with a longer one, to produce an equally illuminated seascape that shows the sea and the sky, as early as 1850.

HDR Photography Development

It is helpful to think about the history of photography, and how painting and photography have influenced each other, when seeing HDR images. Modern HDR themes revive those of the Pictorial photography movement. That movement believed photography should emulate painting and etching to become art, so that pictures with emotion and atmosphere would depict personal artistic expression. Pictorialists thought images with emotion were more interesting than photographs concerned only with realism. Today with HDR software we are re-working past themes from the painters art.

The 1880's were years that reached a crescendo of the Realists vs. Impressionists in photography. The English photographer Dr. Peter Henry Emerson proposed a theory of vision. Arguing that photography should imitate the eye, he knew the eye saw sharpness only at the center of what was viewed, while the periphery of vision appeared blurred. As a result he made his platinum prints sharp only in the center and slightly out of focus towards the edges, seeking a naturalistic photograph.

Some attribute the development of HDR photography to Charles Wykoff. He created a film that was capable of recording high dynamic images directly and used it to take the infamous nuclear explosion pictures that were featured on the cover of Life magazine in 1954. This film had three layers, each with a different ASA rating (an American Standards Association method of defining the exposure index) and it produced three differently coloured images. Ansel Adams elevated dodging and burning to an art form. Many of his famous prints were manipulated in the darkroom with these two methods. Adams wrote a comprehensive book on producing prints called *The Print,* which features dodging and burning prominently, in the context of his Zone System. With the advent of color photography, tone mapping in the darkroom was no longer possible, due to the specific timing needed during the developing process of color film. Photographers looked to film manufacturers to design new film stocks with improved response over the years, or shot in black and white to use tone mapping methods. Modern HDR imaging uses a completely different approach, based on making a high-dynamic range luminance or light map using only global image operations (across the entire image), and then tone mapping this result. Global HDR was first introduced in 1993 resulting in a mathematical theory of differently exposed pictures of the same subject matter that was published in 1995 by Steve Mann and Rosalind Picard. In 1997 this global-HDR technique of combining several differently exposed images to produce a single HDR image was presented to the computer graphics community by Paul Debevec. This method was developed to produce a high dynamic range image from a set of photographs taken with a range of exposures. With the rising popularity of digital cameras and easy-to-use desktop software, the term HDR is now popularly used to refer to this process. This composite technique is different from (and may be of lesser or greater quality than) the production of an image from a single exposure of a sensor that has a native high dynamic range. Tone mapping is also used to display HDR images on devices with a low native dynamic range, such as a computer screen. Steve Mann developed and patented in 1996 the global-HDR method for producing digital images having extended dynamic range at the MIT Media Laboratory.

Tone Mapping
Throughout the better part of the 20th century, HDR images were created by manually tone mapping the photograph via dodging and burning. These processes included directly manipulating the negative and increasing or decreasing exposure in certain areas because the negative has a much higher dynamic range than the print-out. An important example of this era is W. Eugene Smith's Schweitzer at the Lamp – a photo that took 5 days to be produced. Ansel Adams, the famous photographer, was a great fan of the technique and spent hours in the darkroom manipulating his famous pictures.

Comparison with traditional digital images
Information stored in high-dynamic-range images typically corresponds to the physical values of luminance or radiance that can be observed in the real world. This is different from traditional digital images, which represent colors that should appear on a monitor or a paper print. Therefore, HDR image formats are often called *scene-referred*, in contrast to traditional digital images, which are *device-referred* or *output-referred*. Furthermore, traditional images are usually encoded for the human visual system (maximizing the visual information stored in the fixed number of bits), which is usually called *gamma encoding* or *gamma correction*. The values stored for HDR

images are often gamma compressed (power law) or logarithmically encoded, or floating-point linear values, since fixed-point linear encodings are increasingly inefficient over higher dynamic ranges.

HDR with historical images

HDR with historical images is a totally new matter as typically HDR is applied mostly to contemporary digital images. In this sense, HDR is an image enhancement for tone mapping and lighting adjustments solution, that it has been introduced to the mass market, as described earlier, in recent time. Historical photographs such as images produced by the Alinari brothers between 1880 and 1920, or Daguerreotypes taken by Daguerre in the 1840-1850's or silver print by Ansel Adams produced with such extensive tonal range using the zone system, should not be enhanced with HDR, at least not in the way that we use HDR with modern digital photos.

Colosseum, ca. 1880, Alinari brothers, Rome, Albumen print

HDR example - Courtesy: http://www.hdrsoft.com/ gallery web site (modern digital photo)

In this paper we analyze, the tonal map of historical vintage images, mainly thus taken between 1839 and 1970's. The first historical image has been printed in this paper, as it is. The second photo, made around 2012 with HDR tool, shows a very dramatic scene. The result is the increase on the edges of the objects in the photos,

with strong details. The problem with HDR is that *by default*, it looks artificial and ugly, and it takes some work to bring it back to something believable. Though knowing how to achieve that result mostly comes with practice, there is one important trick that I should mention here: you should never try to obtain the final look of an image in the tone mapping phase, and instead just focus on bringing all the details back from shadows and highlights. You should aim for a low contrast (especially local contrast), low saturation image at this stage, and only afterward, in Photoshop and with local curves adjustments, bring back the full glory of the scene. In case of the assembled HDR images, the ratio of pixel value to real scene radiance is linear. The CCD and CMOS sensors both have linear sensitivity too, but the photo taken with a digital camera undergoes processing before it is stored as JPEG on the memory card. That processing includes contrast (or dynamic range) compression, so the photo looks natural when is displayed on a computer screen.

In many cases the photographed scenes do not characterize with very wide dynamic range, so taking an image sequence in order to assemble and tone map a HDR may be too much effort. Also, by taking a RAW photo, instead of JPEG you can achieve a slightly higher dynamic range, so a single photo may be sufficient.

Again with historical images the idea that "*you just load your images in the software, press a button, and that's it*" cannot be easily applied. While one could argue that there would actually be nothing wrong with that (the whole craft vs art debate, which I won't get into), it isn't even true to start with. If you try to process HDR images like that, keeping everything at its default settings, then you will end up with an awful artificial looking image. Getting HDR right is as much of a technique to learn as anything else in photography.

Specifically, the tonal range, hue, contrast, dynamic range, overall look of an ancient 19th or early 20th century vintage photo is very different from a contemporary digital image, which is often much stronger in terms of color saturation, dynamic range and so on (as seen in the examples above).
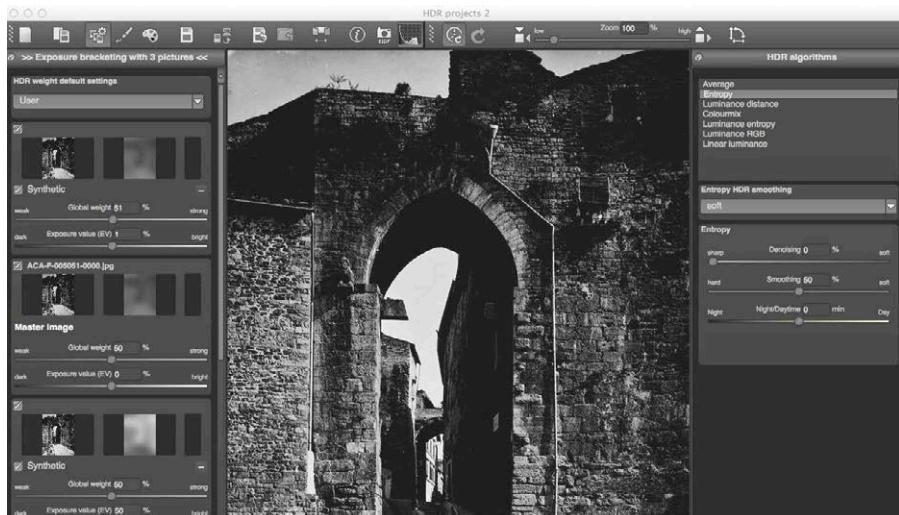
HDR Project 2 application applied to a 19th C. b/w Alinari image

Today, in the world of fine art image reproduction and cultural heritage, reproducing any work of art in the most fast, accurate and efficient way has become a very

important requirement such as the Leaf Imaging Ltd, part of Phase One A/S Established in 1984, Leaf has always been if the forefront of digital imaging. In 1992 it became a part of Scitex Corp, one of the leading hitch companies at the time and introduced the first ever digital camera back. Since then, at a cycle of approx. 2 years Leaf continued to lead the market with innovations such as Live View, CMOS sensor technology, Firewire communication, Wireless preview and control and large, high resolution CCD sensors. The most recent development is a Wide-Spectrum camera in 60MP and 80MP that can be utilized in applications where Infrared and Ultraviolet capabilities are necessary.

Leaf products have won the 2006 TIPA award for innovation and quality. Leaf's current range of high resolution camera backs incorporate sensors with resolution of up to 80 megapixel and utilizes the award winning Capture One workflow software (see example images below). Offering high level of detail, high dynamic range (12.5 f-stops), accurate colour and seamless workflow from capture to output.

The iX camera system was developed specifically for industrial, aerial and reproduction applications and as such it is robust, simple to use and delivers the best image quality and the most efficient workflow, especially when handling large volumes of images that have to be delivered in a short period of time

The camera is compatible with a wide range of medium format lenses from Mamiya and Schneider Kreuznach.

In addition to this, in fine art and HDR work we can also consider the Leaf Credo WS option which is not JUST an infrared back, but it is also an infrared-capable digital back.

The Leaf Credo WS enables you to shoot:

• Infrared (use a IR-pass, visible-block filter)
• Standard Color (use IR-block, visible-pass filter)
• Infrarcolor (use an orange/red filter)
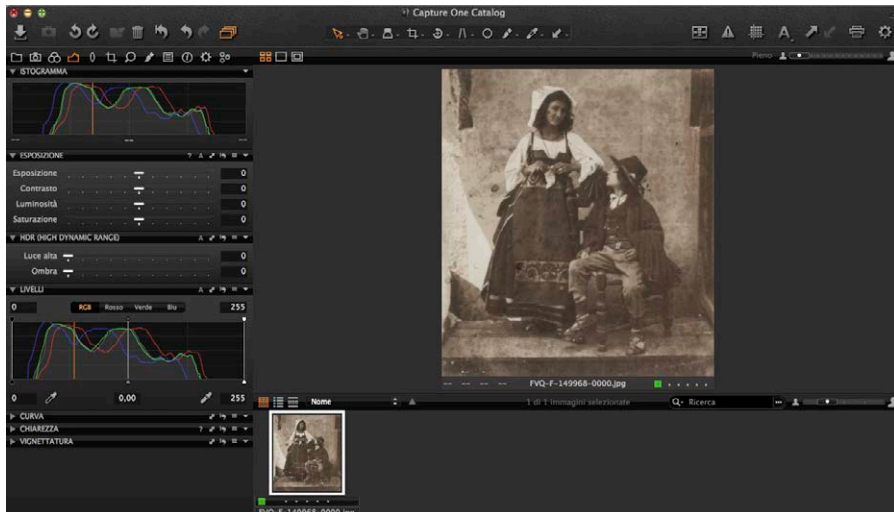
CaptureOne software with default settings on an old Alinari photo
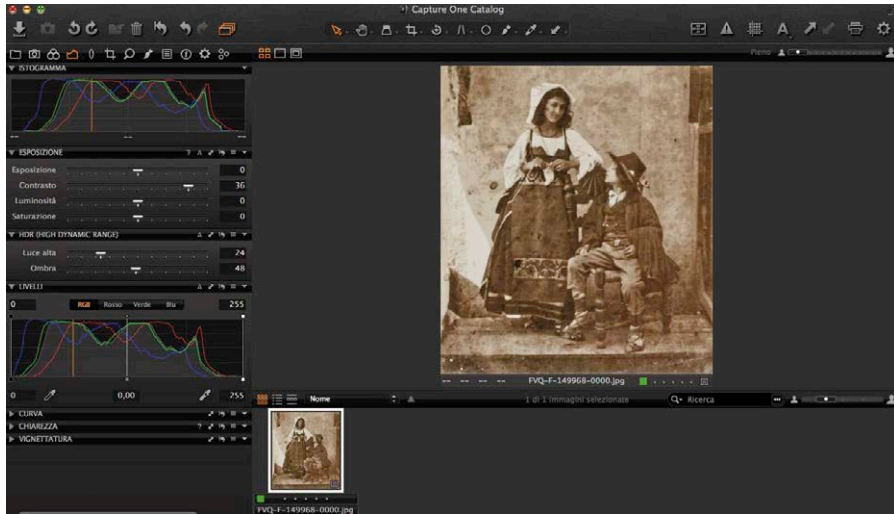
CaptureOne software with HDR enabled settings on an old Alinari photo

Again, it is imperative to understand how to "play" with old photos.
Using HDR too much can just create very false and even fake looking photos. It is again very important to play with the settings on the highlight and shadow and try to apply very little changes to historical images, especially if you work in an historical institution and you want to maintain the look, feel and effect of an ancient image.
For this paper I want also highlight the important of a EU based COST action (HDRi) which is specifically focusing on HDR issues and try to influence also the commercial and end user sector about the proper usage and future directions of HDR.

Credits
http://www.alinariarchives.it
http://www.mamiyaleaf.com/wide_spectrum_credo.html
http://www.ic1005-hdri.com

2D - 3D TECHNOLOGIES AND APPLICATIONS

THz-ARTE PROJECT FOR NON-INVASIVE ANALYSIS OF CULTURAL HERITAGE

K. Fukunaga

National Institute of Information and Communications Technology (NICT)
Koganei, Tokyo 184-8795, Japan
e-mail: kaori@nict.go.jp

M. Picollo

"Nello Carrara" Institute for Applied Physics of the National Research Council (IFAC-CNR)
Via Madonna del Piano 10, 50019 Sesto Fiorentino, Florence, Italy
e-mail: m.picollo@ifac.cnr.it

G.P. Gallerano

ENEA - Centro Ricerche Frascati
Via Enrico Fermi 45, 00044 Frascati, Rome, Italy
e-mail: gianpiero.gallerano@enea.it

Abstract – The scientific investigation of art and archaeological objects is an essential step before any conservation procedures, and the use of non-invasive methodologies is broadly desired in this field. The radiation in the X-ray - infrared range is commonly used to identify the materials employed as well as to study the artistic techniques and the production technologies of artworks and archaeological artifacts. The microwaves and millimeter wavelength regions are less extensively used in the art conservation field, but their application to artistic objects is well represented in the scientific literature. On the other side, the frequency range from 100 GHz to 10 THz has not been used in the conservation field so far, although there are interesting potentialities of the application of the new emerging THz-TDS imaging and continuous wave tomography techniques in the art conservation field. For example, non-invasive cross section image of a panel painting can be obtained by time of flight technique. It means that THz-TDS imaging technique makes it possible to reveal the structure of preparation layers providing useful information to art curators and conservators.

In the case of wall paintings, however, the thickness of the system paint layers - *arriccio* is often too thick for THz wave to pass though it in the attempt to reach the plaster. In addition, surface roughness and/or the diameter of the aggregates, such as sand particles in the paint and *arriccio* layers, often disturb the transmission of the THz wave in passing through the materials. Lower frequency around 100 GHz can partially overcome these obstacles and should be suitable for investigating wall paintings. Starting from this idea, the authors have established an international research project, called "Terahertz Advanced Research Techniques for non-invasive analysis in art conservation" (THz-Arte). THz-Arte Project is focused in developing a prototype of imaging system using sub-THz electromagnetic waves from 20 GHz – 0.6 THz range. This paper will report the first results obtained by using the proposed prototype on wall painting mock-ups

CONSERVING DIGITAL IMAGES INTO THE 23rd CENTURY – A NEW CASE STUDY

Graham Diprose: Photographer, Author and Lecturer, Former Senior Lecturer, London College of Communication, University of the Arts London, UK London's Found Riverscape Partnership, EVA London Committee
grahamdiprose@gmail.com

Mike Seaborne: Photographer, Former Senior Curator of Photographs, Museum of London, UK, London's Found Riverscape Partnership,
www.mikeseaborne.com mickey_vista@yahoo.co.uk

Abstract- While museums and archives digitise their collections for wider access online, and to reduce handling originals, digitised data files may not survive any longer than the artefact being copied. We cannot predict how often digital image data will need to be migrated from one file format, or storage system to another, nor the risks from technical mishaps, 'bit rot' or human error. This paper proposes archiving vital images and documents as hard copy inkjet prints, not in place of digital storage and migration, but rather as an insurance, based on well-known conservation methods, using acid free paper and pigments.

INTRODUCTION

The best archiving and curatorial practices for traditional silver halide photographs are very well established worldwide. That the dyes used in post-world war II colour negatives and transparency films would begin to fade in as little as 30 years was probably less anticipated by the photographers of their particular era [1].

The vast majority of the world's digital image files are presently stored outside professional archives, and their makers will be very lucky indeed if they can still be accessed and viewed in a mere ten years time. Since the technology continues to evolve rapidly, there is no certainty that the image creation, storage and retrieval devices of the future will continue to be based on today's popular digital platforms [2]. Victorian black and white photographs could well outlive those colour dye images shot by our parents, which may themselves last far longer than today's digital images. The authors are researching selecting and sending our most significant artworks, digital photographs and documents forward into the 23rd century as smaller, high-resolution inkjet prints, as an alternative to digital data. The image can then be recovered from today's print-out with minimal loss, using whatever capture or scanning technology may be available, at any time in the future.

Rather than replacing RAID disks (Redundant Array of Independent Disks), or any other data storage system, we propose that this could be an additional technology-proof form of insurance, making it more likely that the image or document will ultimately survive in a usable state. While not everything can or should be archived in this way, at least with this method today's curators can select what they wish to send forward into the future and use a known technology likely to ensure its survival. The

alternative is to hope that our grandchildren's sons or daughters will be discerning when it comes to wiping data to free up space on whatever storage devices they are used in 2099 or 2199. There is a serious risk in relying on them to decide what digital records and images from today's culture get chosen for further migration or deletion.

SO WHAT CAN POSSIBLY GO WRONG?

RAID and cloud computing technologies can be very good, allowing digitised files to be simultaneously stored on several servers in different parts of the world, hence it would be wrong to say that best efforts are not being made to preserve these virtual, digital data files. However, in addition to ever-changing technology, our world is subject to uncontrollable natural events such as extreme weather, earthquakes and floods, to name but a few. Newly discovered risks from the effects of sunspots and solar flares are also now a concern, and cyber attacks on a country's economic and cultural centres are no longer the stuff of science fiction, but a serious threat.

Those of us who have suffered from a hard drive failure on a home computer or data loss from a server failure at work, will already be well aware of the ultimate fragility of digital data. The natural degradation of data (sometimes referred to as bit rot) [3] and data corruption during migration are less familiar issues. Even if we store our valuable TIFF files across many RAID disks and servers in different corners of this planet, there is no guarantee that evolving technology, such as the storage of bits on strings of DNA, for example, will not be so radical that today's files are totally unreadable by the computers used in 50, or even 25 years time.

Smaller specialist archives are unlikely to have the resources and skills needed to meet the challenges of digital migration, nor will they have the budget to employ specialist companies and institutions to look after the data for them. The challenges are huge, from simultaneously migrating and translating digital data on numerous websites worldwide, to writing data to optical discs or solid state drives, with no guarantee there will be any devices able read them in 50 years time.

Any lack of standardisation from one present or future digital format to another will lead to considerable difficulties in consolidating or migrating collections. Thus, rather like the game of 'Chinese Whispers', during the course of repeated migrations necessitated by updates in software or hardware, changes to the image data may well occur. Many smaller image archives are already finding that they are storing a mixture of TIFF, JPEG and RAW files, collected from different sources. How long will these formats survive before, like JPEG2000, they fail due to lack of industry-wide support? Apple Inc co-founder Steve Wozniak recently said "I really worry about everything going to The Cloud, I think it's going to be horrendous. I think there are going to be a lot of horrible problems in the next five years."[4] Our conclusion is that vast swathes of our contemporary history and culture are at risk being randomly consigned to the 21st or 22nd century digital recycle bin through lack of space, budget to migrate, or contemporary lack of appreciation of the images. Or, like some indecipherable stone tablet, of the information being there, but becoming inaccessible, as the last hardware readers of long-outdated formats cease to function. Throughout the numerous migrations likely to be involved in sending digital image data 200 years into the future, we should all be very aware that one day, if it can possibly go wrong, it probably will go wrong.

LONG TERM ARCHIVING OF PHOTOGRAPHIC PROJECTS

In 1997, Mike Seaborne, Charles Craig and Graham Diprose made a continuous photographic panorama of both banks of the River Thames from London Bridge to Greenwich, five miles downstream [5]. This was to be a remake of a panorama first photographed in black and white in 1937 for the Port of London Authority (PLA). We shot on 6x17cm Fujichrome colour film, as at the time, this was considered to be one of the most archival dye-based films available. In 2008, the PLA invited us to make a new digital panorama to celebrate its March 2009 centenary. We were concerned that our newly created digital TIFF files would not outlast the 1937 Silver Gelatine originals, even if entrusted to the considerable expertise of The Museum of London.

   We convinced the PLA that the safest way to ensure that that the new digital panorama would survive for their bi-centenary in 2109, was to make an ink jet printout to match that from 1937, with the same lengths of sections and locations. Prints were made using our Hewlett Packard HP Z3100 pigment ink printer on Hahnemühle 188gsm Photo Rag paper. This allowed any river location to be viewed simultaneously in both 1937 and 2008 versions placed side-by-side. Once completed, our newly archival ink-jet panorama was placed in blue leather folders similar to the 1937 panorama and in 2009, was presented to the Museum of London, as part of the PLA's centenary events. We handed over our TIFF files as well, but are much more confident in the printed version being part of the PLA's bi-centenary celebrations.

   In a further project by Diprose and Robins, "…in the footsteps of Henry Taunt" and sponsored by English Heritage, the photographers digitally revisited the 'tripod spots' of the first Victorian photographer to document the entire length of The River Thames [6]. Their new digital images went into English Heritage NMR Archive in Swindon, alongside Taunt's Silver Gelatine Prints from 1860-1920, but again, to avoid the possibility of photographs from 130 years ago outliving their new digital images, the whole project was archived as A3 digital ink jet prints as well as Tiff files.

RESEARCH METHODOLOGY AND TESTING

   We already had a Hewlett Packard Z3100 available to us, which provides the most fade-resistant prints of any pigment inkjet printer currently available (March 2013). Wilhelm Imaging Research, Inc. still rates this printer and its slightly modified successor the Z3200 as yielding longer-lasting prints on a range of archival papers than any other printer. These pigment based inks were continuously reported to be the most permanent available from any company [7].

   The choice of paper was much less straightforward and hence a large number of different types were tested. We correctly suspected that if the paper had a texture this might interfere with the quality of the image created through scanning or copying. We also thought that that the sharpness of the dot was likely to be an important factor, particularly if we intended to print images at a much reduced size. To assess how the nature of the paper surface affected dot sharpness, we tested several fibre-based and resin coated papers to determine the differences, if any, in dot bleed.

We made TIFF files of 64, 96 and 128 A4 pages from the Microsoft Word version of a new photographic textbook by Diprose and Robins. These files were loaded into Photoshop™, using Contact Sheet II, and printed out. The prints showed that, even at a scale of 128 A4 pages per A2 sheet, the text was still readable with a magnifying glass. Once a single tiny page was scanned and read into OCR Software we could count the number of errors as a measure of ink dot sharpness. Those words it cannot recognise are flagged in green by the software and the sharper the ink jet dot, the more words can be read by OCR and the less green flagged errors occur on the page. Generally, in this simple way, we could tell at a glance if a paper surface was likely to be suitable for our follow-up experiments.

We rapidly concluded that all matt papers tended to cause the dot to bleed into the paper fibres, while on most gloss or lustre papers the ink tended to form a tiny bubble on the paper surface that gave a less complete, and accurate, dot shape. Ortiz and Mikkilineni (Purdue University) produced a paper on Inkjet Forensics in 2007 that reached the same conclusion as our own, that smooth Rag papers produced the sharpest dot [8]. We were keen also to avoid choosing any papers containing artificial brighteners (baryte) as these have been considered by a number of researchers to risk reducing archival life [9]. If a paper has a very slight warm tone base that does not change over a long period of time, this seems advantageous over a paper where changes in brightness may be predicted.

Canson Infinity Rag Photographique paper with a special barrier layer that prevented the ink from sinking further into the paper base, also fully met the archival standards specified in ISO 9706, and gave us by far the best result of all the papers we have tested thus far. Additionally, this paper is internally buffered to resist gas fading, and is totally acid free to avoid any long term paper degradation. We now required a practical Case Study to test our ideas with a real archive and it's curators .

CASE STUDY – JOHN CASS EAST END ARCHIVE - LONDON

The Cass School of Art's East End Archive is an online digital resource bringing together not only historic bodies of work, but also collections from contemporary photographers and artists concerned with London's East End. Initially the Director, Susan Andrews, and her team, had envisaged holding the archive purely in digital form. However, following a Symposium held at Cass School of Art in 2011, where Diprose and Seaborne expressed their concerns over long term digital data storage and migration, it was resolved to run a pilot scheme using some of the East End Archive's images to test the viability of also archiving these digital images as reduced-size pigment inkjet prints.

We tested our methodology by printing out digital images 4 up on A2 (A4 size), 8 up on A2 (A5 size), 16 up on A2 (A6 size) and 32 up on A2 (A7 size). The printed images were then copied using a Nikon D800E digital camera fitted with a 55mm f2.8 Micro-Nikkor lens, which was found to give higher image quality than even the best affordable flatbed scanner. The digital copy files were then processed using Adobe Photoshop software to minimise the effect of the dot screen and to optimise image quality. Our Conclusion was that an image archived A4 would make a good quality A3 exhibition print, one archived A5 would be suitable for most book publication and an A6 printout was still very suitable for any Screen or Tablet output. A7 32 up images would be usable for web or viewing on any tablet or mobile.

Unlike most digital data archives where all files are stored and migrated at the same file-size, Susan Andrews and her team were able to choose to archive different images at different sizes. This was not only significant for budget savings in production, but also as an additional indication to our unborn great grandchildren curators of tomorrow, as to what we, in 2014, felt was the most significant part of our collection. Seeing 32up A7 'Street Photography' pictures of Whitechapel High Street, gave a far better overview than viewing individual images on a screen. This also addressed concerns that, where a particular colour cast was intentional, or a low key image was vital to the artist's vision, it was likely to suffer built in Auto-Colour or Auto Levels corrections, during the many stages of migration to new software or file types.

We are writing our new Case Study with Cass East End Archive to be distributed by UK National Archives in Kew to their international list of Curators. We are also seeking further collaborations to put our ideas into practice. There seemed little point in putting illustrations in this paper, when the proof of our research is in the highly detailed output of new digital files made by copying our reduced size ink jet prints that we will show at EVA Florence Conference. Hopefully this will convince Curators to consider an alternative method for long term archiving of their digital image files.

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A PLACE OF FAITH AND DEVOTION AND ITS CONTEMPORARY RE-READING, THE DIGITAL SURVEY AND INTERPRETATION OF THE SAN VIVALDO "JERUSALEM" AREA NEAR FLORENCE

C. Mastroberti, R. Pacciani, G. Verdiani
Dipartimento di Architettura,
Università degli Studi di Firenze
Firenze, Italy
c_arlam_@hotmail.it; riccardo.pacciani@unifi.it; giorgio.verdiani@unifi.it

Abstract – Out of Florence, in a peaceful area on hill, it is possible to meet the "Holy mount" of San Vivaldo, a rich complex made by a sequence of small chapels and churches. The digital survey operated in 2009 and 2011, created the basis for a detailed reading of all the architectonic apparatus, allowing the creation of the most accurate 2D and 3D representation this complex has never had, but also an "in depth" understanding of the historical and architectonic relationship working in this specific religious settlement.

INTRODUCTION

On May 1497 the local authorities of the town of Montaione, near Florence, offered the old nearby hermitage entitled to San Vivaldo to the Provincial Chapter of the Tuscan Observant Franciscans. After the formal settlement of 24 March 1500, the friars took possession of the site and start building a convent and a church. Within the walled enclusure close to the convent, a group of small oratories and chapels was built over the century, each one making a reference to a Holy Place in Jerusalem..

THE PLACE AND ITS ARCHITECTONIC APPARATUS

The San Vivaldo settlement is a Renaissance monument and a thematic park of faith as well. It collects the architectonic idea of a far away place, while giving the space a powerful sense of a Middle Eastern image: In fact, the group of chapels is modeled as a transposition of Jerusalem as the faithful visitors might easily recall.

The Jerusalem of San Vivaldo, despite a first impression of randomness, is a place developed according to a precise iconographic program. Just as giving a hint of the places of the earthly Jerusalem choosing to represent them just through plants. Sometimes not only peculiarities of access had been repeated, but also some measure cited.

THE DIGITAL SURVEY OF THE AREA

The whole survey was done in two separated campaigns (operated in April 2009 and December 2011 by the Department of Architecture in Florence and the collaboration of AREA3D S.r.l., Livorno) using a phase shift 3D laser scanner. The small size of the architectures and the good accuracy of this tool allowed to produce a very detailed model with high readable details in a quite short time. The whole survey took just two days to be completed, with the full coverage of every parts in and out the building. The whole set of scans was referenced to a system of targets, some of them materialized using flat or spherical specific elements, and other localized over meaningful details all around the architectures. The logic of the survey was quite simple, taking the whole outside, entering, taking the whole inside, making an evaluation about possible "in depth" extra scans to enhance some details and then passing to the following building. Each building of the whole settlement is quite near

to the other and this facilitated a lot the sequence of operations. As told, for some specific chapel some special operations were done. In example, for the Saint Sepulcher a special set of scans was taken: this chapel presents the demolishment of the original roof and is covered by the newer roof. This change in the aspect of the building has caused the original top opening to get lost. But some remains are still in place, under the new structure.

Fig. 1, 2, 3, 4 - Views from the first 3D laser scanner survey campaign, aligned pointclouds.

So for first the building was at first surveyed in his contemporary condition, then, with the help of a scaffolding and of some operators from the municipality, a part of the new roof was removed, leaving visible the original base of the opening. At this point all the scans covering the upper part were replied, creating a "double" version of the same building, and creating the possibility to study the shape of the original opening from a very detailed and accurate survey.

POST PROCESSING OF THE DATA

After a first alignment of the pointclouds describing each building, a specific editable version of the whole dataset was created. Starting from this one the choice felt on a first classical 2D reconstruction, with a particular attention to an accurate vector drawing of all the statue and ceramic elements. The graphic rendering, through plans, elevations and sections was aimed to produce a detail scale equal to 1:20 of the seven chapels covered by the two measurement campaigns. The process of the data was quite simple, working with snapshots from Leica Geosystem Cyclone, choosing classical section planes and preparing the image to be suitable for the further treatment in the CAD software. Bringing the whole set of bitmap based representations inside Autodesk Autocad, a very involving work of redrawing was operated, taking care to respect at the best the details from the screenshots. It is worth to say that the set of screenshots, for each section or plan was not based on a single solution. To enhance the readability of the drawing, for each representation at least three different visualization styles were chosen: a "color from scanner" version (with the reflective value in generic color scale); a "gray scale" version, and a "silhouette" style to enhance the borders and the planarities of each architecture. In specific cases, one more screenshot was prepared, the "elevation map" one, done introducing a variations in the colors according to the "elevation" in a single direction of the whole pointcloud. In this way the possibility to better read differences in a section or in a front view were greatly enhanced with an automatic

process. The main intention was to provide a very traditional graphic representation, the most detailed possible, this is the reason why the choice of the 1:20 scale. The aims are to encourage the subsequent analysis and specific studies on individual chapels offering a high quality set of drawings made in a style that appears like a sort of "tribute" to the tradition of architecture survey and architecture representation.
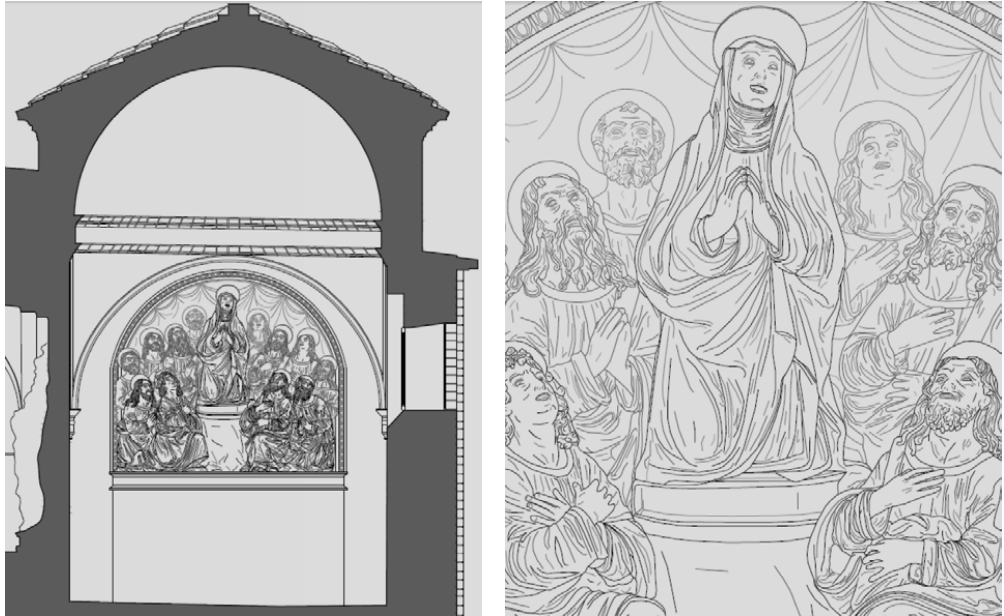

Fig. 5, 6 - Views of a section from the Pentecoste chapel in San Vivaldo

GEOMETRY OF THE ARCHITECTURES

The system of small churches and chapels all around the hill are at the same time a sort of selection of architectonic elements and design solution from their age. The high precision of the survey allows to describe in detail and trace with accuracy the grids and the proportions between each part of the buildings. The geometrical analysis based on the ancient measurement units allows to develop important considerations on building purposes and to advance hypotheses on geometric series used in the design phase, searching proportions and relationships in the use of multiples and submultiples.

It comes out clear that the whole asset is based on the "braccio fiorentino" measurement system, a typical solution of that time, but not an obvious find in this area.

The use of the extracted and treated 2D drawings allows to enhance and put in evidence the combination of geometry and architecture, showing a clear, simple but rigorous criteria that put in robust proportions each building. The dimensioning is oriented to create a very "human" and "easy to catch in a single sight" condition, but all the parts have sober proportions, empathizing the sculptures and the ceramic elements which became the real inhabitants of each church and chapel.

VIRTUAL RECONSTRUCTION: THE HOLY SEPULCHER

One of the most interesting dilemma about the original layout of the San Vivaldo Jerusalem is the previous design of the Holy Sepulcher.

This meaningful building, with his altered roof is worth of an accurate study, while it can give more than one indication about the way the people working on this settlement intended

architecture and the "model" they were representing here. A study based on the geometrical analysis has helped in this direction, but it is not that easy to define a digital reconstruction of the missing parts of this chapel.
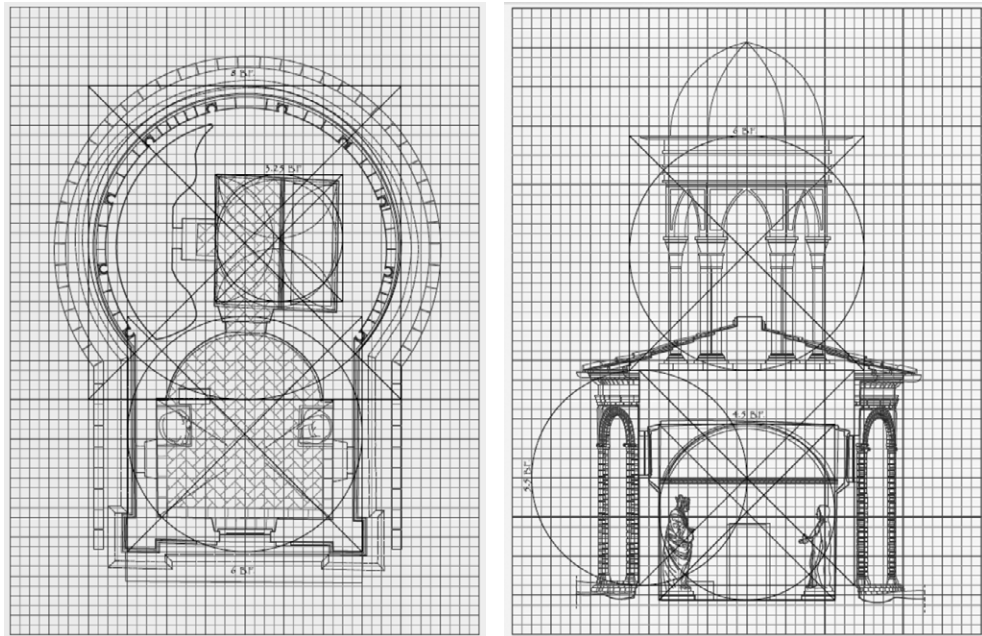

Fig. 7, 8 - Grid Analysis on the virtual reconstruction study for the Holy Sepulcher chapel

First of all the remains and the reference to the "theoric" model of the sepulcher can give a clear indication about the presence of a lantern over the roof, but to make further assumptions about its possible size some accurate reflections are needed. To hypothesize the dimensioning of this element it was chose to follow its graphical traces to extend them into lines and creating a reference pattern to compose the architectural parts. The first passage was doubling the square located on the main front by six Florentine arms, then developing a proportional grid starting primarily by the proportioning of the classical orders, in the specific case using the typical Tuscan order, but this first try was not successful. So the further try started taking into account the possibility of columns without entasis, obviating the failure result of the initial proportions (the stem determined in that way was disproportionate, rather short and stout) and trying to live up to the remains of the base of the columns, which was founded during the past restorations. In addition, the reconstruction and sizing plant has been possible thanks to the results of the survey carried out using the 3D laser scanner, which revealed the hexagonal base of the lantern (two of the six sides, others were built accordingly to a geometrical reconstruction). In this way, following a step by step analysis of the possible design grid, a first and meaningful working grid came out. In the choices made in the reconstruction a very strategic rule was played by the observation of the equivalent monument in Görlitz, Germany, an interesting parallel, which was studied and surveyed using a photogrammetric solution, based on the use of Agisoft Photoscan, one of the most well diffused and better working SFM (Structure From Motion) software. The SFM reconstruction was tested at first with a previous version of Photoscan, the 0.9, then with the use of the new release, the 1.0 the results came out in a more complete and usable way. The testing and the experimentation using Photoscan were operated in collaboration with arch. Mirco Pucci.

The reading of the germanic example gave an interesting contribution in imaging the original aspect of the Holy Sepulcher. From this reading it came out clear how the specific

architectonic solutions are a very "elastic" language for these buildings, where the only rigorous element is the size of the Jesus's sepulcher, it is the element of faith to be respected, all the other elements adapt themselves to the environment conditions and architectural preferences.
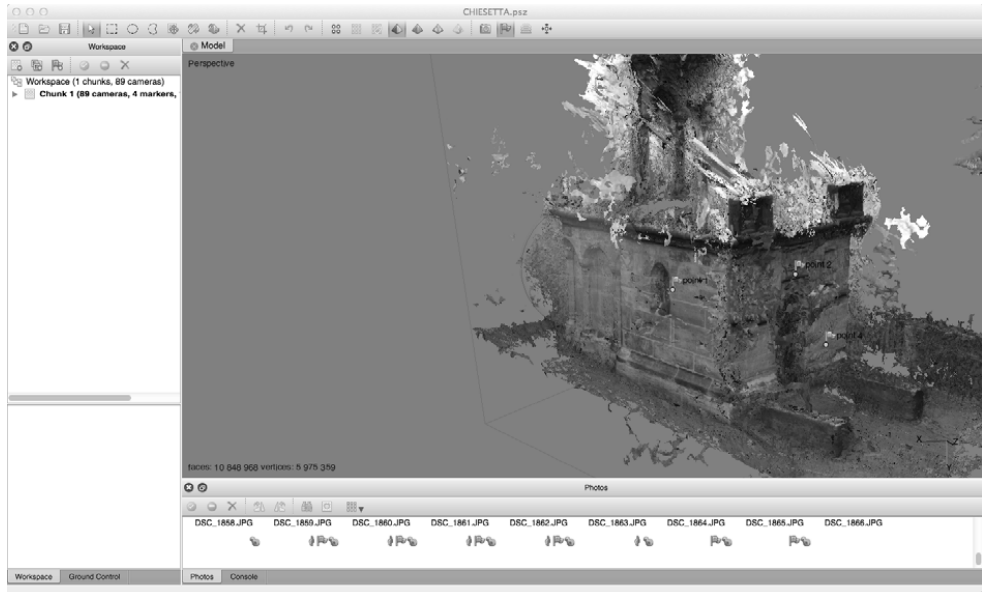

Fig. 9 - 3D modeling from photos of the Görlitz "Holy Sepulcher" using Agisoft Photoscan.

SOMETHING MORE DIGITAL

The developing of an app for San Vivaldo is one of the advanced challenge in this research, it looks more to the tourist and to the curious than to the scholar, but it can be helpful to enhance a right interpretation of the value of this architecture. The development has been carried on in collaboration with arch. Francesco Sani and the APP was initially thought for the use with an Apple Ipad, but it is possible to imagine an easy translation into a Google Android operative system. Inside the APP it has been outlined visit to the chapels, especially trying to create a path as much as possible linear and following as much as possible the timeline of the "episodes"of the life of Jesus represented at San Vivaldo.

The proposed visit to the area starts from the parking area, and provides a passage across the trees leading to the church and to the convent of San Vivaldo and then proceed according to a progression starting from the Chapel of the Samaritan, passing by the Mount Sion chapel, crossing one after the other all the other 13 chapel to focus on the Holy Sepulcher and then closing with the remaining 5 chapels.

The intention is to go beyond the traditional visit based on the use of an audio guide or information boards, reducing the impact of signs all around the "The Jerusalem of San Vivaldo" and giving more attention to the original asset of the place. The APP can be used on site, exploiting a local net or as a home application, it will allow to move through the site information (events, sightseeing, how to get there, touristic information), history and the map which will help to complete the real visit. The application, ready for the visit, will show a map of the site where the various points of interest, the individual chapels are located , specific markers will help in the identification of each element. An arrow indicates the direction to follow in the path led through the activation of a GPS positioning system, the latter will drive both the planned visit of the site. During the visit, an alert tone will signal the proximity of a point of interest. Only those points of interest which have correspondence both with

Jerusalem and Görlitz will present in its form, and automatical procedure will propose the connection with one and/or another website containing appropriate information.

CONCLUSIONS

The "Jerusalem" in San Vivaldo shows its particularities and create the occasion for thinking and reflecting about the historical architecture and the way ancient architects approaches themselves to the logic of building and how they were used to communicate the faith of their age. The articulated subjects create the conditions for more than one challenge, where digital solutions, documentation, representation and new technologies are called to research side by side with the historical and artistic value of a meaningful place.

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Architecture and sculpture: a digital investigation about the Cellini's Perseo basement from the Loggia dei Lanzi to the Bargello Museum.

Pablo Rodriguez-Navarro

Departamento de Expresión Gráfica Arquitectónica, Universitat Politècnica de València, Valencia, Spain

rodriguez@upv.es

Keywords: 3D Photogrammetry, Digital Survey, Benedetto Cellini, Cultural Heritage, Perseo, Firenze

The Benedetto Cellini's Perseo is one of the most well known sculpture from the late Reinassence, it has its place beneath the Loggia dei Lanzi in Florence and it's a masterpiece of bronze with an impressive and dynamic shape. Every day a lot of tourists take pictures or simply admire this statue, but only a few of them stand looking to the rich basement supporting the statue. This secondary but very rich and meaningful artwork is not the original one, it is a very well done copy, while the original one from Cellini is placed in the Bargello museum in a more safe place: the so called "Michelangelo hall".

The piece to digital analyze is the allegory of Mother Earth which Benvenuto Cellini sculpted on each of the corners of this base of his Perseus, finished in 1554. Such a meaningful piece of art is here used to operate a confrontation between two different digital survey tools and developing the results as a base for geometrical reading and for detailed representation purposes. In a certain way it is a piece from the Renaissance used for testing tools of the actual digital Renaissance and bring this tools to create knowledge. As far as the equipment is concerned, a Nikon D3000 camera with an AF-S DX 18-55 mm lens and a resolution of 13 megapixels. The scanner used is the NextEngine model 2020i Desktop 3D Scanner, assisted by a laptop. This scanner is accurate to 0.0001 metres and works by means of laser stripe technology, which performs a sweep of the object obtaining a point cloud which it automatically converts into a polygon mesh.

The model achieved through triangulation has high resolution, but low quality colour texture, and thus additional mapping work is necessary which must be carried out using other IT applications. As regards the process of stringent documentation of the form, as opposed to recording the median size of the edges of the largest mesh of triangles (1-1.5 mm.) produced by photogrammetry, the advantage of this technology is that a more reliable result on a general level is obtained as to the complete morphology of the object. The simple recording of several high resolution scans (to a precision of 0.1 mm.) in the absence of a general reference creates errors of around a centimeter.

Thus the two types of survey can reciprocally be of use to each other in order to achieve high quality results as regards both detailed documentation and pure representation.

After the analysis of the results the meaningful digital models produced are a perfect base to start a better understanding of this sculpture genius, bringing the attention beyond the first look at the statuary aspect and finding the design plot beneath it, exploiting the properties of the digital models as the drawing base for tracing grids, curves, proportional schemes and visualize all of them in a rich 3D space.

THE BAROQUE ALTAR AND LITURGICAL FURNISHINGS IN 3D RECONSTRUCTION AND REFRAMING: SUGGESTIONS FOR A NEW LAYOUT OF DIOCESAN MUSEUMS

A. De Gloria, L. Magnani, V. Fiore, S. Rulli
Dept. D.I.R.A.A.S.
Università degli Studi di Genova
Genova, Italia
magnani@unige.it; sararulli1@gmail.com

Abstract - Effective communication of the artistic image comes from the possibility of its interpretation within the context for which it was created.
The 3D reconstruction of an eighteenth-century altar, with its original liturgical accessories and adornments, has been specifically studied for preparatory activities at the Diocesan Museum in Genoa, a museum where the artistic object is decontextualized.
The 3D methodology has also been applied to show and demonstrate the findings of the historical research that rebuilt the different phases of production of the monumental altar of the Basilica N.S. Assunta in Carignano, Genoa.

INTRODUCTION

Not only does the use of multimedia technologies and, specifically, of virtual reconstruction make it possible for art historians to study a monument's dynamics, allowing for more in-depth analysis from well-defined viewpoints, but also to study re-contextualisation within the original setting and assessment with regard to possible future exhibition choices. Said technology can offer additional support to historians when assessing alternative or still-to-be implemented design solutions compared to those adopted by the artist or architect. Thus the virtual model becomes a support for analysis, a place for testing theories and a means for checking interpretations, as well as a valid support for the disclosure and representation of the research and results obtained. These fields of study have been worked on over the years by the university's Department of Italian Studies, Roman Studies, Classics, Arts and Performance (D.I.R.A.A.S.) together with research groups linked to Genoa University, as part of an exchange and cooperation project aimed at combining humanistic studies with scientific and technological know-how. Specifically, the focus has been on studying spatiality of the fresco and the human figure in space in Luca Cambiaso's work; on reconstructing the historical and architectural phases of assets belonging to the university as well as of local features and villas that have suffered damage. More recent projects have involved the reconstruction of collections split up in various museums and the relative exhibition areas, as well as the re-contextualisation of ecclesiastical items and liturgical furnishings that are currently exhibited in museums and can no longer be viewed in their original setting.

Diocesan museums, the direct consequence of a crisis: digital technologies as a medium for re-contextualisation of decontextualised objects

The creation of diocesan museums during the 1990s was a direct consequence of the need to provide correct conservation of sacred objects that no longer enjoyed the functionality and original context for which they were conceived. A crisis situation resulting, on the one hand, from disappearance of the continuity historically established between the building, its liturgical

furnishings and the community that produced them, and on the other from the liturgical changes introduced over the years, especially by the Second Vatican Council [1]. Said museums, when applying the content of specific national laws [2], currently present to the general public objects whose identification with the community that produced them and whose real function and use risk being viewed in an inappropriate manner, thus threatening a breaking of ties with the history, meanings and uses of the community that identified itself in them. Hence the need to offer the public a richer, more in-depth interpretation that can present said objects in a way that fits their original meaning, re-inserting them into a context of values, history, faith and culture. In this sense, the new technologies can ensure that the layout of said exhibition areas corresponds to more than just containers of decontextualised "signs" and represents opportunities to offer – through three-dimensional models, augmented reality and ICT technologies – a re-interpretation of the items within a context, be it related to space, faith or values, for which they were produced, and provide an understanding of layouts and projects that were not achieved, but which are significant for the history of a community's culture and faith.

Virtual reconstruction of the high altar of the Church of the Santissima Annunziata in Portoria

The use of computerised techniques for three-dimensional virtual reconstruction plays an especially important role within the studies focusing on an analysis of the altar in relation to its liturgical accessories.

On the basis of this observation, it was decided to virtually reconstruct the high altar of the Church of the Santissima Annunziata in Portoria in Genoa [3] in order to be able to re-contextualise the ecclesiastical accessories produced for the setting designed by Gregorio De Ferrari for the canonization of Santa Caterina Fieschi Adorno in 1737.

As can be seen in various accounts from the period and some historical images related to the anniversary of the canonization [4], the white and multicoloured-marble high altar, which now stands bare, had a completely different appearance for the faithful in the past. When there were specific, extremely important celebrations of great devotion, the altar virtually became the focus of the celebration. Gregorio De Ferrari's preliminary design, now housed at *Gabinetto Disegni e Stampe* in Palazzo Rosso, shows the altar adorned with candelabras of varying size and with different lighting effects, vases, altar cards and reliquary statues that combined with the silk flowers helped create a magnificent *theatrum sacrum*.

The ephemeral, which was the absolute protagonist during the seventeenth and eighteenth centuries, risks being lost forever in this century where the effects of the liturgical streamlining – performed by the Second Vatican Council – have meant that all these accessories have been placed in museums in the luckiest of cases, or otherwise moved to church storage areas. Therefore, three-dimensional technology can be used as a valid medium for the study of exhibition layouts for liturgical furnishings, especially as regards diocesan museums which, by their very nature, house various sacred objects that have been decontextualised and whose liturgical meaning, linked to the sacred rite and setting, risk being lost forever.

Virtual reconstruction as a study tool for the canopy designed by Pierre Puget for the Basilica of Nostra Signora Assunta in Carignano

Digital technologies and, specifically, the opportunities three-dimensional virtual reconstruction has to offer, were used as a study and analysis tool during checking of the canopy designed by Pierre Puget during the 1670s for the high altar of the basilica of Nostra Signora Assunta in Carignano, Genoa, a church with a centric layout designed by Galeazzo Alessi for the Sauli family from 1549 on [5]. Modernisation of said object, designed as the conclusive feature of a magnificent

setting based on Bernini's works in St. Peter's, would have involved all the space underlying the dome. Its reconstruction and consequent insertion into the space it was designed for, allowed for an interpretation within the completeness of its architectural, decorative and iconographic context. Said operation provides the opportunity to better assess the ambitions the Sauli family placed in a work that reinterpreted the basilica's Renaissance architectural layout – magniloquent image of the family's position – in the terms of the more modern Baroque and Roman setting, not only for art historians but also for a wider public. At the same time it also made possible some useful observations related to additional theories regarding the method used by the artist to tackle the project. Virtual modelling was performed by referring to two designs currently housed in Musée Granet in Aix-en-Provence and Musée des Beaux Arts in Marseilles[6]. Even if both designs present the project in a similar manner, in scale and in accidental perspective to two vanishing points, the focus was placed on the former of these two, measuring 1860 x 979 mm and with the top part drawn without the slight aberration as regards perspective found in the copy housed in the museum in Marseilles which is possibly a copy of the former on a smaller scale or a preliminary study [7]. The altar's layout and elevation were obtained through perspective modelling of said design, while specific information regarding dimensions was deduced from other drawings of works in Genoa by the same author, specifically the high altars of the Churches of San Siro and Santa Maria delle Vigne. Having established the height of the altar located under the canopy and obtained the dimensions of the other architectural features in proportion to it, Puget's model was re-proposed virtually using the *Autodesk* 3ds Max® programme and inserting it into the three-dimensional digital model of the basilica. This made it possible to confirm how the altar's large size (whose structure reached a height of approximately 16 metres and a maximum width of the base platform's diameter of approximately 10 metres) left a rather narrow passage between its pedestals and the pillars supporting the dome. This would tend to confirm the theory that the statues [8] (under design in 1664) [9] designed by Puget to complete the project and that depicted the Virgin Mary, placed at the top of the canopy and fully inserted into the tambour [10], its focal point, were designed in the beginning to be positioned in front of the cross vault's four pillars and only placed inside niches[11] subsequently and as a result of the size of the altar. A comparison between this reality and the perspective put forward in the design housed in the museum in Aix-en-Provence made it possible to assess how Puget's representation is "distorted" in several points so as to make it possible to see precise decorative and compositional solutions that would have been concealed had a correct perspective been applied. These observations combined with the considerable size of the design – which, given the lack of construction lines and dimensions, does not have the real characteristics of a design, but those of a work aimed at presenting the design – and knowledge of paper «*Spesa di un modello dell'altar maggiore in mezzo della chiesa sotto la cupola*» [12] could make it possible to put forward the theory of a graphic representation which itself served as a model or part of a model rather than an executive design for the production of a wooden model [13]. Indeed, the large design in question – mounted on a new paper support during the 19th century and set against a blue background, although, originally, it was probably unframed [14] – may have been used in such a way that – with a wooden support and suitably aligned with the basilica's entrance in order to meet the observer's eye – it could be viewed as an overlay to the image of the cross vault's space, as a sort of "photomontage" way ahead of its time that recalled Brunelleschi's experiments regarding perspective.

ACKNOWLEDGEMENTS

Documentation for conservation and development new heritage strategies for the future, specifically with the paper entitled *Exploring virtual reality to reconstruct baroque liturgical feast apparatus*; a preliminary, three-dimensional check of the Puget's canopy for the Basilica di Nostra Assunta in Carignano was proposed by Mr. Francesco Pini during his degree thesis presented in 2002- 2003 entitled *Il baldacchino e l'altare maggiore per la basilica di S. Maria Assunta di Carignano in Genova: ricostruzione virtuale di un progetto di Pierre Puget*. The reconstructions of the architectural space of the church and of the canopy contained herein are the work of the DIRAAS Department.

FIGURES AND TABLES
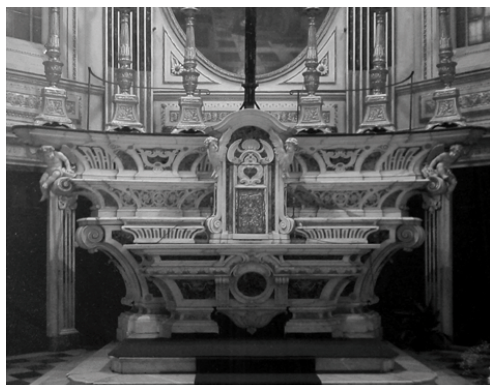
Fig. 1: Altar of the church of Santissima Annunziata di Portoria, Genoa.
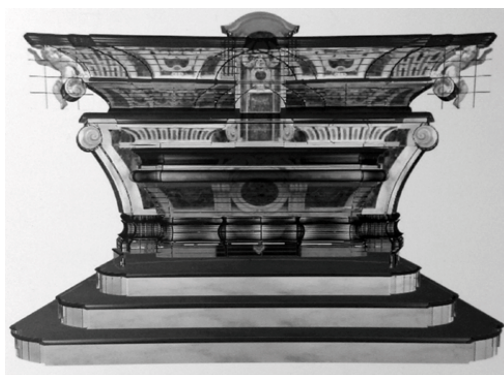
Fig. 2: 3D reconstruction of the altar.

Fig. 3: 3D reconstruction of the altar with its furnishings (Pontifical Mass).

Fig. 4: 3D reconstruction of the altar with its furnishings (Vespers and Eucharistics Exposition).

Fig. 6: The church of N. S. Assunta di Carignano, Genoa.

Fig. 5: P. Puget, project for high altar and canopy for the church of N. S. Assunta di Carignano in Genoa, Aix-en-Provence, Musée Granet.

Fig. 7: A first hypothesis for a 3D reconstruction of the high altar and canopy draft by Pierre Puget.

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Super Multiview and Free Navigation by FTV

Masayuki Tanimoto
Nagoya Industrial Science Research Institute
Nagoya, Japan.
tanimoto@nagoya-u.jp

Abstract − FTV (Free-viewpoint Television) enables realistic viewing and free navigation of 3D scenes. It will find many applications in the fields of broadcast, communication, entertainment, design, education, medicine, art, cultural heritage and so on. MPEG has been engaged in various aspects of FTV standardization since 2001. MVC (Multiview Video Coding) was the first phase of FTV, which enabled the efficient coding of multiviews. 3DV (3D Video) is the second phase of FTV, which enables depth-enhanced multiview systems. Based on recent development of 3D technology, MPEG started the third phase of FTV in August 2013, targeting super multiview and free navigation applications.

INTRODUCTION

FTV (Free-viewpoint Television) [1]-[7] enables us to view a 3D scene by freely changing the viewpoints as if we were there. FTV is the ultimate 3DTV that transmits the infinite number of views and ranked as the top of media in the world. It is also the best interface between human and environment, and an innovative tool to create new types of content and art.

We proposed the concept of FTV and verified its feasibility with the world's first real-time system including the complete chain of operation from image capture to display [8]. FTV with audio was realized by adding free listening-point function [9].

FTV is based on the ray-space method [10]-[12]. We developed ray capture, processing, and display technologies for FTV.

MPEG has been engaged in various aspects of FTV standardization since 2001. MVC (Multi-view Video Coding) [13] was the first phase of FTV, which enabled the efficient coding of multiple camera views. 3DV (3D Video) [14] is the second phase of FTV, which enables viewing adaptation and display adaptation of multiview displays. Based on recent development of 3D technology, MPEG started the third phase of FTV [15] in August 2013, targeting super multiview and free navigation applications. The vision of this third phase is to establish a new FTV framework that revolutionizes the viewing of 3D scenes.

INTERNATIONAL STANDARDIZATION OF FTV

History of FTV Standardization in MPEG

MPEG has been conducting the standardization of FTV as shown in Fig. 1. In 2001, FTV was proposed to MPEG and the 3DAV (3D Audio Visual) activity started. In 3DAV, many 3D topics such as omni-directional video, FTV, stereoscopic video and 3DTV with depth disparity information were discussed. The discussion converged on FTV in 2004.

Then, the standardization of the coding part of FTV started as MVC (Multi-view Video Coding). MVC was the first phase of FTV. The MVC activity moved to the Joint Video Team (JVT) of MPEG and ITU-T for further standardization processes in July 2006. MVC was standardized as the extension of H.264/MPEG4-AVC in March 2009 [16].

FTV cannot be realized by coding part alone. MPEG started the second phase of FTV including view synthesis in April 2007. It is 3DV (3D Video). 3DV is a standard that targets serving for multiview displays [17].

Although the number of input views and that of output views are the same in MVC, the number of output views is larger than that of input views in 3DV. The view synthesis is introduced into 3DV to increase the number of views. However, the view synthesis function of 3DV is very limited. The third phase of FTV started in August 2013 to introduce super multiview and free navigation applications by removing this limitation. MVC, 3DV and FTV will be described in more detail in the following.
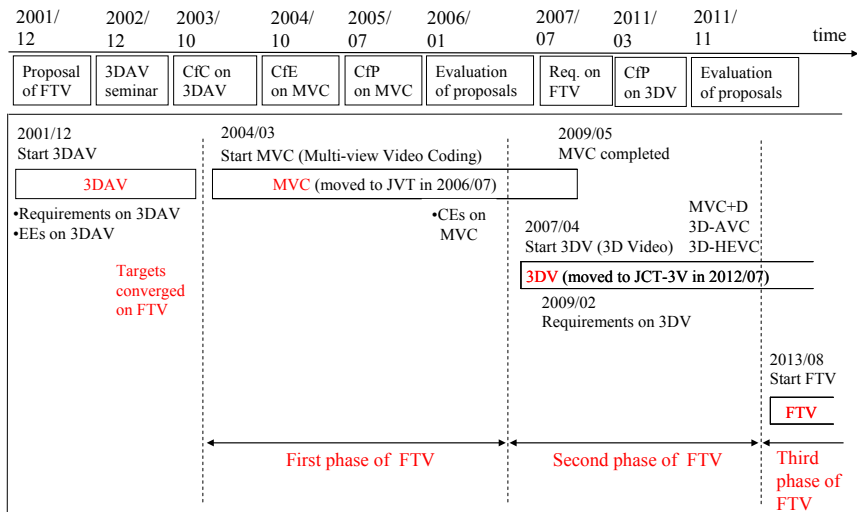

Fig. 1. History of FTV standardization in MPEG.

First Phase of FTV: MVC

The first phase of FTV was MVC (Multi-view Video Coding). The framework of MVC is shown in Fig. 2. MVC targeted efficient coding of multi-view video. In MVC, the number of input views is the same as that of output views. The view synthesis function of FTV is not included in MVC. MVC started in 2004 and was completed in 2009. MVC has been adopted by Blu-ray 3D.
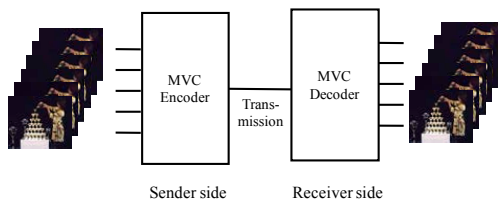
Fig. 2. Framework of MVC.

Second Phase of FTV: 3DV

Before completing MVC, 3DV started as the second phase of FTV in 2007. 3DV targets multiview display applications. The framework of 3DV is shown in Fig. 3. 3DV sends small number of views and generates large number of views at the receiver side for multiview displays. Thus, view synthesis is introduced into 3DV. This view synthesis is assisted by depth information. The standardization of multiview plus depth coding and data format has been in progress in the Joint Collaborative Team JCT-3V.

However, the view synthesis of 3DV has large limitation. Views are synthesized only along a horizontal base line of linear camera setup. Multiview displays with views less than about 30 are considered in 3DV. These limitations have to be removed to introduce further FTV applications.
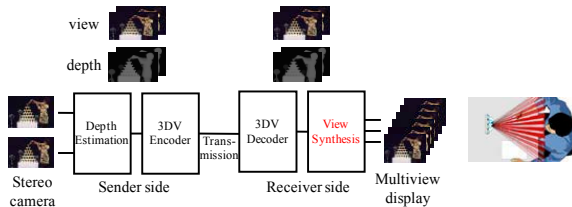

Fig. 3. Framework of 3DV.

THIRD PHASE OF FTV

Background and Motivation

2022 FIFA World Cup Japan Bid Committee planed to deliver the excitement on soccer stadium to the world by FTV. It aimed to revolutionize the viewing of the soccer game by free navigation and realistic 3D viewing as shown in Fig. 4. Super multiview displays with hundreds views will be needed for the realistic 3D viewing.

Fig. 4. Revolutionized viewing by FTV.
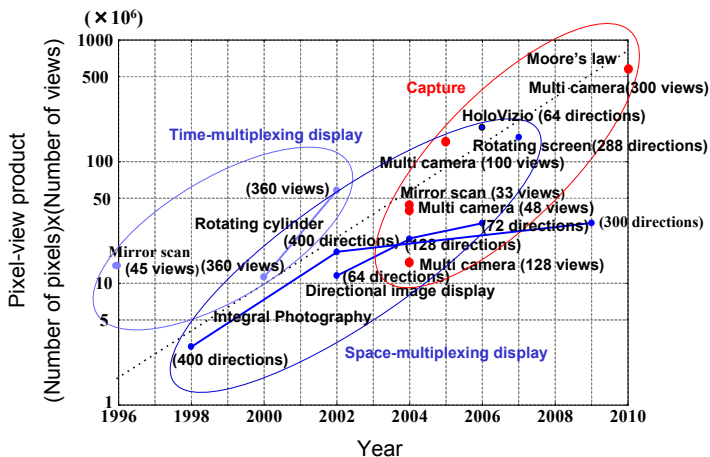
Fig. 5. Progress of 3D capture and display capabilities.

Fig. 5 shows the progress of 3D capture and display capabilities. In this figure, the ability of 3D capture and display is expressed by a factor of the pixel-view product, defined as "number of pixels" times "number of views". It is seen that the pixel-view product has been increasing rapidly year after year in both capture and display. This rapid progress of 3D capture and display capabilities enables the introduction of super multiview and free navigation applications.

Targets of FTV Third Phase

The third phase of FTV targets two application scenarios.

(1) Super multiview

3D displays with hundreds views have become available. Fig. 6 shows a portable 360-degree viewable 3D display, "Holo-Table" [18]. It displays more than 500 views with 1024x768 pixels at 30-60 fps. The feature of this display is not only large number of views but also high density of views. Because of these features, users can see a 3D scene from any directions with smooth motion parallax. Fig. 7 shows examples of displayed images in different directions.

Fig. 6. Portable 360-degree viewable 3D display, "Holo-Table".

Fig. 7. Displayed images of Holo-Table in different directions.

Super multiviews with both horizontal parallax and vertical parallax are realized by IP (Integral Photography) displays [19].

(2) Free navigation

The free navigation applications are considered as a potential new market for the communication companies. Delivery of free navigation video with accompanying spatial audio could be delivered by internet as a new service. The rendering of the virtual view is foreseen as an external service for the customer that may even use low-power mobile devices as shown in Fig. 8.

Fig. 8. FTV mobile application (Orange Labs Poland).

Walk-Through and Fly-Through Experience has been developed using "3D model plus texture mapping" toward FTV [20]-[22]. This technology enables audiences of TV programs to see soccer games from the viewpoint of players on the ground, where conventional TV camera cannot be mounted. Furthermore, the viewpoint can be moved even through specific players as shown in Fig. 9.
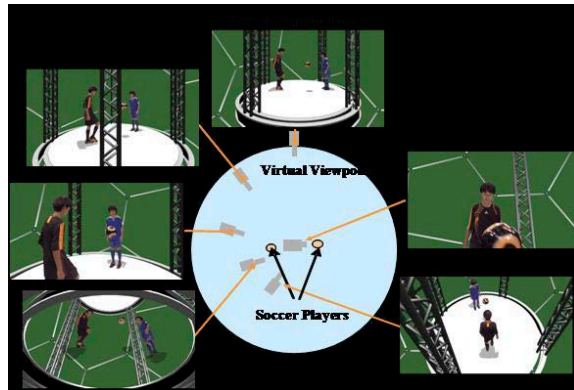

Fig. 9. Walk-through and fly-through experience by FTV (KDDI).

CONCLUSION

FTV is the ultimate 3DTV that transmits all visual information of a 3D scene and ranked as the top of visual media. FTV enables realistic viewing and free navigation of 3D scenes, and will find many applications in the fields of broadcast, communication, entertainment, advertising, design, exhibition, education, medicine, art, cultural heritage and so on. Rapid progress of capture, display, and processing technologies will accelerate the introduction of FTV. FTV standardization targeting super multiview and free navigation applications is in progress at MPEG. You can join the FTV reflector of MPEG at the following site. http://lists.uni-klu.ac.at/mailman/listinfo/ftv

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VIRTUAL GALLERIES - MUSEUMS AND RELATED INITIATIVES

IMAGE DIGITISATION IN ICARUS

D. Jeller

Digitisation / IT
International Centre for Archival Research
Vienna, Austria
daniel.jeller@icar-us.eu

This paper describes the major themes and problems in image digitisation that the International Centre for Archival Research has to deal with and some of the solutions it developed as well as considerations on their impact on further projects. The main topics here are: protection of the sometimes very old and fragile source objects, the question of quality versus quantity, quality control and its limits and which kind of equipment to use for different materials.

INTRODUCTION

One of the cornerstones of the changes that the work with historical documents has undergone in the last decade is the ever increasing amount of materials available online in various forms. A wide range of sources, ranging from rare medieval manuscripts like the contents of the Swiss *e-codices* project [1], historical newspapers as in the *ANNO* project of the Austrian National Library [2] or even 3d models of archaeological finds from the *Carnuntum 3D Object Database* [3] are available for the general public. These and more are possible due to various advances like rising computer processing power, increasingly cheap digital storage space as well as network bandwidth and especially vastly improved digital imaging technology. A varied array of imaging solutions ranging from cheap digital cameras that might already be up to some rather advanced tasks to fully specialised equipment suited to almost everything a digitisation project might need is readily available. The only limit in this regard seems to be the amount of money available to a project to rent or purchase new equipment. Yet, even with sufficient funds there is no "one-size-fits-all" solution when planning a digital imaging project.

As an international association that is focussed on helping cultural heritage institutions plan and carry out diverse projects that deal with accessibility to and collaborative work on historical documents, the question of finding the perfect solution for any digitisation project is essential for *ICARUS* [4]. For its short term projects like the currently running *Crossborderarchives [5]* as well as its established portals like *monasterium.net* [6] a large amount of digital images had to be taken and stored. The digitised objects range from medieval manuscripts and charters to early modern church and other register books and maps, all of them in varying conservation status.

This paper describes the specific challenges and resulting choices regarding image digitisation in ICARUS based on actual projects.

WHAT IS ICARUS

ICARUS, the abbreviation stands for *International Centre for Archival Research*, is an international association open to archives and other institutions from the general fields of cultural heritage preservation, research and publication. The main goal is to promote cross-

border cooperation between its members in planning and carrying out joint digitisation and publication projects. The experience that ICARUS can throw into the mix ranges from about ten years of practice in digitising delicate historical documents both with its own equipment and personnel as well as consulting regarding outsourcing of digitisation to external companies, creating and maintaining web based publication and edition platforms or collaboration tools, assistance in project management and -planning and help with grant applications.

MEDIEVAL CHARTERS
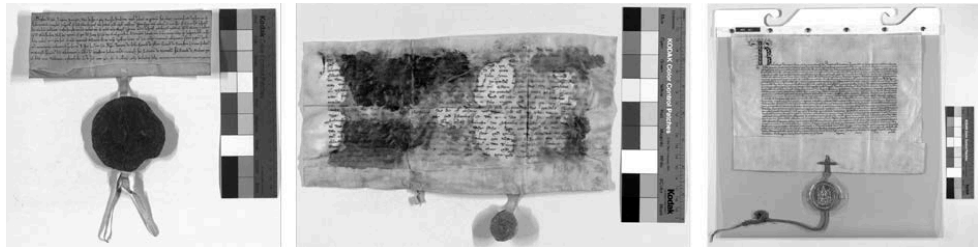
Figure 1: Digital charters from the Monasterium-Project (DE-HStAM_Urk37_000126_12480619, AT-StAWilhering_13240522_145, CZ-NA-ACK_13480407_00307_r)

Before there was ICARUS, some of its current members already collaborated in the form of the *Monasterium-Project* (see [6]). It started around the year 2002 as a locally oriented digitisation and web-based presentation project aimed at historians and other interested people. The digitised objects, medieval charters, are widely acknowledged as one of the most valuable sources for Mediaeval and Early Modern history (starting with the likes of Leopold von Ranke in his *Deutsche Geschichte im Zeitalter der Reformation* from 1839 [7]) and therefore highly sought after by scientists while at the same time rather difficult to access due to their value, fragile nature and unique physical existence at a singular location often in a remote monastery archive (hence the name *Monasterium*). Soon the project started to grow and nowadays the database of medieval charters is comprised of documents from more than hundred twenty archives in thirteen European countries and includes more than 400,000 digital objects with more being added on a regular basis.

The main reason for the existence of Monasterium is at the same time its biggest problem. Due to the delicate nature of the documents to digitise, the process of image capturing has to take place in situ, in the archive that stores the documents. They can come in various formats and states of preservation (see Figure 1). To summarise, the technical solution has to be easy to transport, maintain as well as handle and has to be able to deal with a wide range of formats and conservation conditions.

While we use different methods in other projects (see below), for Monasterium (in addition to images made by the archives themselves with their own equipment) we decided to use a book scanner (Image Access Bookeye® 3 R1 [8], see Figure 3) with a maximum format of DIN A1 and a capture resolution of 400 DPI. Its main advantages are the included lighting, the ability to deal with books (important for the capture of cartularies) as well as with flat charters and the fact that it, due to its nature as a scanner, produces images with a constant resolution of 400 pixel per inch of the actual document.
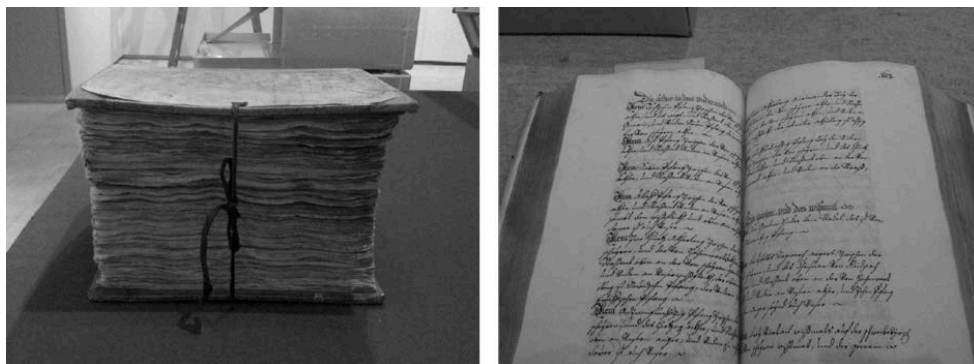
Figure 2: Very thick urbarium from the Bavarian Main State Archive in Munich.

Figure 3: Digitisation with the Bookeye® 3 R1 Scanner in the main archive
of the Teutonic Order in Vienna.

At the same time, it is much easier to operate than a digital camera as no detailed photographic knowledge is required from the user. There are limits to what this setup is able to achieve. As opposed to a digital camera, which has no maximum format but a resolution that decreases relative to the size of the reproduced object, this scanner can only take images up to a size of 630 x 900 mm. This is enough for most charters but not all. At the same time there are types of documents that cannot be reproduced with absolute accuracy. For instance, charters with wax-seals of brown to dark green colour are difficult to capture because the lighting and image settings are rather limited in comparison to those of a digital camera. Also, when likened to such a DSLR, the scanners depth of field is lower. This can be a problem with very thick books (see Figure 2). Still, for the digitisation of charters, which are mostly single sheet

documents, this particular kind of scanner works very well. The resulting images are generally of a high quality, it is easy to use and the number of pictures one can capture is rather high with a maximum of around 150 charters a day in optimal conditions.

CHURCH REGISTERS

Church registers are register books that document baptisms, marriages and burials that took (and still take) place in a parish or a similar community. Starting from the 16th century, these documents are widely used by genealogists and scientists alike as a source for various types of research. Most of the time they are still in possession of the authority that created them so to use them (as with most archival material), one generally has to visit the location where the specific book is kept. At the same time the frequent use of the documents puts a considerable strain on the books. To improve matters, both from accessibility and preservation points of view, the *Matricula-Project* was initiated in 2009 by ICARUS and several archives. The aim was to digitise the register books that were kept in these archives and to publish them in the form of an online database. Due to the nature of the books, several adjustments to the digitisation strategy used in the Monasterium project were necessary. While the books generally were easier to use than the fragile single-sheet charters, they were much bigger in terms of pages to digitise. After an initial phase, where the project was mainly focussed on the Diocesan Archive of St. Pölten in Austria and the image capturing was carried out with equipment similar to the scanner used in Monasterium in situ (only at a lower resolution, 300 DPI), the need to adapt the technical side of the project was apparent. After some experiments with various technologies the digitisation was outsourced to the Austrian company Qidenus that manufactures and operates semi- and fully automated book scanners. [9]
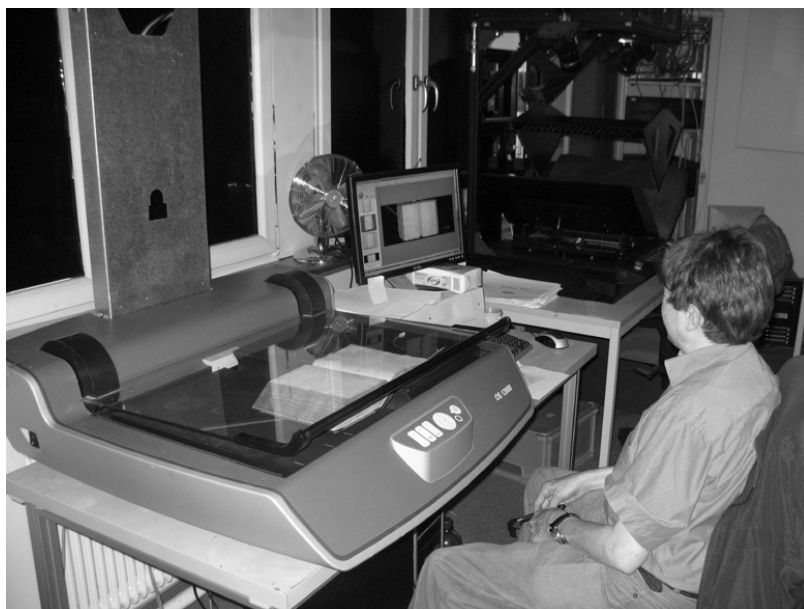

Figure 4: Digitisation at Qidenus. In the front the manual scanner,
in the back the semi-automatic one.

There, the books were separated into newer ones that are generally in better condition and easy to handle and older ones that had to be treated individually. The latter were then digitised with a traditional book scanner similar, whereas the remaining (regular paper and format, pages flexible and not sticking together and not too tight book binding, see Figure 4) were reproduced on the semi-automatic scanners. While the general nature of the books does not allow a fully automatic digitisation, the application of this machine-supported image capturing process with human monitoring was able to speed up digitisation of the books considerably so currently there are already over four million digital pages available online with more being in the process of digitisation.

ILLUMINATED MANUSCRIPTS

Although not part of a bigger project there have been some smaller digitisation ventures in cooperation with various institutions that focussed on digitising medieval illuminated manuscripts, for instance a participation in the *St. Gall Project* that aimed reproduced early mediaeval manuscripts from the monasteries St. Gall and Reichenau in Switzerland. [10] Due to the nature of these books as well as limitations from a conservation-point-of-view the use of a scanner neither manual nor semi-automatic was problematic. While the use of a glass plate or a similar method to fix the pages of a book in a flat or v-shaped book cradle proved beneficial in the case of the aforementioned register books, any contact of the delicate illuminated pages (often with the application of gold leaf) was strictly prohibited. It was decided that the best solution was to get new equipment better suited to the task. Considering that the device to be acquired should be rather inexpensive due to funding limitations while at the same time being able to produce images of a sufficiently high quality yet still easy to transport, the TCCS 4232 (see Figure 5), a kind of tripod with integrated book cradle and lighting, developed by the Manuscript Research Centre of the Graz University [11] paired with a then state of the art DSLR (a Sony α900) seemed the ideal choice. Because the books are of a rather small size, the resulting images (a 21 Megapixel Sensor paired with a maximum image size of 42x32cm and a Zeiss zoom lens) were of a resolution comparable with the ones produced by our scanners. At the same time the architecture and lighting of the Traveller and the high quality sensor and lens of the digital camera proved to be up to the task.

SUMMARY

The most important thing to do when planning a digitisation project is not to try and get the most expensive equipment but to consider carefully what will give the best results for the works at hand. From this point of view all three above described alternatives, manual scanning, semi-automatic scanning as well as digital photography can be capable of meeting the specific requirements of any project. Photography is definitely the cheapest alternative as current DSLR cameras already reached resolutions of around 35 Megapixel and are of a comparatively low price. To digitise bigger documents or objects of varying sizes a book-scanner might be better suited as it is likely to be more easy to use than a camera where the operator has to modify the image settings every time the size of an object changes and because they deliver reproductions of a constant high quality and -resolution. The most costly alternative, the use of an (probably outsourced) automated or semi-automated device could also prove the ideal match for a project, especially if it plans on digitising a high number of easily manageable books.

Figure 5: The TCCS 4232. Image by the University Library of Graz.

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USING A CREATIVE EVOLUTIONARY SYSTEM FOR EXPERIENCING THE ART OF FUTURISM

Steve DiPaola & Sara Salevati
School of Interactive Arts & Technology
Simon Fraser University
Vancouver, Canada
sdipaola@sfu.ca, sara_salevati@sfu.ca

We use Creative Evolutionary Systems (CES) in the development of experiential art education. To explore this domain, Artificial Intelligence generative tools, specifically CES are used so art educators, designers and viewers can collaboratively create and explore cognitive based creative ideas of an evolved artwork via the CES and the interactor (viewer, designer). We are interested in producing a process where the viewer of the art of Futurism, which depicts movement and flow, is an active participant in the creation process and can interactively evolve the underpinnings, rules and style of an artwork as a new form of experiential art education.

INTRODUCTION

This research specifically addresses how Creative Evolutionary Systems (CES) not only enhance creativity and encourage new collaborative practice but can also act as an art education tool by providing artists/designers/viewers insight into various historic art movements and styles. The original artwork or deconstructed seed "gene" objects fed into the system are not a template or design schema, rather pieces of knowledge (genes in evolutionary terms), content that can be fundamentally evolved through means of an interactive control. This creation and exploration process through the rules, styles and objects of an artwork (here Futurist artworks) gives the viewer/interactor an opportunity to explore the process of the artwork rather than just viewing its final form on a wall. Through the CES, the viewer/interactor can exchange, manipulate and evolve the deconstructed seed forms based on emerging ways an artist's might negotiate aesthetic elements within their work. Through the selection of different historic styles, our goal is those using our CES systems can select and combine elements from a particular art era through transfer of knowledge from the provided domain. One of our CES systems, Evolver, introduces an interactive environment where the diverse and collective source material of artistic or stylistic ideas can be shared, re-interpreted, and used, as a basis for new ideas which constitutes the vital source of creativity and evolution. Another one of our CES environments more ambitiously (and experimentally) simulates the more deeply human cognitive process of a Futurist artist, by attempting to depict a still work, not from the visual elements segmented out of the historical canvas, but from new source movement of a dancer from a real dancer performance.

Our authored CES, called Evolver, explores the generation of new artwork using genetic algorithms where constraints are expressed as principles, rules and concepts related to visual organization of art and design compositions [1]. The users created output is a multilayered artifact based on a developmental processes chosen by the art educator/designer defined by visual elements such as shape, size, color, texture and

style. This can be seen as Figure 1a, b where elements of Futurist art master Umberto Boccioni's painting "Charge Of The Lancers" (1a) are segmented and input into the Evolver CES, and a viewer/interactor can create many evolved new versions (1b) to explore/understand the underpinnings of the work through an experiential creation process. Unlike other evolutionary systems, Evolver preserves file edit ability at any generation in a standard vector (SVG) format, allowing artist and designers to stop and edit files at any stage, to modify and then feed back to the system if they wish. This brings to focus the role of artists and designer as actor/agency working within cross flows of knowledge, perception and information. This allows them to be a simultaneous participant and observer in ongoing collaborative conversation.

The main goal of this paper is exploring Evolver as an educational and learning tool both for the creative practitioner and audiences learning a particular artwork or art series. Our focus in this research is on Futurism, specifically the works of Umberto Boccioni who was one of the most influential artists within this movement. His works represent modernity in form of movement and experience of flux [2]. Our research attempts to show the living object in its dynamic growth; we believe his philosophy is the essence of Evolver's algorithm and purpose, which therefore makes a good test case. We deconstruct his artwork as segmented rules, shapes and styles within Evolver as an organism that can grow and evolve within each state of its development. This allows for a unique learning tool where student artists and museum viewers alike can use our interactive system to experientially explore the inner workings of a body of work by a master artist.

1a: Boccioni: Charge Of The Lancers
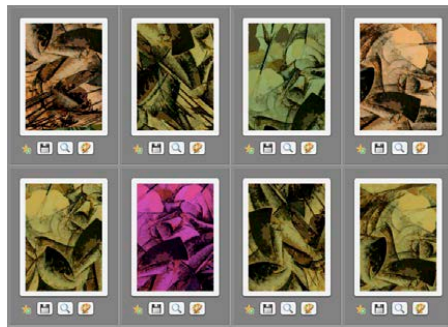
1b: Elements (genes) of (1a) evolved by a user who continuously remates populations via interactive Evolver tools, exploring in depth the elements of the painting.

ART & TECHNOLOGY

New technologies are drastically changing the nature of fine art and creative processes. Computers are playing very significant roles in creative practices and have already become a new type of creative canvas, brush or musical instrument. In recent years a strong relationship has been formed between computers and creativity through the emergence of a new subfield of Artificial Intelligent (AI) called computational creativity [3]. Computational creativity is the study of systems that exhibits behavior that would mimic the creative process in humans. Such creative software can be used for autonomous creative tasks, such as creating novel music and art. However, this process has enabled us to better understand human creativity and to produce programs

for creative people to use, where the system acts as a creative collaborator rather than a mere tool.

CESs use techniques from evolutionary computation, a class of computer software systems that employ software techniques derived from Darwinian evolution to find solutions within a large search space. They test the current population of programs (that output art work) by a given automatic or human based 'fitness function' test and then marry (i.e. applying genetic crossover, mutation and replication) those programs that do best, thereby passing on those best genes to new offspring [4]. The product of these programs is the 'phenotype', which is the individual organism or in this case the final design or art work. The purpose of our system is to aid the creative process and to generate results to problems that traditionally require creative people to find the solutions [4]. Our system 'Evolver' uses the presence of a human to guide the direction of the evolutionary search. Such system, as with most creative evolutionary systems, use a human (often the artist or viewer under interactive control) to make the aesthetic decisions after each population [5].

FUTURISM & BOCCIONI

The futurist movement began in the twentieth century and above all, it valued dynamic motion, speed and general efficient of the machine. The beauty of the machine aesthetic was greatly embraced by the Futurists. They urged to reject the past, to embrace the present and to draw inspiration from the increasing world of machines. They were determined to revolutionize art tradition

Italian painter and sculptor Umberto Boccioni is arguably one of the most re-known artists of the Futurist Movement. In 1910, Boccioni led the movement by promoting the representation of the symbols of modern technology — fury, force, and flux [2]. Extremely interested in the speed and movement of machines, Boccioni captured these elements throughout the majority of his artworks including States of Minds, 1911 (figure 2) and Dynamism of a Soccer Player, 1913 (figure 4c). He abstracted objects and figures thereby representing human drama in modern life, via an extremely powerful sense of speed, movement and force within the mechanical environment. Boccioni was obsessed with capturing of the incessant flux of life in the motion of crowds, the fast life in modern cities with roaring airplanes, their trains and cars sweeping through the landscape [2].
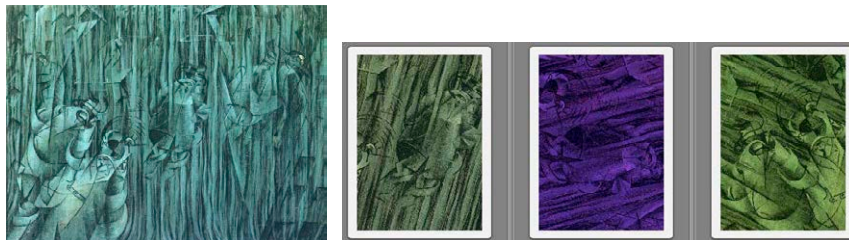
INTERACTIVE EXPERIENCE

Interactive experience is comprised of both physical and psychological interactions in a feedback loop, which involves collaboration or exchange [6]. We believe that our systems support interactivity and engagement through principles of narrative situated in our design. Such principles include, entry point (capturing audiences' attention), physical interactivity (affordance to interact with the system), shareability (being able to exhibit an exploration of particular art style), and spontaneity and playfulness (the element of surprise of the various output). We believe that the immersive quality of interactivity as being similar to conventional narratives that mask the structure of the story (plot, characterization, dramatic turning points) by using that very structure to create emotional hooks on which to hang our disbelief [6]. Evolver does not directly tell the audience a story, but implies that one exists, encouraging each individual visitor to interact and interpret the concept and develop their own understandings. This promotes the audience to become an active participant in the artwork's narrative.

Evolver promotes interactivity and user engagement through narrative by expressing the story and voice of an artist within a particular painting or an artwork. In our first Evolver test cases showcases the story of Boccioni's paintings by allowing viewers to become an active participant in their exploration and evolution. Evolver provides an immersive environment where the viewer not only lives through the artist's intent and creative process of the final artwork but also becomes a part of the dialogue by experiencing that style and era through their own interaction.

EXPERIENTIAL LEARNING & MUSUEMS

Researchers exploring contemporary learning in museums suggest that learning is enhanced when humans participate in interactive experiences [7,8]. Experiential Learning Theory (ELT) suggests learning happens through a process of grasping concrete experiences and abstract concepts and transforming them through active experimentation or reflective observation [9]. Recently ELT has intersected with integrated learning theory, which conceives learning as a "spiral" of experiencing, reflecting, thinking, and acting in active response to a learning situation [9]. Experiential and informal learning, in an interactive environment has the potential to be beneficial for the participant (i.e. the art learner/viewer) as they become engaged and their attention transforms into interest where knowledge transmission is facilitated and real learning takes place. Traditional museums and exhibitions of artwork can create reactions without full personal engagement and develop experiences not meaningful enough to capture visitors' full attention and open up to further growth [10]. Continued exploration results when human impulses and desires are recognized as motivating factors in an educational experience.


2a: Boccioni: States of Mind   2b: Evolved output (2a genes) from an Evolver user session.

Through Evolver and our other experiments, our goal is to provide an educative experience, which expands possibilities into richer purposes and interests for an art audience. Through exploration, physical manipulation and experimentation; Evolver helps viewers learn about an art style through experientially 'researching' its highs, lows and boundaries through a creation process. Learning experiences are participatory rather than passive; Evolver facilitates the co-creation of ideas, which are driven by curiosity and sustained by engagement. The Evolver system inspires viewers to explore content in a way that is most meaningful to them. They take an active role in determining the purpose and the nature of the activity. Figures 1, 2 and 3 show a few of the 100s of evolved output that our viewers created interactively.

We first analyze the source painting deconstructed it into many different source constituent objects and rules – the genes of the evolved CES, which then are available to the viewer to interactive evolve into different emerging new forms. The process is still immature but proved fruitful to our test subjects, who actively learned from the

process and discussed notions of Boccioni's techniques in ways that are more sophisticated after the interactive experience. More work on the cognitive process of Boccioni (or other artists / art era that we use) is needed, so we can parameterize deeper art processes into the CES system. With that in mind we used our new work in cognitive correlates of art practice to experiment with a much more ambitious yet experiment system, that works not just with shapes, style, color and rules of a final Boccioni piece (i.e. Figure 1,2,3) but attempts to recreate the entire cognitive process.
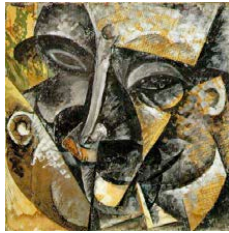
3a: Boccioni: Dynamism   3b: Evolved output (3a genes) from an Evolver user session.

In our second CES research experiment, we use AI tools that take as source a sequence from a moving dancer, more simulating the cognitive process Boccioni might have used in creating the depiction of a moving soccer player (Figure 4a). A dance video (Figure 5a&b) as source was evolved into a final still that uses the rules, styles and elements from Boccioni's 'Dynamism of a Soccer Player' (hereafter "Soccer"). All aspects of this final image (Figure 4b) were created generatively with texture synthesis (using the texture of "Soccer"), cognitive synthesis (using the palette and rules of "Soccer") as well as other aspects. This 2nd CES represents the possibility that new source material (not from the original "Soccer") such as a viewer moving live in front of a camera could be used to experiential create/understand the process and ideas of Boccioni in terms of a sense of movement and force. More work is needed for stronger art/cognitive process for full art education/museum use.
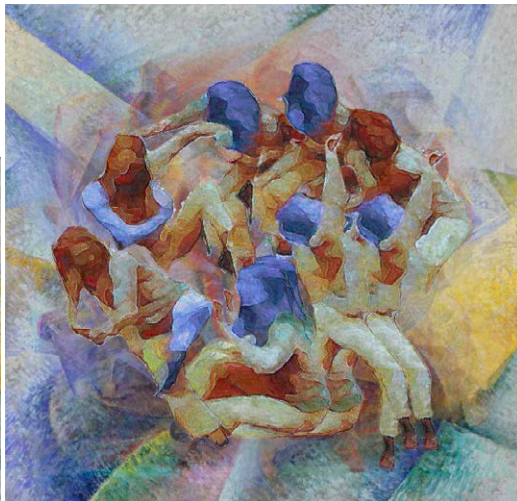
4a: Boccioni: "Soccer"   4b: New AI created forground automatically evolved from the new source dancer movement (5a, 5b) and the cognitive process, texture, and other elements of 4a.

5a: Source material of a dancer from a video, which as a movement seqeunce created 5b

5b: New dancer source autmatically created 4b, our Boccioni "Soccer" inspired, AI evolved work.

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STRUCTURING WILD-STYLE: DEVELOPING A RESEARCH DATABASE AND CONNECTED WEB ARCHIVE FOR HISTORICAL GRAFFITI

ELISABETH LINDINGER
Research Center for Culture and Computer Science
HTW University of Applied Sciences
Berlin, Germany
elisabeth.lindinger@htw-berlin.de

SUMMARY

The idea to share research data and make it accessible to the public is not a new one.
The World Heritage Site of Musawwarat es Sufra (Sudan) was once a sanctuary that played a major part in connecting Africa and especially the kingdom of Kush with Egypt, the hellenistic Mediterranean, and the Near East. The so-called „Great Enclosure" is a conglomerate of several temples of different shapes and sizes and is therefore a singular place with a special history of utilization and the changes it underwent.

The remaining walls of the five Meroitic temples are covered in graffiti from ancient times to very recent days. These graffiti, the motifs, their meaning and their spatio-temporal distribution within the site offer a unique insight into the ways different societies interacted with the site over a time span of more than 2000 years.

The Musawwarat Graffiti Archive project consists of two parts. The first step we undertook was to develop a Graffiti database. This database is created especially to support fast, easy and reliable on- site documentation of the graffiti during field seasons, which usually last only a few weeks per year, which is why it needed to meet the following requirements:

- work offline, as there is no digital infrastructure on site;
- offer stable use and easy trouble-shooting in case of a malfunction;
- follow the workflow of traditional documentation in order to make the usage intuitive for staff with little experience in IT and not to create more work than absolutely necessary;
- contain digitizations of all media used for documenting the graffiti (e.g. photos, drafts, RTI data, tracings);
- serve for an easy, structured access to the collected data and metadata in order to answer research questions arising during work on site.

The research database is up and running, and by now contains already more then ten thousand data sets, as well as over five thousand image files. So far, part of the data are openly accessible through our website, but the interface is not yet as user-friendly as we might wish for.

During the next step, we will therefore strive to design a web-archive that displays nearly all our raw research data belonging to one of the five temple sites. We are currently working on developing a strategy that will allow us to present our extensive data and file collection to other scientists, and still makes the visit to our archive an interesting and entertaining experience, and convey new insights into the history of graffiti in general, the use of sacred places over the centuries, and the change in pictorial motifs and glyphs during that time.

In our talk we present the special conditions of documenting pictorial graffiti on site, the structure of the database and the emerging workflows, the general implications for the documentation and web-publishing of research data on cultural heritage.

PRESERVATION OF CULTURAL HERITAGE AS DOUBLE HISTORICITY: ITS SUBSTANCE AND THE IMPORTANCE OF EXISTING

Sara Penco
Restorer and ideator of the "Penco System"
E mail: info@sistemapenco.com

History and culture represent the very *origin* of "progress" throughout the expression of wealth, social prestige, political and economic growth of a Nation.

Innovation is therefore an essential premise, the unavoidable rule and pathway that has to be followed to face "*global challenge*".

Sharing processes of elevated innovative contents may lead to the pursuit of aspired "*results and goals*": namely to promote an indispensable *renewal* in order to obtain the *mutual enrichment of our own knowledge on an international scale*.

To *promote and increase the value* of "cultural heritage" means that we have to consider it a strong "*nerve centre*" where the primary charge is to detect the exact *solutions which are* able to face the *numerous "criticality"*.

These "criticality" are worldwide problems common to all the countries that own an artistic heritage; the several aspects of these problems change within the incalculable risks that concern the preservation of the heritage itself: *"across-the-boarder requirements"*.

Innovation and sharing may give a transversal instrument fit to pick out strategical interdepartmental solutions: within research, registration, census, improvement of the heritage, tourism, culture, traceability, security, monitoring, thefts, illicit trades, money laundering offences.

The "Penco System", conceived by a restorer, represents an instrument of elevated innovative contents. It is the herald of strong solutions aimed to *promote and optimize the value* of cultural heritage, as well as being fit to give a solid support for the creation of solutions dedicated to the *overcoming of "criticality"*.

The "Penco System" is a project which provides an *innovative* support to the study, filing and diagnostics of the manufactures of art by means of a file of historical-iconographic information and a software.

The heart is the database, including the *features* which have characterized the iconography of a "subject" in the long run. The system can detect the features characterizing a definite historical period and a localized geographical area, thus allowing to identify the age and the area the artefact derives from.

The filing method can be applied to any subject, from the holy to the profane one and to any type of artefact the images can be filed.

The result of the iconographic research will be able to be compared with two other databases: the one of the historical documents and the one of the chemical characteristic of pigments as well as the executive techniques.
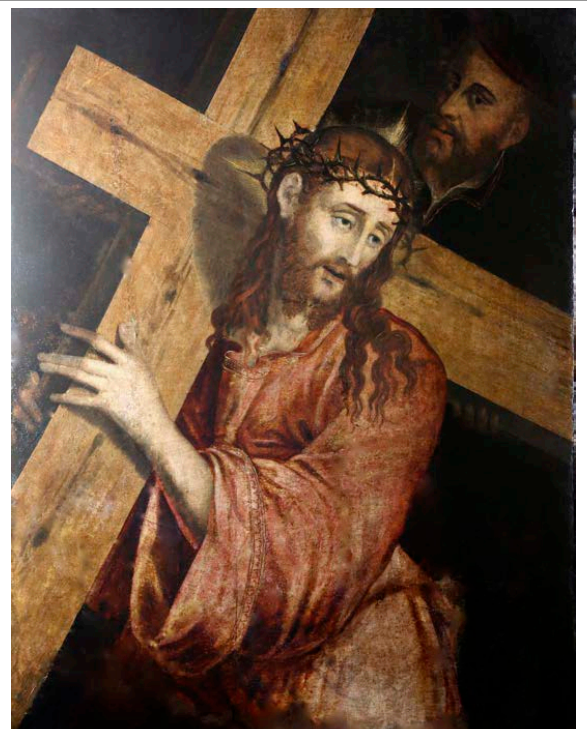
The *method* characterizing the "Penco-System" can also be applied to the Eastern Cultural Heritage.

An example.

The restoration of a "*Christ Carrying the Cross with character*" has made it possible to re-appreciate *the work of art for the use of materials.*
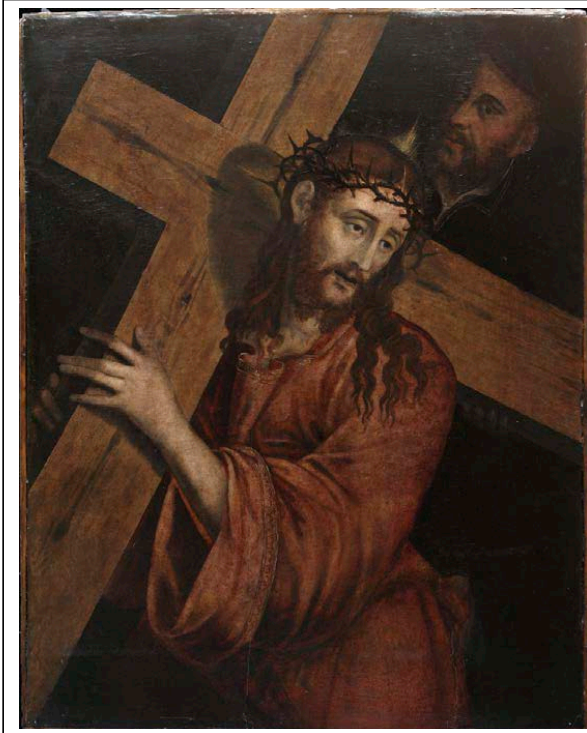
Before restoration (Fig. 1)   After restoration (Fig. 2)

The painting showed a considerable layer of harmful deposits: formed by the overlap of yellowed varnish, general dirt and also numerous "repainting"; altered over time and imputable to a previous and dated restoration.

A careful preliminary investigation on the pictorial material showed the presence of several "second thoughts", visible before cleaning.

The artist, therefore, is not worried that the final draft of the colour lets a glimpse, although in transparency, of the evident traces of the changes he has made during the execution of the painting.

Look at how these "thoughts" are still easily identifiable: on the chin and beard on the face of Christ, which have been completely moved higher, on the thumb of the left hand of Christ, originally positioned towards the centre of the crossbar of the cross and then lowered into a more natural position, to the index finger, on the arm of the left hand of Christ, decreased compared to the first version and, finally, the left shoulder, where it reads an obvious correction.

An important consideration emerges from the findings: the presence of "second thoughts" show how this "unpublished" work should be identified in the drafting of the first version.

In fact, the "changes" will always belong to the original first draft of a "prototype" from which, subsequently, may have made replicas, copies of students of the same workshop of the Master, or derivations attributable to the following centuries.

In any case, it is an established thesis in the world of art criticism, that the one who is to copy from a prototype, never repeated the "second thoughts" but reproduced the final draft.

Second thoughts detail (Fig. 3)

The artefact of art and its reason for existence: the "Penco System"

The "*Christ Carrying the Cross with character*" has been put through a careful study using the "Penco System" by means of which it was possible to find some important information concerning to the product itself.

The result of the *first research*, through the *recognition of iconographic attributes*, led to the *regain of historical iconographic meanings* and allowed to correctly identify the subject portrayed: "*Christ Carrying the Cross with Simon of Cyrene."*

The result of the first research was compared with the second database, in which are stored ancient historical documents.

The outcome of this second survey allowed us to trace, in the text of the "*Vite*" by Giorgio Vasari dedicated to the "*Vite di Giorgio Vasari*" (Vol. III, p. 977), the description of a work followed by the same artist certainly before the year 1553. The painting was originally intended to be given to a Pope's relative, but, in 1553, Vasari himself testifies

that the work had been completed and sold it to his friend Andrea di Jacopo della Fonte for sixty crowns of gold.

The work represents "*... a Christ carrying the cross with natural shapes ...*".

The text reads as follows: "*... Tornato dunque a Roma e dato fine alle dette opere cominciate, e fatta una tavola all'altar maggiore della Compagnia della Misericordia di un San Giovanni decollato, assai diverso dagli altri che si fanno comunemente, la quale posi su l'anno 1553 (140), me ne volea tornare. Ma fui forzato, non potendogli mancare, a fare a messer Bindo Altoviti due logge grandissime di stucchi e a fresco;…*"

"*... E dopo, per lo palco d'un'architettura, quattro quadri grandi a olio delle quattro stagioni dell'anno (141); e questi finiti fui forzato ritrarre per Andrea della Fonte, mio amicissimo, una sua donna di naturale, e con esso gli diedi un quadro grande d'un Cristo che porta la croce, con figure naturali, il quale aveva fatto per un parente del papa, al quale non mi tornò poi bene di donarlo (142).*".

The note (142) refers: in the "*Ricordanze*": "*…Ricordo come al dì 16 di Giugno 1551 Andrea Jacopo della Fonte Fiorentino ebbe da me un ritratto d'una cosa sua dal mezzo in su il quale fu lavorato a olio in tela con diligentia il quale andò a conto dello essere stato in casa sua della Signora Ersilia de Cortesi moglie del sig. Fabbiano de Monti l'allogatore d'un quadro con Cristo porta croce per 60 scudi d'oro, e che quest'opera venne data ad Andrea di Jacopo della Fonte.*".

The regain of "knowledge": the benefits and aspired results.

The "Penco System" through an innovative method is a contribution designed to handle "complexity" in the art world.

The logic followed is based on the reliability of the process and therefore allows the regain of "*knowledge*" from which the "*aspired results*" spring.

However, the method itself provides that the aspired results, before being "*validated*", will necessarily have to be evaluated, modified, denied or approved by experts.

In our example case, the path of the regaining of "*knowledge*" of this unpublished work, has allowed us to identify the following.

The article portrays a "*Christ Carrying the Cross with Simon of Cyrene,*" who helps Jesus to carry his cross on the way to Calvary.

The painting is an oil on panel painting of the sixteenth century and is cm 83 x 107, and therefore can match the appropriate measures to portray the "*life-size figures*" (information traced in ancient documents).

The confirmation that we are talking about two figures is reflected in the archival documents traced through a specific method: firstly, in Vasari's text would indicate the presence of at least two characters, and secondly, the concept is also emphasized in the note 142, which refers to a payment of sixty crowns of gold, an amount that, at the time, was quantified by a commission of about thirty crowns for each figure represented.

At this point, the information tracked through the "Penco System" allows us to evaluate other documentary sources, which reveal the reliability of the stylistic comparison between the unpublished work, "*Christ Carrying the Cross with Simon of Cyrene*," and a 'Vasari's other work that portrays a "*Christ Carrying the Cross*".

This last mentioned painting, which is as well an oil on panel painting, is situated in a private collection of Ancona and published in the monograph "*painter Giorgio Vasari without effort*" by Umberto Baldini (Fig. p. Data sheet 85 and p. 169).

This artwork was quoted among those "... to connect to the copious production of the same subject listed by Vasari in his Memories and yet not known, but of which a short time specimen was given to Messer Bindo Altoviti in Rome May 20, 1553 *«di braccia uno et mezzo drentovi una figura dal mezzo in su grande un Cristo che portava la Croce»…*".

The "*braccio*" (the "arm"), represented the linear unit of time and corresponded to about 60 cm., so our panel, which measures 107 cm., may result consistent with the "*unidentified*" painting described in the ancient texts.

Another aspect is confirmed by the dating of our artwork, that from a stylistic comparison there has been a clear influence of Tiziano.

This could reasonably witness the historical location identified shortly before 1553, after Vasari's return from his trip to Venice in 1542, when he saw the works of Tiziano "*…il che feci assai volentieri per vedere l'opere di Tiziano,...*" ("... which I did very willingly to see the works of Tiziano…") (The "*Vite*" by Giorgio Vasari dedicated to "*Vita di Giorgio Vasari*" (Vol. III, p. 968).

Finally, note how the character in the back, although consistently identified with the figure of Simon of Cyrene, wears a dress referring to the sixteenth century (and not to the time of the Crucifixion of Christ) and a hat that resembles the one worn by cardinals.

This "double" iconographic interpretation could witness a tribute that relates to the first recipient of this artwork, that hidden behind the image of Simon of Cyrene, would make it more likely that the work may have been done as a tribute to a recipient associated with the Pope (observation and contribution of prof. Bussagli Marco, professor and expert on iconography and iconoclasm).

In the logic of the "Penco System" the regain of "*knowledge*" of Cultural Heritage is a strategy not only designed to represent appropriate solutions to manage "*complexity*" but as well a strategy designed to identify appropriate solutions to cope with the "*criticality*" of a highly "*neuralgic*" sector.

To handle "*complexity*" means finding all the information inherent to the artefacts that could define "*knowledge*".

It's only through "*knowledge*" that it can be possible to identify systems of homogeneous and accessible "*cataloguing*", so that the World Heritage is surveyed, protected and enhanced in a constantly changing global scenario.

In essence, the basic requirement is to obtain a method in which all the different kind of "*information*" are put in relation to each other, in an ongoing process and a harbinger of those "aspired results" that are precluded in the current technique.

However, it should be emphasized that an essential phase of the method is represented by the "*validation*" of the "*aspire results*" by the experts.

Returning to our example: if the results of the studies would be confirmed and then "*validated*", the unpublished work would be stored as the likely "*Christ Carrying the Cross with Simon of Cyrene*" performed by Giorgio Vasari, originally intended to a Pope's relative, but which then Vasari thought it was more appropriate to sell it,

"*... a Messer Bindo Altoviti in Rome May 20, 1553 ...*".

Otherwise, the "*Christ Carrying the Cross with Simon of Cyrene*" would be stored in the system as an unpublished artefact but with correlated information that refers to it.

However all the process phases will always be accessible and will be put through continuous verification and validation.
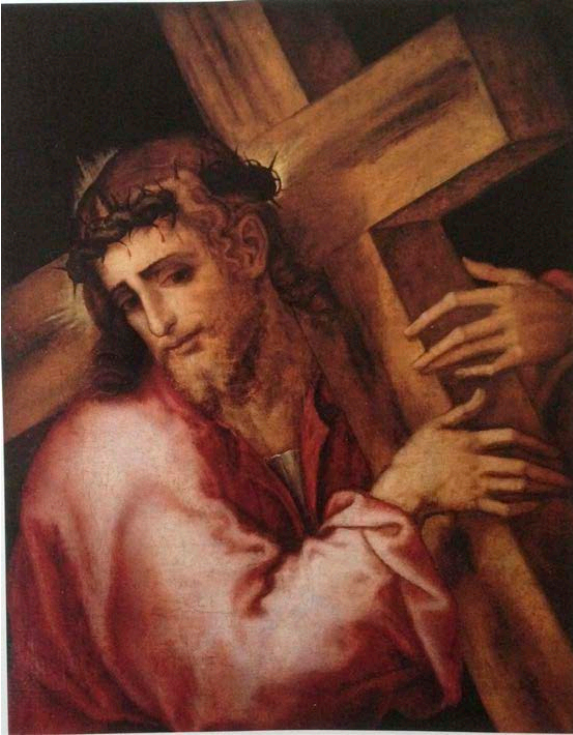
"*Christ Carrying the Cross*" Giorgio Vasari. Private collection of Ancona (Fig. 4)

Globalization: necessities and solutions dedicated to the safeguard of the human heritage.

The "*scientific excellence*" of projects and "*innovative contents*" transforms itself into *economic opportunities* within the qualifications of *competitiveness* that reinforces the scientific and technological base of European industries. This also promotes research, gives birth to the relaunching of an "*industrial leadership*", as well as setting the *competitiveness* of Italy and Europe to the pursuit of a *sustainable development*.

Through the fortification of capacities, we can plan an *intelligent growth* that may promote a coherent cooperation with other countries.

Fortifying the role of Europe in the world's scenario means to face the globalization through a better comprehension of history, of other political an economic systems, and therefore cover the gaps concerning research and innovation by supporting the *elaboration and control* of intelligent qualification of strategies.

Development puts itself in the growth of political aims linked to social and economic benefits, mainly through competitiveness and the pursuit of goals set to the increase in value of "cultural heritage": promotion and disclosure of a Nation's own heritage.

A NEW COGNITIVE APPROACH TO ART EXPERIENCE: PRIMING, EEG-BASED VIRTUAL REALITY, AND DIGITAL STORYTELLING

Raffaella Folgieri[1], Annalisa Banzi[2], Diletta Grella[3]

[1]*Dipartimento di Economia, Management e Metodi quantitativi*
raffaella.folgieri@unimi.it
Università degli Studi di Milano, via Conservatorio, 7
20123 Milan – Italy
[2] Centro Studi sulla Storia del Pensiero Biomedico – Università Bicocca
annalisa.banzi@gmail.com
Villa Serena, via Pergolesi, 33
Monza – Italy
[3] *Journalist and digital storyteller*
dilettagrella@yahoo.it

Abstract. The work is divided into three parts: the first, introductory, describes the possibilities of digital storytelling to enhance the enjoyment of the museums public combining and triggering the mnemonic processes related to priming through storytelling. The second section enters into the merits of priming, presenting ways and means which could be adopted to measure and better understand its effect. Finally, the third part focuses on new media defined by the meeting of Artificial Intelligence with digital storytelling and priming to create experiences in which the active and respectful dialogue with our heritage is accompanied by a successful evolution of an individual.

INTRODUCTION

Museum goers usually do not have a viewing methodology that helps them to engage with, appreciate, and remember the objects (artworks, pieces, and installations) displayed in a museum.

The user experience enhancement model presented in this paper – based on priming, digital storytelling, and cognitive technology – facilitates improvement of the skill in reading artworks and objects, concurrently enhancing the memory (recall) of these objects' features.

Our aim is to provide unique, leading-edge, and user-friendly technological devices – specifically designed and personalised for a museum – which improve visitors' comprehension and memory thanks to story-narrated prime stimuli.

The model described is adapted to a series of mini-tours linked to an individual topic related to a single collection displayed in the museum.

MUSEUMS AND DIGITAL STORYTELLING

One of the new frontiers in communicating arts and culture is the so called digital storytelling, or multimedia tale: the exhibition spaces, museums and galleries may present equipment and installations that, through multimedia (words, sounds, lights, photographs, motion pictures, video), tell artworks, but also objects, environments, places, aspects of the territory...

Multimedia tale, however, is a very broad definition, including numerous and different ways of using new technologies in the exhibition spaces.

In some museums, for example, there are actors who tell the audience a story, while around them, thanks to the use of multimedia, an historical or cultural environment is recreated. In other places, the story can be told by a holographic projection. And, again, there are cases in which they are projected on large video screens that tell stories related to the exposure in progress...

A place or a topic, finally, can be entirely designed and reported through the use of digital techniques. The exhibition turns that into a story that evolves from the beginning to the end, thanks to moving images, sound, touch screens, devices....

The latter is the most comprehensive and complex use of digital storytelling, with a strong artistic value.

The benefits of using multimedia tale in the field of art and culture are several. First, it is possible to make a reconstruction of the context in which the work was created. Around a fresco, for example, you can digitally reconstruct the interior of the church where it was. A voice can tell who painted it, its meaning, the author's life ...

Another advantage consists in the possibility of direct interaction with the work. In traditional museums and exhibition spaces, in fact, you have no way to interact with it, you can at most change the angle from which you look at it, you can zoom in or out, but nothing more. Who benefits of a work or an artistic space through the digital story is instead often led to participate with the work itself, for example by choosing to activate a device rather than another, and in this way by taking a virtual tour that provides some stages rather than others.

The digital stories, then, often benefit from the contributes of the public to their creation. From passive spectator, the viewer becomes a co-author.

Also the use of multimedia produces interesting effects on the fruition of the masterpiece.

Some researches [2,3] confirm that, in general, the use of multiple communication codes - typical multimedia story - allows creating a stronger emotional connection between the work and its beholder, that is a better feeling.

On an emotional plan, then, the narrative-digital dimension facilitates the fruition of the object, and this is especially true in the case of a non-expert individual, far from the object itself as for interest, curiosity, knowledge.

This kind of multimedia also does not harm the attentional capacity of the viewer, but facilitates the flexibility of its mental models and stimulate both the creative and the logical thinking.

In conclusion, the multimedia tale surely represents a great opportunity for the dissemination and learning of art and culture.

Who uses it, however, must be conscious that its purpose is not a technological virtuosity for its own sake. On the contrary, the aim should always be to engage the public and help them understand all the aspects of a work of art, an object, a subject, a place ... that would otherwise remain difficult to understand.

A COGNITIVE MUSEUM

Studies on the museum public suggest some ways to make the museum more accessible to visitors who do not have adequate training in art history. Ideally, the museum should address all without excluding people who have a low level of education. Unfortunately this is not always achieved, just think of the captions that often assume prior knowledge. The goal for the operators should focus on strengthening the progressive autonomy of the visitor in a rational dialogue with the art work, encouraging critical thinking and desire for knowledge.

The discoveries of the last decades in the fields of Psychology and Neuroscience explain some of the cognitive mechanisms that can then be facilitated by encouraging and improving the utilization of the museum. In 1971, Meyer and Schvaneveldt psychologists [17] discover *priming*: a form of memory that triggers several crucial aspects of learning such as attention, memory and perception. At the outset, the phenomenon can be defined as the influence that a preceding stimulus determines on the perception or memorization of a subsequent stimulus. The first stimulus is called *prime*, the next one is called the *target*. Presenting, for example, as a prime-stimulus the word *cherry*, we can reduce the response times to questions about the subject related concepts such as *red*, *round*, *cake* and *fruit*. A person will take a few tens of milliseconds less to answer questions like "*Red is a color?*" if he/she has previously received as *prime* the word *cherry* instead of *banana*.

Priming is the improvement of performance - measured in the speed and accuracy of response to a presented stimulus - in a perceptual or cognitive task produced by the context or from a previous

experience [15,16]. This type of memory is common to all individuals. It remains relatively stable throughout the life cycle and it is automatically activated and retains the information for long periods of time. Characteristics that make it potentially eligible to become an active tool and an aid to the audience is that it is not accustomed to relate to the artistic world.

The thesis that is supported is that the visitor can easily get in touch with the constituent parts of the works of art through the use of priming in the museum environment. These are small actions that affect a limited impact on operating costs and museum building. Among the different types of priming those who have most to encourage the enjoyment museum are the *repeated visual-perceptual priming* and the *repeated semantic priming* based on equality between prime and target stimuli.

This psychological phenomenon may thus facilitate the recall of visual (such as color, line, composition, etc.) and semantic (iconographic theme, the meaning of the painting in relation to the historical context or the client, etc.) stimuli inherent in the work of art: awareness of the aspects that make up the object should help also to develop their own method of critical approach to be implemented whenever the opportunity arises in comparing to the cultural heritage.

The approach based on priming may help to define a new model of a museum that we could call *cognitive* for the attention given to the needs of the brain in relation to the learning of artistic content (not failing the respect for the Cultural Heritage identity) .

This methodology can be adapted to all shareholders, in its various forms, and may become a tool to break down cultural barriers, meeting even to foreign audiences of all backgrounds, as it uses mechanisms that characterize all human beings.

BRAIN AND TECHNOLOGY

Advances in Neuroscience, and in particularly in Brain Imaging, allow to investigate the response mechanisms to individual priming stimuli, making them measurable and therefore quantitatively comparable. Correspondingly, Cognitive Science and, in particular, Artificial Intelligence, provide powerful models and investigation instruments to record the relationship between Art and the Brain, analysed more easily thanks to recent technological tools such as BCI (Brain Computer Interface) devices.

Advances in Brain Imaging (diagnostic imaging systems investigating brain areas and functions, such as computed tomography, CT, functional MRI, fMRI, the Position Emission Tomography, PET and Electroencephalography, EEG) make it possible to observe the so-called "living brain", which is the brain in action, allowing real-time assessment of the reactions of individuals submitted to specific stimuli. Among all the techniques, the EEG results the most suitable for the lower cost and the high temporal resolution, important to evaluate the timing of response to stimuli. The new BCI (Brain Computer Interface) devices, born within the branch of Computer Science that studies models, methods and tools for the interaction between men and machines, based on EEG, offer not only the opportunity to interact with a computer through the interpretation of brain rhythms, but above all, thanks to the recording software and AI algorithms for the interpretation of the cerebral rhythms, provide the ability to detect the response of individuals to specific stimuli in real time. A BCI device [1] consists of a simplification of the medical EEG that is a hardware/software system that reads electrical signals or other manifestations of cerebral activity, transforming them into digital forms that a computer can understand, process and convert into shares and events or make available for subsequent analysis. The advantages are not only in the low cost of the devices, but even in Wi-Fi, which allows individuals to feel relaxed, to reduce anxiety and to move freely in an experimental environment. The collected brain wave frequencies are grouped in alpha, beta, gamma, delta and theta as the traditional EEG.

The BCI devices allow to investigate the relationship between art and the brain both from the point of view of the artist, during the process of creation of a work, both from the point of view of the public, while living in the experience of art. In particular, it is possible to investigate the neural activity during the perception of colours [21], decision-making and memory functions [24,6] and

analyse the brain response of an individual during the aesthetic experience, whose reactions are observed in the prefrontal cortex and the orbitofrontal area [9,12] in which BCI's sensors are placed.

In several studies on priming, individuals were exposed to visual-perceptual, semantic or conceptual stimuli, to assess the subsequent emotional and cognitive response in the context of the museums of Visual Arts [5]. For this purpose some subjects, before taking a tour of the museum, were subjected to priming stimuli, through a video and under the supervision of the researcher, and, subsequently, the effectiveness of the priming was measured using electroencephalographic analysis. The results have been encouraging. In fact, compared to the control groups (neutral stimulus and the absence of stimulus), participants to the experiment who received the stimulation showed an increase in levels of attention corresponding to the questions related to the given stimulus, revealing a reinforcement of the memory mechanisms. The described studies are part of a wider interdisciplinary research [5,10,11] which aims to assess the response of individuals to visual, auditory and perceptual stimuli, measured by classical methods of Psychology and Cognitive Sciences as by innovative methodologies such as EEG Brain Imaging.

Currently the research aims at understanding the mechanisms of cognitive basis of creativity, aesthetic experience and education to art. The performed experiments demonstrate, however, the evident and enormous potential of technological tools available today, giving also the possibility to verify, following the concept expressed by [25,26], that the human ontogeny is also determined by the contribution of the cultural tools available in the historical and social context.

CONCLUSIONS AND FURTHER DEVELOPMENTS

In this paper we present our idea to reinforce experience of art, discussing a possible approach conceived on the combination of cognitive technologies, priming and digital storytelling. This approach can led to a model suitable to enhance visitors' experience and involvement.

In addition to all the possibilities described above to measure and better understand the effect of priming stimuli in the presence of art, technology now offers tools that can enhance the enjoyment of the museum public, combining and triggering several memory processes related to priming through the powerful mean of the narrative.

Moreover, we want to underline the importance of the new media that can be designed through the combination of artificial intelligence approaches with the digital storytelling and priming to create experiences in which the active and respectful dialogue with our heritage is accompanied by a successful evolution of the person.

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INVESTIGATION OF THE ACTIVITY BASED TEACHING METHOD IN E-LEARNING MUSICAL HARMONY COURSE

P. Pistone
Dept. of Arts
Faculty of Humanities
Michel de Montaigne Bordeaux 3 University
Bordeaux, France.
Pascal.Pistone@u-bordeaux3.fr

A. Shvets
Dept. of Culture Sciences
Faculty of Humanities
Maria Curie-Sklodowska University in Lublin
Lublin, Poland.
annashvets11@gmail.com

The problem of knowledge representation methods became important with development of e-learning education. One of the methods is based on associative approach and consists of application of different forms of visualizations. Another method is based on activity approach and consists of the use of interactive on-line applications. The second method is widely used in programming languages learning, however such a method is rarely applied in on-line harmony learning. For such a reason we invented a range of interactive activities and compared the above-mentioned methods for harmony learning in the Moodle platform for distance education.

INTRODUCTION

Modern educational cyber space presents a range of resources to learn music harmony on-line, such as music theory course on the known coursera.org platform, [1] Khan academy-like UK based on-line non-profit project [2], and other projects [3,4,5]. The methods of teaching used in above-mentioned resources are based on associative teaching method: the interactive component is reduced to the press of the play button on music or video player, the graphical elements are static and do not reflect the occurring sound processes. However, modern possibilities of information technologies and programming languages allow to use the interactive component in much more advanced way.

For such a reason we've created a range of interactive on-line activities for learning musical harmony as well as the dynamic visualizations of the harmonic sequences. The both forms are using the graphs of knowledge representation in music harmony [6].

METHODS AND ACTIVITIES

These two forms represent two different methodological approaches – active based approach and association based approach. Association based approach is widely used in off-line education; however the application of this method in on-line education requires large number of visualizations to be efficient. The activity based method derives from the researches of Jean Piaget [7], which assumes that external activity causes an increase in mental and intellectual development, because the activity changes not only the external object, but also the subject who does this activity.

Association based method on-line content

For realization of the first method 3D animated models of harmonic sequences were created, being representation of used graph system [8]. Within these visualizations were used different colors to mark the function groups; different intensity of each tone of the accords to mark its decreasing importance from the ground to the seventh tone; and the numerical marks of the mentioned tones. Animation contained the directional arrows to mark the direction of each tone's moving as well as highlighting of the moving tones. Animation was used to the sequences in graph representation too, reflecting occurring musical processes in the sound track, added to the animated visualizations.

Activity based method on-line content

For the realization of the second method were created interactive web applications with the use of JavaScript programming language. Two types of applications were developed. The first type was based on interactive graph filling: students had to drag and drop each pattern of the graph to the corresponding function indication within empty exo-frames. The sound of the chord, as well as the window of the whole 3D animated visualization of the sequence with the use of this chord, were appearing after the pattern being correctly dropped (pic. 1).
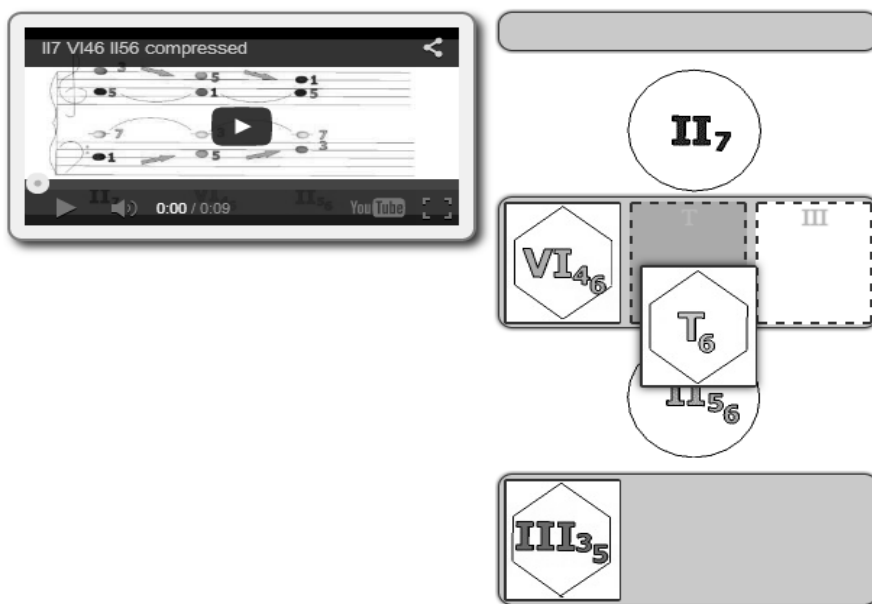
Pic. 1. Screen-shot of the first type of interactive on-line application.

This type of application differed by the form according to the use either of the horizontal or the vertical triad of graphs. The main goal of this activity was to provide general view on the diversity of harmonization possibilities reflected in the graph representation.

The second type of interactive web applications consisted of more detailed work with tones and intervals forming the accords of the sequence. The notes visualizations showed in the graph part were the main material of work within this activity. When the cursor was placed on the pair of either two upper tons (top interval) or two bottom tons (bottom interval), the sound of this interval, as well as the degrees of the scale, on which these tones were placed, were appearing (pic. 2). After this

first stage of chord intervals recognition, the second stage of the same activity followed, which consisted of the same top-bottom interval division of the chord, but applied to the two neighboring chords.

The main goal of this activity was to show the basis of harmonization variation, to show that the same degree could be harmonized with different chords within the graph and play different role in chord structure as different tones. The special task of the second stage of activity was to turn attention on the voices movement within the sequences.
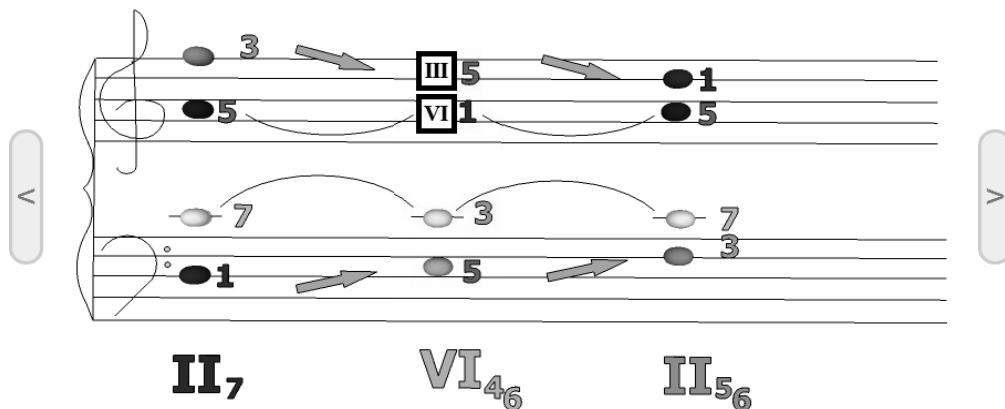
Pic. 2. Screen-shot of the second type of interactive on-line application (first stage).

EXPERIMENT CONDITIONS

Student groups

Final expertise of the activities efficiency have been investigated within the experiment held in the Michel de Montaigne Bordeaux 3 University. 41 students of the first year of a Licentiate in Musicology degree took active part in the experiment. The control group consisted of 21 students and the experimental group – of 20 students.

Learning content

The amount of learning hours and the learning program for both of groups was equal. Both groups worked in a computer classroom with the Moodle platform for distance education of Maria Curie-Sklodowska's university, but in different on-line classes. The control group had the learning content organized as Moodle traditional lessons with different pages. These pages contained described 3D animated visualizations, embedded as youtube videos with appropriate text description. Within the content of the lesson for the experimental group there were links to pop-up windows with the described above interactive web applications. The experimental group had no text description in the proposed activities. The post-lessons tests were the similar for both groups.

EXPERIMENT RESULTS

All the students had to pass two main tests – the pre-test and the post-test. During the course they received also points for the post-lesson's test. The final estimation consisted of the overage estimation between final test estimation and number of post-lessons tests estimations. Such a mixed

estimation allowed to measure the engagement of students during the course.

Influence of animated visualizations in previous experiment

In the experiment which preceded the present experiment with students of Maria Curie-Sklodowska's University [9] we've been investigating the efficiency of animated visualizations in Moodle platform compared to the traditional 'in class' way of training. The results we obtained showed the significant difference between experimental (with use of animated visualizations) and control (without animated visualizations). The overage estimations were equal according to the pre-test results – 4.0 for both of groups, but they changed to 4.1 in the experimental group in opposition to 3.0 in the control group according to the final test; the quality of knowledge was almost similar at the beginning – 0.9 in the experimental group and 0.8 in the control group and it changed at final test to 0.9/0.2 in relation of the experimental-control groups. Thus, the significant influence of the animated visualizations on the efficiency of knowledge assimilation has been obtained.

Influence of interactive web applications in present experiment

Despite the significant results received in the previous experiment, the feeble activity in post-lessons tests, which could cause the lack of systematicity, was observed. Thus, in present experiment we've tried to apply the other forms of knowledge presentations, with application of the activity based method of teaching realized in the web space. The student's activity during the course was measured by estimations for post-lessons tests. The frequency of measurement was two weeks, which was equal to one module within four lessons. The penalty for a delayed response to the post-lessons tests was equal to 50% of the last received estimation. As mentioned above, the final estimation was the overage calculation of the final test estimation and three other estimations received for post-lessons test within each of three modules of the course, consequently, the amount of final post-test estimation was 25%.

The overage estimation at the beginning of the experiment totaled to 0.7 in the experimental group and 0.71 in the control group; and 0.75 in the experimental and 0.67 in the control groups at the end of the experiment (pic. 3).
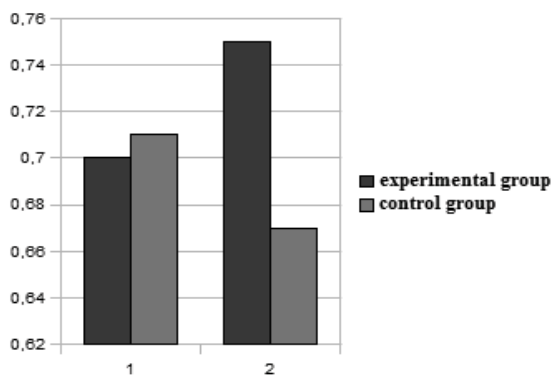
Pic. 3. Overage estimation at the beginning and at the end of the experiment.

The estimation of quality of knowledge shows a proportional increase in both groups. At the beginning of the experiment it was equal to 0.5 in the experimental group and 0.42 in the control group; and at the end of the experiment - to 0.75 in the experimental group and 0.66 in the control group (pic. 3).
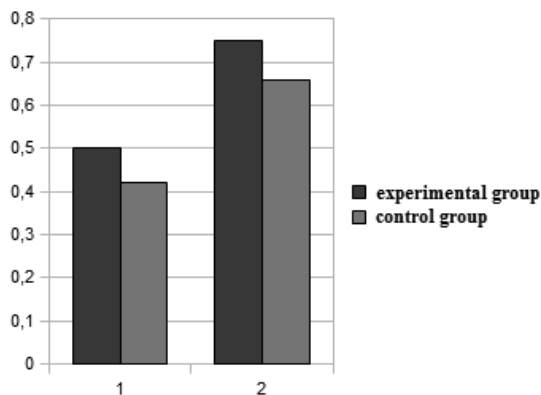
Pic. 4. Quality of knowledge at the beginning and at the end of the experiment.

CONCLUSIONS

The estimation of the quality of knowledge showed the efficiency of both methods of teaching - association based method with use of animated visualizations as well as active based method with use of interactive web applications. However, as proved the overage estimation at the beginning and at the end of the experiment, the activity based method of teaching with use of web interactive activities could be considered as more engaging. We can suppose that such an increased engagement into training process leads to the systematisation of assimilation of knowledge and influence the long-term memory. The importance of interactivity factor [10] as well as the failure of exclusively verbal form of presentation in e-learning [11], makes the second method of teaching with use of interactive web applications more appropriate for distance education. The fact that experimental group had no text description (only the interactive activities), but resulted the same proportion of the quality of knowledge increase as the control group with text descriptions, allows to assume, that in conditions of information society with supersaturation of verbal information, the activity based method with use of interactive applications could be a good alternative to the assimilation based methods of teaching with accent on verbal forms of knowledge presentation.

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ACCESS
TO THE CULTURE INFORMATION

LONDON'S DIGITAL CULTURE: ARTISTS & DESIGNERS, PUBLIC SERVICE MEDIA & 'LIVECASTING'

Dr James Hemsley and Dr Nick Lambert
VASARI Research Centre, School of Arts,
Birkbeck, University of London,
43 Gordon Sq, London WC1H 0PD
n.lambert@bbk.ac.uk
jrhemsley@hotmail.com

Professor Lizzie Jackson,
Ravensbourne,
6 Penrose Way, Greenwich Peninsula,
London SE10 0EW
lizzie.jackson@rave.ac.uk

Abstract: Focusing on London, we first consider Art & Design at the leading edge of creative computer use for some 60 years by exploring three case studies. Second, the BBC with specific regard to recent and new initiatives with implications for its European peers in together facing *Le Defi Globale*. Third, we examine the surprising recent success of performance '*live streaming*' from pioneering theatre stages to cinema; these are extending the notions of '*liveness*' and communities of interest. Finally we indicate potential cross-overs.

This paper is a second step [1] in exploratory cooperative research bringing together three differing perspectives: Computer Artists & Designers (Lambert); Public Service Media (PSM), focusing on the BBC and the need for European PSMs to cooperate more (Jackson) and 'Live-casting' of theatre performances globally to cinemas (Hemsley]. Efforts to explore synergies are indicated.

INNOVATIVE ARTISTS & DESIGNERS IN LONDON

Creative Industries are the great growth area of modern London. More photogenic, and definitely more socially acceptable, than the banking industry, and acting as agents of economic regeneration in the "new" areas of East London, Creative Industries have actually always been a part of the London economic scene. Moreover, another axis is emerging immediately north of central London, around Kings Cross/St Pancras stations, taking in Islington and areas towards Farringdon and Clerkenwell. We will examine three creatives who exemplify different aspects of the London media arts scene: typography designer Neville Brody; painter & digital artist Julian Opie; artist & designer Daniel Brown. For a general outline of the history and development of computer art, see: Lambert et al. [2]

The designer and typographer Neville Brody defined an influential strand of British graphic art during the 1980s. In 1981 he joined *The Face* its art director. As a magazine of music culture, *The Face* was highly influential and Brody shaped its graphic direction, mixing hand-drawn typefaces and cut-ups with an almost Dadaist feel, drawing on existing punk culture but also moving towards new forms. This was on the cusp of the desktop publishing revolution and Brody was one of the first to engage with the potentials of digital typefaces, with a disk-based typographic magazine called *Fuse* in 1991 pointing towards new methods of delivering digital content to audiences. Whilst he promoted a clean, sans-serif approach as graphic designer of the mainstream magazine *Arena*, Brody wanted to engage with a new generation of type designers. Apart from his direct influence on the evolution of digital type and its creative usage, Brody also set up the innovative London design firm Research Studios which established an international clientele from the outset. It quickly attracted major clients, such as Dom Perignon, and grew into a federated structure of semi-independent design groups across Europe and the USA. One of their largest projects was redesigning the BBC's

"Global Visual Language" identity in 2011. Besides his work at Research Studios, Brody is now Dean of the Royal College of Art (RCA) School of Communication, and the President of D&AD (Design and Art Direction), which presents British design awards. In this role he not only champions creativity in education, clashing with recent UK government initiatives that threaten to reduce school Art and Design teaching, but also finding ways to reshape the RCA itself into a new research-driven organisation with an emphasis on the radical designer. Brody also applies his design talent to larger strategies with the aim of changing institutions and the public perception of design.[3]

Whilst Brody took the raw energy of late 1970s London and used it to inform his typographic vision, another artist of his generation responded to the rise of new technology in a somewhat different form. Julian Opie imbibed the conceptual stream of thought at Goldsmiths College in the early 1980s via Michael Craig-Martin, honing his style into a readily-recognisable signature of highly simplified outlines and flat colours. Opie considers that his work is "99% surface", in the sense that it has great clarity and readability; his objects are reduced to types and yet retain some kind of individuality as fluidly executed linear forms as well.This is not coincidental, for although Opie works across several media, the computer is an essential part of the process. Apart from appropriating the visual language of the digital screen, Opie also creates large standalone installations based around LED screens in outdoor environments.   There are several notable examples around London, in particular at Regent's Place in the Euston Road area where *Ruth Walking in Jeans* (2010) is displayed high up on a building, a figure of LEDs constantly in motion, outlined in white light. By integrating his work into London's urban environment, Opie takes the mainly interior world of the digital screen and places it in spaces where it is very striking, despite our immersion in digital imagery.Thus, Opie shows that the digital artist may be present in London's urban landscape and also influence the city's visual perception of itself, through his iconic figures and designs. By spanning a range of media, linked with a distinct stylistic signature, Opie has a certain ubiquity in the visual imagination of the contemporary city [4].

By contrast, artist and designer Daniel Brown is more widely represented in the virtual landscape of the Net than in the physical world; however he has been very influential with his pioneering interactive websites Noodlebox (established in 1997) and then PlayCreate. He is the recipient of several design awards, including the Design Museum's *Designer of the Year* in 2004.Brown's main interest is in how interactive experience can generate new types of form, and use game-like elements without necessarily becoming games in themselves. With inspirations as varied as Golan Levin and Bill Viola, Brown's aim is to create digital art that is not self-conscious about its digital origins, but rather looking past the medium instead to find its aesthetic qualities. Brown has pursued a joint career as both digital artist and designer, separating out his projects which are primarily artistic (such as those shown at the major digital art show Decode at the Victoria & Albert Museum in 2010) and those for his design business, including work for SHOWstudio. His most widely-recognised artworks are his *Flowers* series, most recently a Flowers Construction Kit using the biologist D'Arcy Thompson's concepts of morphogenesis to inform an interactive tool for evolving more complex floral forms. This demonstrates Brown's strong interest in science as well as code, and the underlying playfulness of generating organic images. Moving to London in the late 1990s, Brown is very much immersed in London's cultural life. However, a 2003 swimming accident in 2003 left him paralysed from the shoulders down, with only limited motor control in his arms and fingers. Despite this, he is able to continue his design career using computational aids, such as head-mounted cursor control and voice recognition software. The

computer, then, forms an essential part of Brown's artistic experience and extends his body in a very necessary way, as well as providing the medium for his work.[5]

This necessarily brief overview shows how artists and designers have changed their practices to work with new digital tools within the context of London's art and design scenes. To see how larger digital producers have developed, we next examine the case of the BBC.

BBC PROJECTS: SUCCESSES, FAILURES & CHALLENGES

The BBC has a history of experimentation, testing, and moving on; its R&D department engineers have hundreds of patents, including the invention of colour television. The BBC Online department was formed in 1997, just before www.bbc.co.uk. Next the BBC began to explore database-driven content in order to keep pace with commercial developments. Numerous dynamic services were offered: WebGuide (reviews of websites), BBC Jam (interactive educational games for children), online communities (leave messages and chat to fellow enthusiasts), interactive dramas, and, in 2002, the highly successful BBC iPlayer. BBC current priorities include the development of an online repository of live and non-live linear and non-linear content under the banner of 'The Space' (previously The Digital Public Space) which was originally developed for the 2012 Olympics as part of the accompanying cultural programme by the ex-head of the BBC's digital archives projects, Tony Ageh. Use of The Space is extended outwards to UK cultural organisations, large and small, to promote British events and performances to the UK public. Live online streams from the BBC equivalent of a traditional analogue broadcast. However commercial UK producers such as Peter Bazalgetti, the originator of Big Brother, are also offering live broadcasting via the internet. The Royal Shakespeare Company (RSC) and Royal Opera House in the UK have regular online events. Examples of failures are not uncommon as described in our previous paper, especially the Digital Media Initiative entrusted to Siemens [1]. Significantly, the BBC Channel 3 is moving to internet delivery (due primarily to the changing viewing habits of younger audiences and financial pressures) as a new commercial 'London Live' TV Channel opens.

Nevertheless, there is a continuing need for an alternative to commercial media, and demand for quality news and other public-facing services, to support democratic processes, especially when voting levels are declining. For a well-functioning democracy, the public needs to understand how to engage with politics and with representative structures, and, further, make their voices heard. The internet offers the ability to be responsive, and this is now considered by Lovink as the 'norm' for many publics [6] Public service media, however, have found offering such services problematic. The main issue for PSM is that their online content and associated services are not as sophisticated as e.g. Google and Netflix. PSM websites are often poor creatures that – at worst - merely serve to market television and radio programmes. Search and aggregator sites are, in comparison, engineered for the internet age and for networks, and thus able to analyse and exploit the behaviours of publics. Google, YouTube, etc., can easily add television and radio streams as an additional content 'layer', the complicated analysis and delivery infrastructure is already there. PSMs are in a vulnerable position according to Leurdijk [7]. For Victoria Jaye, Head of the BBC's iPlayer, *'findability'* in an increasingly crowded market is the main issue currently (Salford Media conference, 2013). The BBC has to fight for market-share amongst NetFlix, YouTube, Amazon Prime, LoveFilm.com etc. which entered the online streaming/download market early. In addition, the simplicity of their public-facing user-interfaces masks the complexity of the platforms and audience-tracking and recommendation mechanisms driving these services. *Can PSM keep up/catch up?* The BBC is investing further in the popular iPlayer, adding sociable

elements such as recommendations, and in 'MyBBC', designed to improve the viral forwarding of BBC content, and also the *'findability'*, a market-led position.

What function or functions should a modern public service media be fulfilling? Hendy argues that PSM continues to be a critical element of our media provision, *"[T]he public service broadcasting ethos is precisely this: to transform mere technology into a social philosophy"* [8]. PSM is – in itself – a public good. Couldry notes *"media play a crucial role in representing the facts and norms that guide our action in the world and, if they do so badly, they can injure the social fabric"*[9]. In an ideal world PSM functions are highly associated with the wellbeing (and therefore preservation) of nationhood and its associated publics. This includes access to a sufficiently wide range of opinions and to quality content in order to inform, educate, and entertain. European PSMs need to 'catch up', perhaps by joining forces to develop some kind of re-purpose-able platform, or by partnering with organisations who make PSM content 'findable' in the network age. The BBC, for example, already has partnerships with YouTube, LoveFilm, Netflix and so on. The issue is that PSM is not – as previously – in the driving seat; they are suppliers to the commercial online distributor. The Austrian public service media (ORF) is committing its Spring edition of TEXTE, the ORF magazine, to drawing together 28 PSM experts from across Europe. Without finding effective ways of approaching innovation collectively, the smaller PSMs in the smaller countries, are not likely to have sufficient resources to compete.[10]

'LIVECASTING' FROM THEATRE STAGE TO CINEMA SCREENS.

'High Culture' live-casting to cinemas nationally and internationally was boldly innovated by New York's Metropolitan Opera in the 2006/2007 season, followed by London's Royal Opera House and the Paris Opera as well as other 'High Culture' institutions, e.g. ballet from Russia [1]. UK Theatre was a 'fast follower' initiated by David Sabel, with the National Theatre's new venture 'NT Live' providing *'simulcasts'* of live productions to cinemas. Here we consider an NTLive case study: a 2014 performance livecast of Shakespeare's *Coriolanus* from the Donmar Warehouse, a strikingly successful small theatre in Covent Garden, a few hundred yards from the Royal Opera House. Donmar has acquired a reputation for stylish innovative productions. Its stage is surrounded on three sides by spectators with just some 250 seats plus 20 'standing places' in its small intimate space, strikingly different from the National Theatre's massive 1,160 seat Olivier auditorium.

Coriolanus, the last of Shakespeare's great Tragedies but not one his most performed plays. The adulated Tom Hiddleston plays the title role with impressive panache but the character's arrogance leads to his downfall at the hands of scheming politicians representing (and manipulating) the People. As such the message is still very relevant to our times. NTLive transmitted a live Donmar Warehouse performance this February to some 300 cinemas across the UK and over 1,000 internationally. This *Coriolanus* theatre version was seen by over 40,000 people with 'remote' audiences in cinemas of over 170,000 (data; Donmar Warehouse). Both Donmar theatre and cinema live-screening versions have received critical and public acclaim. One striking aspect seen live at a major multiplex cinema with a large screen from a mid-auditorium seat was the astonishing impact of deft cinematographic and video mixing work benefiting from the Donmar's intimate size and lay-out. This is in sharp contrast with a one/two cameras procedure for theatres and more akin to filmic practice. As a particular case of Walter Benjamin's *aura* of an artistic work, viewing of a 'live' event is generally regarded as more 'fulfilling'/higher quality/ more real than seeing or listening to the

same performance mediatized whether by radio ,(internet) TV, mobile telephone, Tablet, Lap-top etc. One distinctive feature of the 'Theatre to Cinema' model is the size and nature of the audience *in the same venue* (up to 300 plus but sometimes considerably less) plus the knowledge that *a 'live audience' is at the theatre* plus other audiences at *over a thousand other cinema venues*. Does this constitute an 'Imagined Community' in the sense of Benedict Anderson. Currently there is little critical literature but interest is growing fast in several disciplines (and inter-disciplines) such as the developing field of *'Adaptation Studies'*.

The February 2014 *From Theatre to Screen – and back again* Conference at De Montfort University, a key centre in the Adaptations Studies field, attracted over 50 participants including from Austria, Belgium and Spain. John Wytner's Keynote Lecture focused on 'live-streaming' based on his production experiences with the Royal Shakespeare Company (RSC) and research at Westminster University with a corpus of nearly 50 Shakespeare cases [11]. Wytner stressed that due to NTLive many more Shakespeare plays have been captured and screened over the last few years than in the previous half century with clear implications for their future non-live availability in Benjamin's 'age of mechanical reproduction'. Also he highlighted the importance of looking back to the history of early cinema for helpful insights for the future of these intriguing developments. In a well-attended parallel session, Cochrane praised the general innovation regarding Opera, Theatre and other performing arts:*'--- serve many admirable purposes in extending audiences and income streams, in diminishing feelings of cultural isolation ---'* [12]. She also described the interesting case of a dedicated live staging of a radio programme *This American Life* (2007): a phone app enabled audience members with smart phone sound capabilities to participate in a musical piece with dancers. All four speakers noted lack of a common term for hybrid stage performance & transmission to multiple cinema screens, indicating its embryonic nature; alternatives include 'Live relays'; simulcasts and live-casting. We use the latter until a common term emerges.

Numerous audience behavioural and reception questions arise, e.g.: Are there differences in reception and audience behaviour between the 'theatrical event' and the hybrid 'cinematic event' case of *Coriolanus*? Should the 'live' (but remote) cinema viewing audience behave as usual or as at the theatre/opera (e.g. applause at the end?).How should/do/will people regard 'live' viewing *en masse*/collectively with the 'Big Screen' at a cinema contrasted with viewing at home, other 'individual'/'small group' venues and travelling using a mobile phone or Tablet? The loss of 'autonomy of view', 'reception rights' is well recognized; 'theatre buffs' lament the loss of their ability to choose their own view. However, perhaps the 'average audience member' welcomes the camera's eye provided by the 'screen/filmic director'. Is audience enjoyment (negatively) impacted by the numerous cameras (e.g. 10 at one recent opera performance)? Or is it enhanced by their knowing that they are accompanied (and envied!) by tens of thousands of viewers around the world. What role(s) does/will Social Media play regarding pre-, during and post-performance viewer experiences? Audience studies and surveys are frequent in Film & Theatre academic fields as well as management and marketing purposes; we may expect such studies addressing 'live-casts'.

SYNTHESIS EFFORTS IN ON-GOING RESEARCH

We are endeavouring to exploit emerging synergies between the authors' different areas in our ongoing research. First, the ubiquitous role of 'Design'. The BBC (and other European PSMs) now must creatively design high quality services on a wider range of differently sized platforms: from mobile phones upwards. Can artists and designers help more? The design role in Theatre is crucial as the credits of the *Coriolanus* demonstrate with four of the 8

'Creatives' being designers, including Lighting, Sound and Video. Second, '*Liveness*'; originally a defining feature of television at its origins, is also a vital subject for hybrid stage and cinema-screened 'live' performances. The dual '*liveness*' of cinema and stage performance audiences attracts inter- and multi-disciplinary study following Auslander [13]. We have focused principally on London but have hardly 'scratched its surface' in this paper.

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LEARNING IS A WAY TO ACCESS
TO TREASURE OF MUSEUMS

Elena Gaevskaya
Faculty of Arts
Saint – Petersburg State University
Saint-Petersburg, Russia
E-mail: elena.gaevskaya@gmail.com

Abstract

The article focuses on the use of information resources developed by museums for educational purposes. The author examines the resources published on the websites of museums, projects, and massive open online courses.

Virtual space becomes a learning environment of the Information Society. Our contemporaries use tools and training methods different from the methods and tools of the previous era. For example, in antiquity learning was based on spoken word and occurred by 'word of mouth', in the Middle Ages is on the verbal and written word, in an industrial society is on printed word, and tools of information society are electronic and networking communication. We believe that the latest tools does not exclude or replace the tools accumulated previously. Moreover, we should use arsenal of electronic funds with caution, since we very recently started using them.

Internet provides scholars and students with a place for scientific and educational publications and communications for learners. However, we must not forget that scientific and educational segment is part of Internet, which one works today as a tool of manipulating public opinion for marketing purposes. Thus there is a certain contradiction between commercial and academic segments of the Internet. If the main task of the first segment is depersonalization of human, transformation of an individual to a consumer who must not accept any information critically. Nevertheless, actors of academic sector face another task. It connects with development of human individuality. The issue is in the foster of personality who would be able to critically reflect a huge amount of information resources, express themselves in the virtual space and combine communication with colleagues in network in 'real' spaces.

Here, in our opinion, we have reached one of the 'sore points' of debate about the place of electronic and web technologies in modern education. It reflects the modern pedagogical issue. It seems that humanity is freezing in anticipation that very soon network will go on the place of boring books and meticulous teacher and a learning becomes a pleasant game. We are afraid; these expectations will not come true. History shows that technologies have influenced on the development of methods and forms of learning[1]. However, humanity has mastered new technologies, but does not renounce previous. For example include books into an arsenal of pedagogical tools, universities have not abandoned the techniques of memorization of texts, writing skills and rhetoric. We believe that the same fate befall electronic and web learning, they will serve to the subjects of the educational process along with the tools previously mastered by mankind.

1. Маклюэн М. Галактика Гуттенберга. Становление человека печатающего/. Перевод И.О. Тюриной. - М. Академический Проект: Фонд "Мир", 2005. - 496 с.- («Концепции») ISBN 5-8291-0548-9 (Академический Проект), ISBN 5-902357-28-4 (Фонд «Мир»).

E-learning and web learning have its own specifics, so the theories, which reflect these aspects, are actively developing. For example, Open Education, Life Long Learning, Cognitive Science, Blended Learning, eLearning, Edutainment, Connectionism, Multimedia Learning. We add to this line the term net learning. It reflects learning via communication between experts in virtual and 'face to face' communication.

The cognitive theory of multimedia learning posits that optimal learning occurs when verbal and visual material presents synchronously [2]. Base of this concept is the ideas of the dual coding theory[3] and the theory of working memory[4]. The experimental studies showed that testees have better remembered data presented both verbally and visually than just video or audio information. The working memory is based on operation of two substantially independent areas of the cerebral cortex, which usually operate in parallel. One of them is responsible for the perception of visual information, and the other is for the verbal (acoustical) data. It allows a person to simultaneously process information coming into the brain from the verbal and visual channels.

R. Meyer and his colleagues examined the theory of the double coding for multimedia in a series of studies conducted in the 1990s. The researchers have successfully proved the correctness of the hypothesis of a higher efficiency of multimedia teaching tools compared with monomedia. The conclusion was that the testees, who worked with multimedia training aids, were better prepared than those, who studied with monomedia tools. Thus, these materials can serve as the theoretical basis for the development of teaching aids based on collections of museums.

The theory of pedagogical connectionism refutes the opinion of adherents of multimedia aids about low efficiency of monomedia tools. At the same time, the connectionism shows ways of existence such materials   on the web. Advocates of the connectionism have emphasized the importance to teach students skills of network development and decision-making [5].In this theory the network concept is very multifaceted. From the point of view of physiology, neural networks are created in learning, psychology studies mental networks, and sociology explores communities. Nodes of mental networks includes data, information, and knowledge. Conjunctions of social networks can be people, organizations, libraries, websites, etc. Learning is a process of creating a network of nodes that allow person to achieve educational and life goals. So the nodes can be attributed as potential of intellectual potential, and connections of social institutions. Key skills today are the ability to recognize patterns, potential of different areas of knowledge and to integrate them, as well as to create new concepts. Learning is process of search information in variety of sources, and creation of new information, experience and social communities.

According of S. Downes, a training is socialization of the individual, the main result of a training is to become part of the educational, expert or social network. Learning takes place in a group therefore a source of knowledge and a content of training activities depends on participation in a community life. Learners acquire knowledge via interactions with teachers or experts as well as make copies of models. Other members of the community reflect and correct process copying of models or activity. In our point of view, it is transfer of the medieval practice of training to the virtual world. Communication of the Web2.0 is largely consists of an exchange of video and audio information and it generates a variety of resources. Resources are created by all members of the network, including experts, teachers, and students.

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4. Baddeley A.D. Working memory. Oxford, U.K.: Oxford University Press, 1986.
5. George Siemens. Learning Management Systems: The wrong place to start learning November 22, 2004 Access: http://www.elearnspace.org/Articles/lms.htm, 2013

One of the most debatable issues is following. Community of experts or learners has paramount importance and resources are needed only insofar as the community demand them. The learning environment is interdisciplinary, since it is a complex of research materials for solution of any tasks, for example development of a virtual museum. Thus, a modern pedagogical tasks are creation learning resources for network and knowledge management in the web. Learning is realized via interaction with other people (social networks), with the teacher (the blended learning, the massive open online course), self-teaching of a learning objects are presented on museum's sites, for example, Galleria d'Arte Moderna di Milano (GAM Milano) [6], Ashmolian[7], Pompei, Erculano, Stabii[8].

This point of view may seem disputable. However, our experience shows that such regularity as the effectiveness of collaboration of experts from different areas of knowledge and different levels of training is confirmed by practice. It is noteworthy that D. Siemens doesn't use the term 'student' in his works. In our opinion the researcher shares   the opinion that people of the information society learns all life. Individuality is starting point in web learning for the scholar. Knowledge of an individual supports the development of a knowledge of a community, and contribute the development of the network as a whole and its individual members.

In the context of the theory of connectionism can explain the contradictions of such phenomena as Massive Open Online Courses (MOOCs). From the point of view of 'the connectionismers', MOOCs are 'nodes' of community of experts, learners, rubbernecks etc. Such communities serve for creating a new form of interaction of Internet users are for learning and not for commercial purposes. MOOC presents resources created on base of integration of knowledge from different fields of science, and often include information provided by the museums. Arts, Humanities, Anthropology, Sociology   courses are in high demand by users of MOOCs. Universities and museums usually combine efforts to create such courses [9],[10].

There is debate about the MOOC among Universities of Europe and the United States. Critics of these resources have predicted deterioration in the quality of education as the main result of use of these materials. The MOOC's advocates address to democratization of education as the main argument in the discussion.

From our point of view the MOOC are not competitors of classical universities. They have different aims, content, methods and forms of activity. They are open content resources and one of purposes of them is to creation environment for communication between experts, leaners, and self -learners. Our experience shows that MOOCs have coped this objective [11],[12].

However, MOOC also serve the goal to entertain internet user via learning. Therefore, we are on the field of   the edutainment theory. This theory is fashionable, but is not new. Some ideas of the theory expressed in this works of J.-J. Rousseau, E.Ashmol, K.Ren, I.Vinkelman, D. Lessing, K.D. Ushinsky, A.I.Herzen, M. Montessori. The theory of edutainment is at a new stage of development in XX-XXI century in connection with development of animation (Walt Disney), educational television, computer and online games. This theory is waiting his development. It

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will develop to area of the underlying mental processes, in particular creating such motivation to learning, as a pleasure of acquiring knowledge. These issues raised but not resolved in the works of Lev S. Vygotsky and Maria Montessori.

Social mechanism of activation of edutainment idea is not new. There is at least the fifth turn of the helix of development the idea. The first is connected with the history of Greece, the second with the Renaissance, the third with the age of Enlightenment, the fourth with the epoch of flourishing capitalism, interrupted by World War I, but it was implemented in European countries 1950-70s ('boom of tourism') and the USSR in the 1960-80ies ('boom of books').

Museums have been actively participating in the edutainment of Internet users and today most major museums have sections of "Education" on their websites. Educators and users have different opinions to this phenomenon. On the one hand the publication on web quality and reliable materials is very valuable activity. By efforts of educators, artists and informatics have been developing resources for people of almost all age groups, levels of education, place of residence. Such resources allow to internet visitors to spend with pleasure their leisure time and motivate to visit museums.

On the other hand, the vast majority of these programs are intended for entertainment purposes only. Supporters of the edutainment are welcomed such learning practice. Critics argue that such approach often connects with deterioration of educational content, and people start treating to museums and universities as a Disneyland. We believe that the museums' websites contain information about outstanding artistic and scientific treasures and may serve for pedagogical goals, namely to enrich of the content of education and to modernize of methods of training in universities and schools. Scholars and teachers have been developing ways of trainings are based on interactive communication of experts and learners.

We see two ways of collaboration between museums, universities, and schools today. The first one is provide students and teachers with materials for their routine work as well as invite them to learning event to museums. The second way is creation virtual learning objects aimed to teach individuals to understand fine arts focuses on games. We give in examples of the first way … some museums of Italy, Russian State Museum [13], and Ashmolian [14] and collaboration of Russian State museum, Novgorod State museum and Saint Petersburg state university [15],[16]. The best examples of the second way is resources of MOMA San Francisco USA[17] and Catalogue of the exhibition of Monet in 2010[18].

It is impossible to study web spaces of all museums in Italy. Three of them [19],[20],[21] are carrying out educational activities in real space. On their websites, they present schedule of classes and a description of activities. This confirms our view that Information Technology can support the capacity of funds that are based on other technologies. There are word of tour guide and lecturer, numerous publications, including albums, games, catalogs of exhibitions etc. Each

13. Russian Museum: Virtual Branch, access: http://www.virtualrm.spbu.ru
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of these tools has its strengths and weaknesses, and together, complementing each other, they can more fully acquainted visitors with the museum exhibits.

In conclusion, we note that one of the most important tasks of the museum originally was associated with the learning of visitors. Role of information technology is to set up tools serving this purpose. We do not need to abandon the methods and tools that have proven their effectiveness. The most important task of educators is organization of the museum space, which motivate visitors to knowledge achievement and help them to achieve the knowledge.

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ONLINE EDITION EMA - THE LETTERS OF ERICH AND LUISE MENDELSOHN 1910-1953 HTTP://EMA.SMB.MUSEUM (NATIONAL MUSEUMS IN BERLIN / GETTY RESEARCH INSTITUTE, L.A.)

Dr. Andreas Bienert
Staatliche Museen zu Berlin - Stiftung Preußischer Kulturbesitz
Berlin, Germany
a.bienert@smb.spk-berlin.de

The correspondence of Erich and Luise Mendelsohn existed in split entities – Luise's 1.398 letters to Erich having been held at the Getty Research Institute, Los Angeles, and Erich's letters to Luise, numbered 1.410, having shifted to the Kunstbibliothek, Berlin. Obviously, mutual reading was difficult, though the correspondence provides a fascinating glimpse into the ideas of the architect and the lives of German Jewish émigrés in England, the British Mandate for Palestine and the USA.

The digital online edition of the letters - *http://ema.smb.museum* - negotiates these impediments. It brings together the archived funds in the virtual space and allows for a comprehensive understanding of the livelong dialog of the architect and his congenial, cello playing wife. Architecture specialists, historians, art fans and history buffs can observe Erich and Luise as they compose their letters and mingle in a circle of friends and acquaintances that included Albert Einstein and Erwin Finlay Freundlich, the Mosse and Heymann families, entrepreneurs Simon and Salman Schocken, architects Hendrikus Theodorus Wijdeveld, Frank Lloyd Wright, Richard Neutra, Ely Jacques Kahn, Richard Döcker, J.J.P. Oud, the painter Amédée Ozenfant, the sociologist Lewis Mumford, the composer Arnold Schönberg and the leading figures in German and international Zionism, Kurt Blumenfeld and Chaim Weizmann. The correspondence covers a periode of 43 years from 1910 to 1953.

As distinguished from printed editions the digital edition EMA - Erich Mendelsohn Archive - follows the concept of an open, ongoing process. Electronic resources from the global networks are widely used to enrich the data. Critical annotations, indexing and the association of keywords and terms with external links render the written texts with academic and multimedial contexts. Linked data and semantic web technology rebind the EMA edition with a universe of knowledge. Geographical Information Systems like geonames.org have been adressed as also valuable normative databases of the German National Library or the Library of Congress. Thus, interoperable references have been established for proper names, places, incidents, periodicals and works of art. Finally, addressing media portals like SMB-digital, Europeana or DDB grants for a highly illustrated reading about works of architecture, art and music. Any of the transcribed texts are also to be downloaded in standardized TEI-Format. Our online editing tool "Refine!Editor" has been administered by "3pc GmbH Neue Kommunikation".

The EMA digital edition has been realized as a transatlantic co-operation of the Kunstbibliothek - Staatliche Museen zu Berlin and the Getty Research Institute, Los Angeles. It has generously been funded by the Alfried Krupp von Bohlen und Halbach Foundation.

Networked Museum, Concept, Design, Technology and Experiments

Shinji Shimojo
shimojo@cmc.osaka-
u.ac.jp
Cybermedia Center
Osaka University
Ibaraki Japan

Masaki Chikama
Kaori Fukunaga
Eiji Kawai
masaki-c@nict.go.jp,
kaori@nict.go.jp
eiji-ka@nict.go.jp
National Institute of
Information and
Communications Technology
Keihanna/Koganei Japan

Hisako Hara
hara@aa.osakac.ac.jp
Osaka Electro-Communication
University
Shijonawate Japan

Jin Tanaka
tanaka@ote.kddi.com
KDDI Corp.

Takayuki Morioka
takayuki.morioka.mh@hitachi.com
DIS Project, Hitachi Ltd.
Yokohama Japan

Vito Cappellini
vito.cappellini@unifi.it
University of Florence

Networked Museum is a museum which consists of multi tiled high definition display, network and a cloud. Through the use of cloud, we can store precious art-works around the world. Using a high speed network, we can share the art-works which are displayed in the high definition display interactively. Although the art-work in digital form has some limitation as compared to the original one, it could also extend some aspects beyond the original.

Based on the concept, we conducted experiments of Networked Museum at Knowledge Capital, Osaka in June 2013 connecting Florence, Italy with high speed network. Knowledge Capital is the core facility of Grand Front Osaka, which was just opened in April 2013 and consists of commercial offices, hotel and residential condominium. Knowledge Capital intends to create new innovation by cross-fields collaboration, involving over 100 companies, universities and research institutes.

In these experiments, we use a tiled display setup in the conference room inside of *The lab*, a unique museum showing research and industry prototypes in the Knowledge Capital. In these first experiments, some digitized fine art-works from Uffizi Gallery are shown in the tiled display controlled by "Meiga Navi" software. Using this software, one can choose an art-work from the collection and show it on the tiled display in very large scale. Besides showing a fine artwork in the tiled display, we performed remote conference with HD quality using a high speed network between Osaka and Firenze (University Incubator). Using a video conference facility, many researchers from Italy and Japan get together to discuss about liaison of art and technology and global collaboration. Among them, Cristina Acidini, Superintendent of Polo Museale Fiorentino, gave a lecture on Uffizi Gallery Collection showing digitized art-works on the tiled display. This Event called "Japan - Italy Project on Art and Science Digital Renaissance" was opened to the general audience as a part of official Italy - Japan Year with the appearance of Mr. Marco Lombardi, Consulate General of Italy in Osaka. In Florence, University Pro-Rector Marco Bellandi presented the Incubator and the Laboratories for Innovation Transfer to Enterprises (CsaVRI).

By using several high speed Research and Education networks in three continents, JGN-X, Transpac3, Internet2, GEANT and GARR, an interaction with video conference works well for audience at both sides. We also use our experimental SDN (Software Defined Network) testbed, RISE. The next step of there experiments will extend Software Defined Network between Japan and Italy to achieve high quality and secure network, trying to show digitized art-works from a remote server.

CROWDSOURCING – NEW POSSIBILITIES AND LIMITATIONS FOR IMAGE ARCHIVES

Nicole Graf, lic. rer. soc.
Head of the Image Archive
ETH Zurich, ETH-Bibliothek
Zurich, Switzerland
nicole.graf@library.ethz.ch

Abstract – The internet has made crowdsourcing as a kind of voluntary collaboration considerably easier from a technical perspective and there is now talk of crowdsourcing 2.0. Slowly but surely, this new form of generating and sharing knowledge is also finding its way into the cultural sector of memory institutions (GLAM for short). ETH-Bibliothek's Image Archive took advantage of this Web 2.0 technology to catalogue the Swissair photo archive in a four-year project (2009–2013). This presentation focuses on experiences concerning the editorial workflow, technical realisation, level of technical support required and public relations.

INTRODUCTION

Crowdsourcing refers to the outsourcing of subtasks by institutions or companies to volunteers, who help to perform these tasks in their free time out of interest and specific (specialist) knowledge. The internet has made this kind of voluntary collaboration considerably easier from a technical perspective and there is now talk of crowdsourcing 2.0. Probably the most well-known project of this nature is *Wikipedia*. Slowly but surely, this new form of generating and sharing knowledge is also finding its way into the cultural sector of memory institutions (GLAM for short). Here are some examples of crowdsourcing projects by major institutions: image-commenting on Flickr Commons, an image archive project initiated by the Library of Congress; geotagging old map materials at the British Library; or proofreading under the National Library of Australia's Australian Newspapers Digitisation Programme.

SWISSAIR PHOTO ARCHIVE

ETH-Bibliothek's Image Archive took advantage of this Web 2.0 technology on its own image database to catalogue the Swissair photo archive in a four-year project (2009–2013).

With around 1.8 million photographs and images from 1860 to the present day, ETH-Bibliothek's Image Archive owns one of the largest historical image archives in Switzerland. The main focuses are image holdings directly related to ETH Zurich (e.g. a collection of portraits and topographical views or the photographic collections of numerous former ETH-Zurich professors) or other substantial document sets that have been purchased or gathered as existing image collections (the archive of photographic agency Comet Photo AG, the Luftbild Schweiz Archive, the Documenta Natura Archive, the Stiftung Industriekultur Archive).

In 2009 ETH-Bibliothek gathered the photo archive of Switzerland's former national airline Swissair from its previous owner, Luftbild Schweiz. The archive comprises around 200,000 photographs (different formats and materials) dating from 1910 to Swissair's grounding in 2001. The collection documents the technical and staff development of the airline and its predecessor

companies, the day-to-day work of its employees and the photographic presentation of Swissair as a national symbol.

When the collection arrived, however, it soon became clear that the information on the images provided was very limited and incomplete. Often, the location and year were missing or the exact aircraft type, building, events, description of the activities or important people had not been identified.

Editorial workflow

The basic requirement for the online crowdsourcing method is the inventorying, digitalisation and online publication of the images. For years, external funding has enabled additional staff (primarily student assistants to perform routine work) to be hired and the projects tackled quickly. Eventually, a selection of 40,000 images were digitalised in the Swissair Photo Archive.

Luftbild Schweiz had already come up with the idea of having former Swissair employees complete the missing information on the photographs but could not see it through due to a lack of human and technical resources. Consequently, the Image Archive sought a collaboration with the extremely well-organised former Swissair staff members. Appeals in newspapers and at the annual meetings eventually yielded a group of around 130 former employers, who provided their expertise to shed light on the pictorial information.

And so, in December 2009, a cooperative project was launched that by might be termed "controlled" crowdsourcing, where an identifiable group of experts was encouraged to participate by way of an open appeal as opposed to an anonymous mass (such as on Flickr Commons, for instance).

The volunteers used a special log-in account to access the section of the image database where the photographs to be edited were uploaded in weekly instalments of 200 pictures at first, then 350 later on in the case of extensive reports. Each instalment remained in the image database for eight weeks. Of the 130 people who signed up, on average forty described images; half a dozen even intensively and regularly. The volunteers included long-standing pilots, flight attendants, technicians and administrative staff, which meant that the majority of the topics in the collection were covered.

On the database, the metadata (title, author, date) displayed could not be overwritten. Instead, the volunteers were able to enter additional information in a special "notes" field without any structural guidelines and label it with their personal initials. After eight weeks, the photos were removed from the internet and the Image Archive staff verified and edited the various data. If the entries were unclear or several people had provided contradictory information, for instance, the former Swissair staff members were consulted directly. The retirees' original notes were stored in the database unchanged and the original titles and descriptions of the images displayed in the inventory lists.

While the example photograph was merely recorded with the vague information "workshop", after the editing process the title eventually became as follows: "Revision of a DC-3 engine in the engine workshop in Dübendorf, installation of the crankshaft with a counterweight in the middle section of the crankcase. Pratt & Whitney R-1830 Twin Wasp, 1937–a."
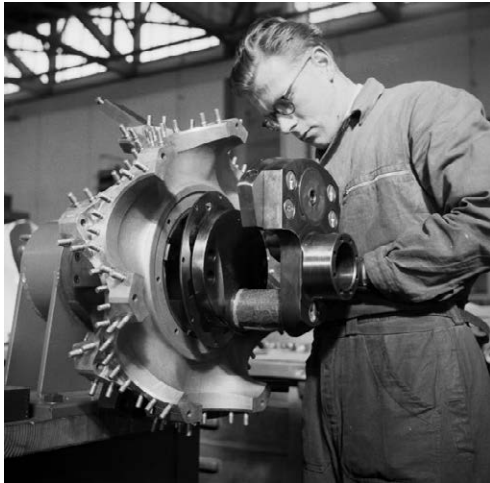
Fig. 1: Example photograph (signature: LBS_SR01-04616)

Finally, the photographs were annotated by the staff of the Image Archive. The time and effort that went into reworking the photographic information and supervising the Swissair retirees had been underestimated. The project was eventually completed at the end of 2013, which meant that a total of 40,000 images had been uploaded onto the image database BildarchivOnline (http://ba.e-pics.ethz.ch).

Underestimated resources

Besides the web-based work carried out from home, it was also important for the volunteers and the contact person at the Image Archive to communicate by telephone and email. The result was an invaluable transfer of knowledge and the time required had been seriously underestimated at the beginning of the project. This insider knowledge was especially priceless during the subsequent refinement of the keyword tree. Due to their lack of the necessary specialist knowledge, in many cases adding the missing information would only have been possible for the archive staff – if at all – with a tremendous amount of research. As the amount of digitalised and supplemented photographs grew, however, their expert knowledge of the subject also improved.

The Image Archive invested the following resources in the crowdsourcing project:
- Supervision and knowledge transfer in the first year of the project: approx. 0.2 full-time equivalent (FTE)
- Image management (editing and uploading the photographs, answering the volunteers' technical queries): around 0.1 FTE
- Title-editing: approx. 0.2 FTE
- During the three-year project, we were able to finance a 60% position for the annotation work with external funds

CONCLUSION

Compared to open and anonymous crowdsourcing projects, the knowledge transfer with a manageable group of experts who showed a great interest in the history and heritage of their airline was vast. Without the dedicated support of the former Swissair employees, a lot of implicit

knowledge would have been lost. However, this does not mean to say that the Image Archive team did not reflect on the photographs and the volunteers' comment with a critical eye.

The specific web-based cooperation aimed at clarifying the image information available therefore entailed a certain time investment above and beyond editing the input. Nonetheless, the wealth of expert knowledge that can be offered to users thanks to this form of crowdsourcing more than makes up for it.

Following the success of the Swissair project, further crowdsourcing projects are being considered at the Image Archive. The presentation concludes with initial analyses of the suitability of various online platforms (e.g. Flickr Commons and Wikimedia Commons) and the issues involved.

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SOLUTION FOR CULTURAL EXPERIENCE IN PLACES OF ELECTIVE SUPERMODERNITY (NEOLUOGHI)

F. Spadoni

Rigel Engineering S.r.l.

Livorno, Italy

spadoni@rigel.li.it

R. Rossi

Rigel Engineering S.r.l.

Livorno, Italy

rossi@rigel.li.it

F. Tariffi

Space S.p.A.

Prato, Italy

tariffi@spacespa.it

 Abstract – This paper presents the first results of NeoLuoghi, a research project co-funded by the Italian Ministry of education, University and scientific Research (MIUR) under the PON R&C program. The project proposes an innovative methodology as well as advanced technologies enabling a new paradigm for fruition of the cultural space and cognitive mediation, in "themed-parks", based on the concept of neo-places (neoluoghi) as opposed to Marc Augé's non-places. The paper briefly describes the methodology developed in NeoLuoghi for the automated production of myth-related narrative scripts for themed parks in a scenario of cultural fruition and gives details concerning the design of the visitor experience and in particular, the management of the social networking interactions in the themed park.

INTRODUCTION

Themed-parks are widely intended as neo-places of cultural experience (narrative and sympathetic museums, equipped urban areas or real experiential themed parks): may represent the conductive and fully participated founding metaphor of the relationship between society and cultural values, a new world of knowledge experience and aesthetic shared emotion.

Almost twenty years ago, in an essay and book of the same title, "Non-Places: Introduction to an Anthropology of Super-modernity", in 1995, Marc Augé coined the phrase "non-place" to refer to places of transience that do not hold enough significance to be regarded as "places". Examples of a non-place would be a mall, a motorway, a hotel room or an airport. As of today, the current scenario perhaps permanently removed the roots at the base of the judgment of Augé, prefers semantically saturated experiential enclaves, sharable places of the imaginative certainty. We can say, with Bonomi, that the super-modernity generates "heterotopias", special places that are relatively (though not absolutely and not for all) valued.

The project strategy is to consider cultural neo-places such as themed systems with a high density of information (i.e. *bigdata*), which require integrated solutions to evoke, perform, transmit, manage and customize projective and evocative messages, creating an effective "ambient intelligence" that is functional to experiential mission of each location.

According to such scenario, the project objective is to define methodologies and tools to operate at multiple levels on the neo-places of cultural experience, to: (i) understand, raise, design and create content; (ii) provide infrastructure and advanced services of "ambient intelligent" and (iii) make them sustainable and functional to strategies for territorial development.

To demonstrate the method, the project is developing innovative applications based on emerging mobile and wearable devices (e.g. Heads-Up Displays like Google Glass) allowing end users to experience the cultural neo-place accessing related information and content, included multimedia and augmented reality. The visiting experience will be supplemented by social networking functionality

allowing users to share content and experiences in a collaborative or competitive effort (e.g. geo social games, prizes competitions.

NeoLuoghi innovative method allows to realistically enforce the business assumption of systematic, efficient and flexible market coverage of the national landscape of cities and places of culture, starting from the the city of Naples and Campania regional scenario, where the validation phase of the project will take place, addressing suggestive venues like Paestum and Gianbattista Vico's Baroque Naples.

In the next section, we give an overview of the general objectives of the project as well as the methodology developed in NeoLuoghi for the automated production of myth-related narrative scripts for themed parks in a scenario of cultural fruition. In the main section, we will present the preliminary results of the projects concerning the visitor experience and in particular, the management of the social networking interactions in the themed park. Finally we propose some indications for further work.

THE METHODOLOGY

The project considers five major aspects, namely (i) the perception of cultural systems, both historicized and recognized, both potential and achievable through initiatives of cultural engineering; (ii) the visual, spatial and functional architecture of the experiential systems; (iii) the experiential systems and ambient intelligence (internet of things, internet of everything); (iv) experiential marketing of services for the enhancement of territories and cultural resources (social marketing); new development strategies for cultural experiential systems.

The first two areas of work fall within the domain of socio-cultural research, and are aimed to investigate the mechanisms by which the contemporary sensibility perceive cultural systems.

The third objective is technical and creates the conditions to transform theme parks into "smart" places in which information is handled and distributed efficiently, improving visitor experience and enjoyment. The fourth objective is again included in the domain of social sciences. It develops socio-economic skills that will underpin a growing role of the NeoLuoghi offering value-added services in Italy and in particular in the southern regions. The last area of work has a support function that, through the methodologies developed, will produce a socio-economic analysis to estimate at multiple levels the economic impact of the investment.

Mythopoesis and narratology

Mythopoesis is a narrative genre in modern literature and film where a fictional mythology is created by the writer of prose or other fiction. The authors in this genre integrate traditional mythological themes and archetypes into fiction. Narratology refers to both the theory and the study of narrative and narrative structure and the ways that these affect our perception.

The project NeoLuoghi aims at rationalizing and modeling the process of elaboration of the "experiential script" of a themed place, while keeping the process the most repeatable and reusable in new contexts. If, as seems evident, a themed place qualifies and becomes operational for its imaginative efficiency, i.e. its ability to immerse users in a *fabula* conducted personally by the visitor / customer / tourist is of the utmost importance to be able to identify and effectively to evoke a pervasive and imaginative world, which identifies the Park (implicitly or explicitly) and the experience that is able to transfer to those who visit and live it.

The project developed a methodology for the analysis (detection, classification, valuation) of the pervasive themes that run through contemporary society, as opportunities for thematic representation and identification. Furthermore, for each of the possible driving themes, the project provided a methodology for the narratological development of theme itself, such as: in a specific imaginative

context, what needs to be said and lived, in what order and with what stylistic features, with which relationship between the self and the environment, in what structures congenial to elective socializing.

Design and tale of the NeoLuoghi

The project produced an attempt of methodological classification and "industrialization" of the creative processes that are implicit in the activities of architectural workshops during the development of themed and experiential entertainment systems.

The aim is to rethink the processes of visual ideation and spatial composition on the one hand, and of synthesis between architectural and exhibition set up on the other. As of today, such processes are customized, intuitive, creative, and "cultural" in the deepest sense. The aim is to extrapolate, in the narrow domain of interest of the project, the constants, rules, strategies, conduct, reference models, and ultimately a set of organized knowledge that can effectively support the work of those who design, enrich and organizes themed urban spaces and immersive theme parks .

In detail, the project provides: (i) the definition of the *imagery* in the Park, namely the salient elements of style and visual image, of symbolic and descriptive scenery that translate the deep *script* of the themed space in its organization and visual communication; (ii) the study of "spatial narrative" of the park, in the relationship between the plain narrative of a cultural story-myth and the ways in which a system of aesthetic suggestions spatially unfolds: his proxemics, that is the logical organization of the spatial dimension in which the user interacts, the fundamental architecture of the space, and then in theatrical dramatization of space; (iii) the study of models of construction and urban design: the selection and implementation of urban and didactic apparatus (the "implicit parks", i.e. the historic urban centers), and the creation of architectural artefacts and the set up of exhibition spaces in real theme parks.

SOCIAL NETWORKING ASPECTS OF THE USER EXPERIENCE IN NEOLUOGHI

One of the most challenging objectives of the project NeoLuoghi is to deliver an immersive yet unobtrusive user experience, leveraging emerging information and communication technologies. The main device considered for content fruition is a tablet where a native application smartly displays the required content types, provided by web applications as well as stored locally. To this aim the first aspect considered is the modulation of information in line with the users and their characteristics, through profiling techniques and solutions for dynamic narrative content generation (storytelling), consistent with the mission of the experiential park. The second aspect concerns the strengthening of the experiences that visitors can enjoy in the park, either implicitly or explicitly, thanks to new techniques for creating multiple points of interest in the urban fabric and in the park, solutions to manage social and emotional interactions enabling a cooperative and engaging experience of the park, and augmented reality solutions to create a more immersive and emotional viewing experience.

The social interactions and connectivity during the visit of the themed park, and in general during content fruition, is implemented through the NeoLuoghi Social Network (NL-SN), whose members are the visitors of the themed park. The NL-SN is a tourist geo-localized SN (similar to Foursquare) that allows the user, during the narrative development of the visit, to access mechanisms of social interaction. The NL-SN provides recommendations on points of interest (POI), access to competitive and collaborative discovery games, ability to post photos and comments and to discover visitors with similar interests whom to meet during the experience.

The NL-SN ability to recommend content and POI is accomplished by profiling the visitor on the basis of: (i) her behavior during the visit, (ii) visitor's social interactions in the NL-SN, and (iii) the present and past behaviors of the visitor in external SN (e.g. Foursquare, Twitter, TripAdvisor). To

profile the user, data on user activities on SN (*SN data)* is collected, after requiring proper authorization, by either directly the NL-SN system or extracted by crawling third parties SN. External SN data points are retrieved either through their native Application Programming Interfaces (API) or through SN aggregators, such as Gnip, LoginRadius or Hootsuite).

Since *SN data* typically have different formats and different meanings, it is normalized and then associated to the user profile in order to complete it with SN aspects. Subsequently the complete user profile is used as input to recommendation algorithms for the definition of content and POI recommendations. A part of the user profile will be characterized by social aspects, both originated from external sources (other SN, social sections of external non social websites, e.g. Amazon) and originated by the NL-SN. Additional information completes the description of the user profile, in particular the dynamic data collected by the fruition application on the user's tablet, such as geographical location, interest shown, preferences, pathways, interaction with the NeoLuoghi's themed park POI

In addition, the system develops simple recommendations concerning the activities of the user on the SN (*social recommendations*) and provide them to the user. In particular, the recommender system provide visitors (i) advise on people geographically close or mission-related to meet and share the park experience and (ii) recommendation about common activities of interest, such as the presence of events or games in the area .

Finally, the system collects recommendations originated by external SN and forward them to the user device where they are displayed properly (e.g. using non-intrusive side scrollable list) trying to associate them to the POI / location visited .

The key challenge in the design of the social interactions is to give users the benefit of social interactions (typically, specialized recommendations) while maintaining an unobtrusive and immersive user experience where the focus is on the visit (e.g the monument or art work) and the technology is just a precious invisible support.

CONCLUSIONS AND FURTHER WORK

This paper presents the preliminary results of the NeoLuoghi project, a large research initiative addressing a new paradigm of fruition of the cultural space and cognitive mediation in "themed-parks". The project proposes an innovative methodology as well as advanced technologies for modeling the process of elaboration of the "experiential script" of a themed place, while keeping the process the most repeatable and reusable in new contexts.

The first part of the research was dedicated to investigate the mechanisms by which the contemporary sensibility perceive cultural systems. In addition, key enabling technologies are adopted to transform themed parks into "smart" places in which information is handled and distributed efficiently, improving visitor experience and enjoyment.

Next steps in the project are to finalize a system architecture integrating the different system components and to design and implement the user interface of the tablet application for content fruition. Finally, the system will be evaluated with real users, in real cultural scenarios in Naples.

ACKNOWLEDGMENTS

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MULTIMEDIA GUIDES BASED ON AUGMENTED REALITY TECHNOLOGIES

Tatyana Laska   Sergei Golubkov
Russia, Saint-Petersburg State University
Institute of Art
tatyanalaska@yandex.ru

Saint-Petersburg State University involves experts of different industries in innovative projects aimed at development of state-of-the-art computer technologies. Among them there are projects which target is development of multicomponent multimedia environment, i.e. a system of interactive applications for mobile devices created with the use of augmented reality technology. Today solutions, structure and interaction of components in such applications have no parallels in the world.

Technologies which enable users to interact with historical and cultural landmarks in the way they wish are becoming more and more popular nowadays. They include such means as: technology of augmented reality, geographic information systems, GPS navigators and mobile telephone communication.

Augmented reality is a cutting-edge computer technology which is successfully applied in the rest of the world in tourism, museum, education and social industries, but is still not widely used in Russia. A big variety of applications can be developed on the basis of this technology: from multimedia guides for separate objects of cultural heritage to large-scale virtual museums. Main tools for using this technology are users' mobile devices - smart phones and tablet computers with special applications downloaded from Internet storages. Information resources as software products with elements of augmented reality include: applications used for access to universally recognized museums of Russia, applications providing excursions at historical and cultural sites or covering only separate cultural artifacts, digital archives, libraries, virtual museum collections etc.

Multimedia applications integrate several technologies: technology of augmented reality (AR), GPS-navigations and recognition of QR codes. These technologies are supported by smart phones on the basis of platforms iOS and Android platforms and are available in Android Market and the App Store as any other popular and common products.

Software described above enables visitors of museums, cultural and historical landmarks not only to have excursions on their own just using smart phone as a virtual guide, but also to see how a monument or an ensemble looked like in the past, to see some non-preserved objects or missing details, get textual or sound comments.

One of the key targets in such projects is adoption of high technologies in museum and education industries. It corresponds with worldwide trend of technical equipping of cultural institutions.

Multimedia products can be used as information resources for city tourism. Nowadays implementation of such projects can be of great benefit to many of Russian cities and regional centers. They help to develop, form and support modern image of a city not only in the boundaries of Russia and not only for its citizens, but also for those

users who live abroad. Multimedia applications develop and practice modern approach of representing architectural, historical and cultural landmarks.

So far our team of software designers has developed several multimedia information resources.

Multimedia guide "Saint-Petersburg State University"
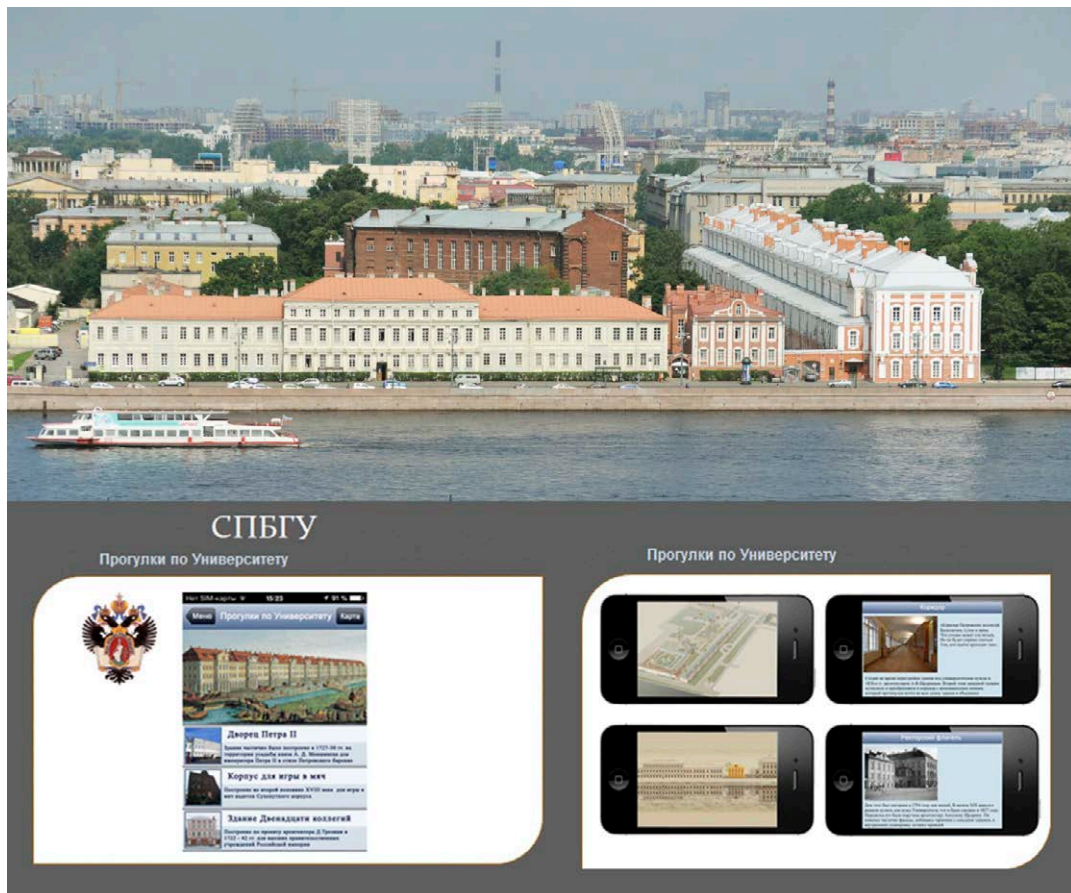
Content of the project is University space, its history, departments, buildings, people, memorial places; saying in other words – it is University in time and space. Emphasis is put on historic significance of the university on the national and global levels. Result of this project is of a great educative and pedagogic value.

We implemented complex approach to develop this information resource which fully shows historical and cultural value of Saint-Petersburg State University. The application is based on documentary materials and describes history of the university as well as its today's life. University is not just a place where people get higher education and do research work – it is a cultural, intellectual and spiritual center of the society. Distinctive feature of educational and cultural institutions is that they clearly display processes which take place not only in education and scientific circles but also in the society in general. In some certain periods of history status of such institutions could reflect society profile and represent its ideology. Remarkable events, the great names of history and crucial inventions in science and education were often anticipated,

accompanied or followed by corresponding processes in other fields of life.

Saint-Petersburg State University has always been scientific, education and cultural center for the city of Saint-Petersburg and the whole Russia. Such project as development of multimedia guide for this university is also aimed at popularization of its values and attracting people's attention to history of the city and the country.

As mentioned before, one of our goals is adoption of high technologies in education. By doing this we increase the quality of technical support in education and cultural institutions, enhance their functions and representative capacities. Up-to-date hardware and software make it possible to follow world trends.

University multimedia resource will be accessible for all Internet users. Such coverage and wide range of information collected in it will go a long way towards forming of university image as open and tolerant institution. Moreover, the university is used to being a leader in application of innovative technologies, a center of scientific and creative work. It is highly important that there is own multimedia guide to introduce it.

Multimedia guide "State Peterhof Museum Reserve"

State Peterhof Museum Reserve is a unique architectural and park monument. Its palace complex and surrounding park were built in the 18-19th centuries and used to be

a country residence for Russian ruling dynasty. In 1918 it turned into museum. Main building of the ensemble is Big Peterhof palace. Park, garden areas and numerous fountains brought world-wide fame to this place.

Developed application provides detailed information on all palace buildings, museums, fountains and parks of Peterhof, gives opportunity to study its past and learn more about its today's life. Walking in the park with audio guide visitors listen to descriptions of monuments and landmarks. There is an option to follow routes specified in the map or to plot own routes in any directions – interactive map shows user's actual location at any moment of the walk. Augmented reality turns excursion into exciting trip: it displays old maps, shows the park as it looked like 200, 150 and 100 years ago, points out remains and traces of past. Some of those objects, structures and facilities which were not preserved and thus do not exist can be viewed as digital 3G models.

Multimedia guide "Oranienbaum Through the Centuries"
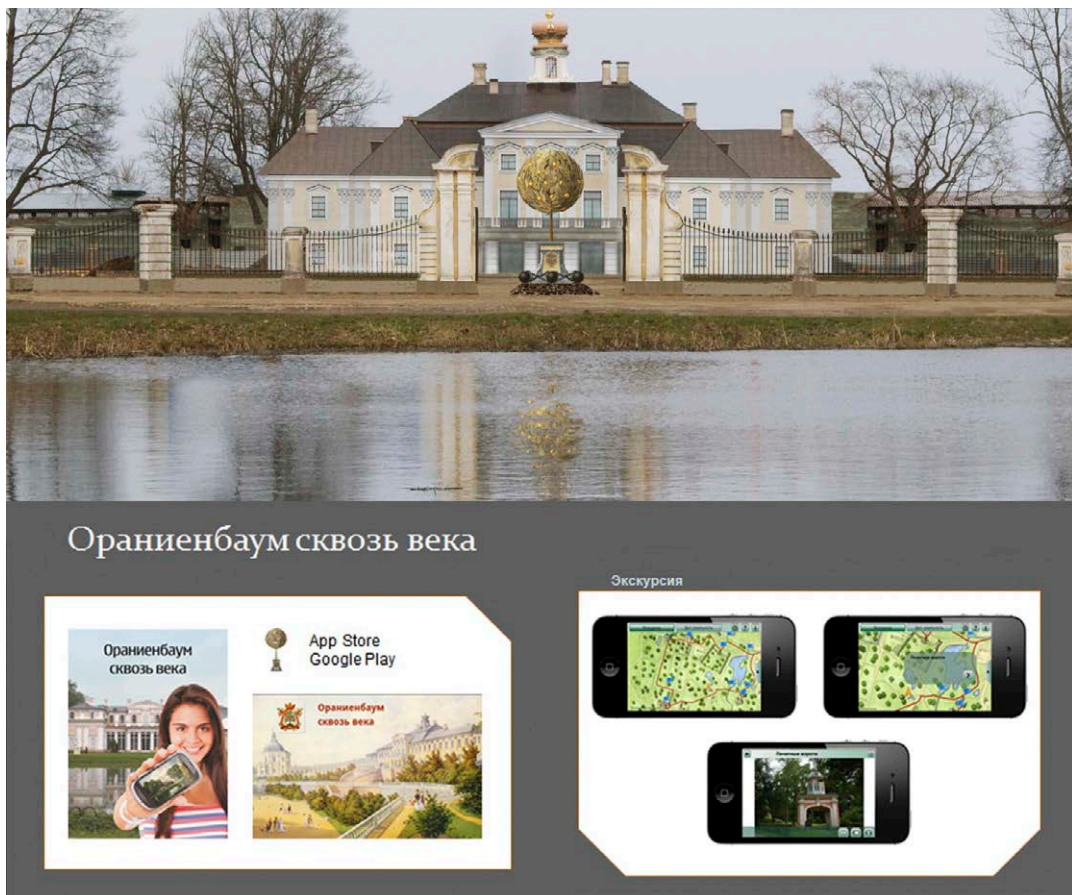
Oranienbaum is a universally recognized palace and park ensemble on the coast of the Gulf of Finland. Its palaces and parks were built in the 18[th]century. Today it belongs to the State Peterhof Museum Reserve.

Multimedia application presented to commemorate tercentenary of the complex and support its further development drew a wide response in professional circles of

museum staff and experts of IT technologies, mass media and application users also highly appreciated the product.

This multimedia guide provides customized excursions to the most interesting places in Oranienbaum museum and park complex, gives information on its landmarks and monuments and helps users to find objects they look for; applied technology of augmented reality shows original appearance of museum exhibits, buildings and facilities.

Mobile applications "Vivat, Peterhof!" and "Oranienbaum Through the Centuries" were developed by the team of State Peterhof Museum Reserve, Saint-Petersburg State University and i-Free company with support of Russkiy Mir Foundation.

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