



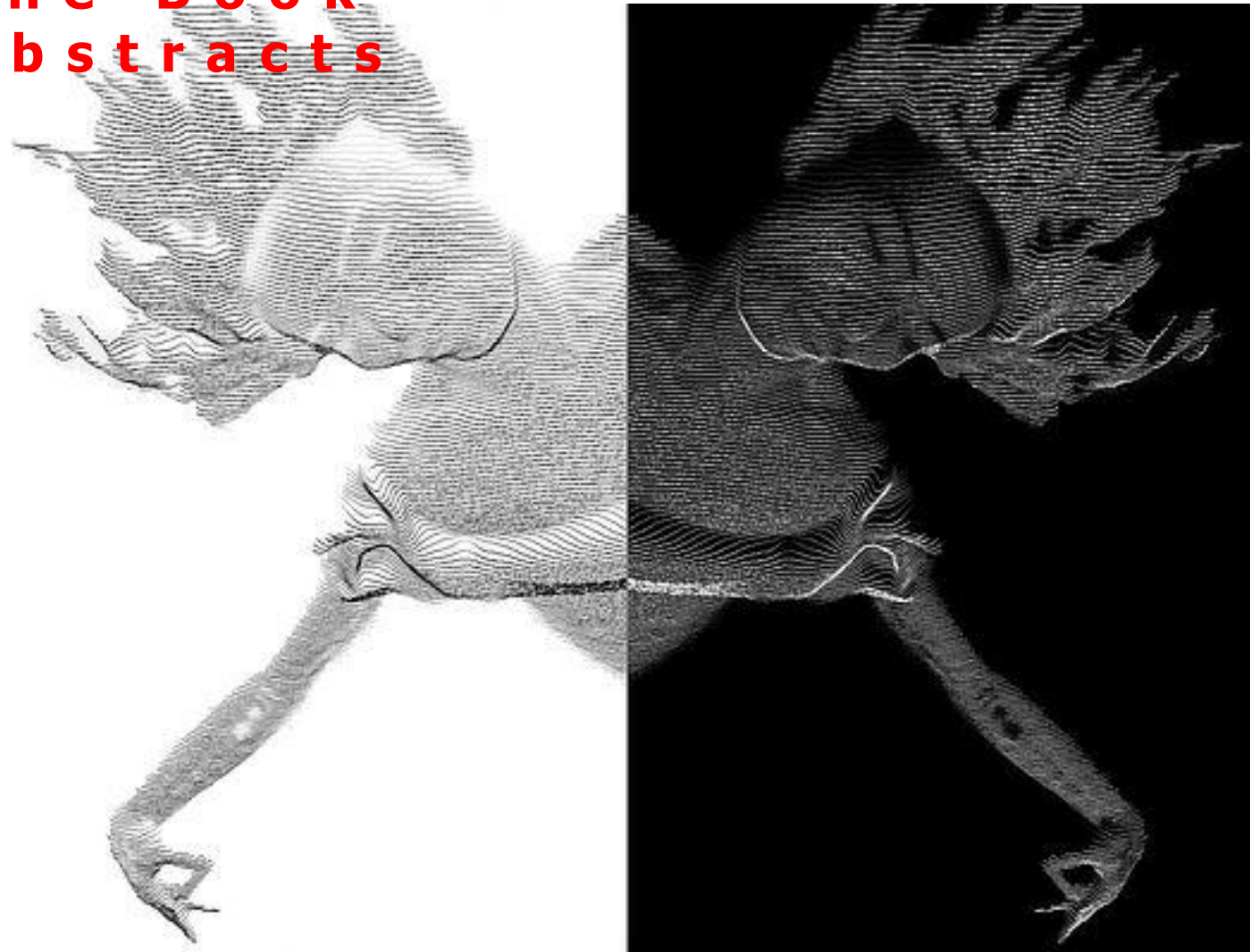
iV2018 – 22nd International Conference Information Visualisation

10 - 13 July 2018

University of Salerno • Salerno • Italy •

<http://www.graphicslink.co.uk/IV2018/>

The Book Abstracts



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iV2018 | DIGITAL ART GALLERY Online Exhibition
July 2018- June 2019

VIRTUAL GALLERY VENUE
www.graphicslink.co.uk/DART.htm



Exhibiting Artists:

Gloria DeFilipps Brush

Tom Chambers

John Corbett

Dena Eber

Santiago Echeverry

Gina Gibson

Maria Hettinga

Richard Hooper

Teja Krasek

Robert Krawczyk

John Labadie

Lane Last

Joe Nalven

Leslie Nobler

Gabriele Peters

Peter Petersen

Rabi Roy

Philip Sanders

Stuart Smith

Bogden Soban

Jing Zhou



12th Doctoral Research Workshop Information Visualisation

Organised by
Information Visualisation Conference
In cooperation with

BDIRG BIG DATA & INFORMATICS RESEARCH GROUP

&

DIPARTIMENTO DI INFORMATICA, UNIVERSITÀ DI SALERNO, ITALY
DEPARTAMENTO DE INFORMÁTICA, FCT/UNL, PORTUGAL

The Information Visualisation Conference (iV) is an international conference that aims to provide a foundation for integrating the human-centred, technological and strategic aspects of information visualisation to promote international exchange, cooperation and development. Building upon the reported success of last year's workshop, IVS is pleased to announce the "**12th Doctoral Research Workshop**" which will run as part of the 22nd International Conference on Information Visualisation (iV2018).

Doctoral Research workshop

This workshop focuses on the issues that doctoral students face during their studies and includes following interactive sessions – the theme for this year workshop – Impact Design for your research.

Tuesday 10 July 2018

09:30	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer >
	Registration
10:00	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F5 >
-	Doctoral Research Workshop
13:00	10.00 Opening & Welcome from discussion Panel members
	10:15 Designing Research Impact
	11:10 Set impact goals for a specific research project and devise strategies to achieve these
	11:30 Break
	11:45 PhD student Presentation – 1: Belen Carrion, Universidad Carlos III de Madrid, Spain
	12:05 PhD student Presentation – 2:
	12:25 Group Discussion
	13:00 End of Morning Session
13:00	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer >
	<i>Lunch Break</i>
14:00	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F5 >
-	
17:00	Doctoral Research Workshop
	14.00 Generate number of action points for generating impact from your research
	Able to explain how to measure impact
	Make Impact a key section of your Research
	15:00 PhD student Presentation – 3
	15:30 Break
	16:00 PhD student Presentation – 4: Zied Ben Othmane Kantar Media, Advertising Intelligence France, FR, France
	16:20 PhD student Presentation – 5
	16:45 Group Discussion
	17:00 Close

Wednesday 11 July 2018

09:00	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer > Registration
10:15	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • P1 > Opening & Welcome Prof. Alfredo De Santis, Computer Science Department Director, University of Salerno, IT Prof. Genoveffa Tortora, University of Salerno, IT Prof. Ebad Banissi, BDRIG - Division of Computer Science and Informatics, LSBU, UK Local organising Committee chair: Prof. Rita Francese, Università degli Studi di Salerno, IT Theodor G Wyeld, Flinders University, AU
10:30	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • P1 > Session iV2018_1.1: Information Visualisation Chair: Prof. João Moura Pires, Univ. NOVA de Lisboa, Portugal Temporal visualization of sets and their relationships using time-sets <u>Masood Masoodian</u> , Laura Koivunen Aalto University, Finland Visual Analytics for Decomposing Temporal Event Series of Production Lines <u>Dominik Herr</u> ¹ , <u>Fabian Beck</u> ² , <u>Thomas Ertl</u> ¹ ¹ University of Stuttgart, Germany; ² paluno, University of Duisburg-Essen, Germany
11:15	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer > <i>Break</i>

12:00 -	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • P1 >	
13:00	Session iV2018_1.2: Information Visualisation Chair: Prof. Gilles Venturini, University Francois Rabelais of Tours, France Visual Search in digital libraries and the usage of external terms <u>Arben Hajra</u> , Klaus Tochtermann Leibniz Information Centre for Economics - ZBW, Germany Visualizing Art Historical Developments using the Getty ULAN, Wikipedia and Wikidata <u>Doron Goldfarb</u> , Dieter Merkl Vienna University of Technology, Austria A new diagram for amino acids: User study comparing rainbow boxes to Venn/Euler diagram <u>Jean-Baptiste Lamy</u> University Paris 13, France	
13:00	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer >	
	Lunch Break	
14:15 -	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F1 >	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F4 >
15:20	Session iV2018_1.3: InfVis- Information Visualisation Theory & Practice Chair: Prof. Masood Masoodian, Aalto University, Finland Tourist Spot Recommendation Applying Generic Object Recognition with Travel Photos <u>Risa Kitamura</u> , Takayuki Itoh Ochanomizu University, Japan A Graphical Simulator for Modeling Complex Crowd Behaviors <u>Yu Hao</u> ^{1,2} , Zhijie Xu ² , Ying Liu ¹ , Jing Wang ³ , Jiulun Fan ¹ ¹ Xi'an University of Posts and Telecommunications, China; ² The University of Huddersfield, United Kingdom; ³ The University of Sheffield, United Kingdom Visualization techniques representing effects of coordination of vessels' movements <u>Sosuke Fukaya</u> ¹ , Kazuo Misue ² ¹ College of Media Arts, Science and Technology, School of Informatics, University of Tsukuba, Japan; ² Faculty of Engineering, Information and Systems, University of Tsukuba, Japan	Session iV2018_1.4: Visual Data Mining and Analytics Chair: Prof. Clausius Duque Reis, University of São Paulo - USP, Brazil A Web App for Visualizing Electronic Nose Data <u>Paolo Buono</u> ² , Fabrizio Balducci ¹ ¹ Università degli studi di Modena e Reggio Emilia, Italy; ² Università degli studi di Bari A Visual Analytic approach to analyze Highway Vehicular Traffic <u>Paolo Buono</u> , Alessandra Legretto, Stefano Ferilli, Sergio Angelastro University of Bari "Aldo Moro", Italy Using Visualization to improve Clustering Analysis on Heterogeneous Information Network <u>Wenbo Wang</u> ¹ , Yuwei Li ¹ , Xiaopei Liu ¹ , feng wang ² , youyi Zheng ³ ¹ Shanghaitech University; ² Jilin University; ³ Zhejiang University

14:15 - < Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F5 >

Session iV2018_1.5: Knowledge Visualization and Visual Thinking

15:20 Chair: Prof. Fatma Bouali, University of Lille 2, France

Progressive Annotation of Schematic Railway Maps

Yuka Yoshida¹, Ken Maruyama¹, Takamasa Kawagoe¹, Hsiang-Yun Wu², Masatoshi Arikawa³, Shigeo Takahashi¹

¹University of Aizu, Japan; ²TU Wein, Austria; ³Akita University, Japan

4D-UX: User Experience Design Principles for Coupling Multidimensional Visual Representations in Presentations

Remo Burkhard¹, Jan Perhac¹, Simon Schubiger², Shiho Asada¹, Anastasia Troyanov¹, Sailin Zhong¹, Yingying Jiang¹

¹Future Cities laboratory, Singapore-ETH Centre, Singapore; ²Institute of Interactive Technologies, University of Applied Sciences and Arts, Northwestern Switzerland

Scrollytelling – An Analysis of Visual Storytelling in Online Journalism

Michael Zeiller, Doris Seyser

University of Applied Sciences Burgenland, Austria

Using Rules for the Visualization of Tableaux Proof Techniques for Propositional Logic

Nada Ahmed Hamed Sharaf¹, Slim Abdennadher¹, Thom Frühwirth²

¹The German University in Cairo, Egypt; ²Ulm University, Germany

15:20 < Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer>

Break

iV2018 _ Programme

15:50 - 17:00	<p>< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F1 ></p> <p>Session iV2018_1.6: InfVis- Information Visualisation Theory & Practice Chair: Beatriz Sousa Santos, Universidade de Aveiro, Portugal</p> <p>2.5D Extension of ChronoView for Exploring Periodic Features of Temporal Data <u>Takahiro Ishii</u>, Kazuo Misue University of Tsukuba, Ibaraki, Japan</p> <p>Radial Calendar of Consumption <u>Catarina Maças</u>, Penousal Machado CISUC - Department of Informatics Engineering, University of Coimbra, Portugal</p> <p>The Branching Data Model, the Foundation for Automated Tree Visualization <u>H. Paul Zellweger</u> ArborWay Labs, United States of America</p>	<p>< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F4 ></p> <p>Session iV2018_1.7: Human-Computer Interaction for Information Visualization Chair: Theodor Wyeld, Flinders University, Australia</p> <p>Augmented Treasure Hunting Generator for Edutainment <u>Rita Francese</u>¹, Michele Risi¹, Riccardo Siani², Genoveffa Tortora¹ ¹University of Salerno, Italy; ²Dedagroup Wiz</p> <p>OpenLL: an API for Dynamic 2D and 3D Labeling Daniel Limberger, <u>Anne Gropler</u>, Benjamin Wasty, Jürgen Döllner Hasso Plattner Institute, Faculty of Digital Engineering, University of Potsdam, Germany</p> <p>Extending Attention Span for Children with ADHD using an Attentive Visual Interface Othman Asiry¹, Haifeng Shen¹, Soher Balkhy², <u>Theodor Wyeld</u>¹ ¹Flinders University, Australia; ²King Faisal Specialist Hospital and Research Center, Jeddah, Saudi Arabia</p> <p>A Pilot Study: VR and Binaural Sounds for Pain Management <u>Francisco Perales</u>, Miguel Sanchez, Laia Riera UIB, Spain</p>
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iV2018 _ Programme

15:50 - 17:00	<p>< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F5 ></p> <p>Session iV2018_1.8: Information Visualization Evaluation Chair: Prof. Zhijie Xu, University of Huddersfield , UK</p> <p>A Visual Analytics GUI for Multigranular Spatio-Temporal Exploration and Comparison of Open Mobility Data <u>Sergio Di Martino</u>¹, Camilla Robino², Laura Di Rocco², Giovanna Guerrini², Michela Bertolotto³ ¹University of Naples, Italy; ²University of Genoa, Italy; ³University College Dublin</p> <p>From Linguistic Linked Open Data to Natural Interaction: a case study <u>Marco Grazioso</u>, Valeria Cera, Maria Di Maro, Antonio Origlia, Francesco Cutugno University of Naples, Italy</p> <p><Short Paper> Social Issues analysis and visualisation in Online Social Networks: Visualization of diffusion behavior pattern of influencers by genre on SNS <u>Chisae Iwashina</u>¹, Mitsuo Yoshida², Takayuki Itoh¹ ¹Ochanomizu University, Japan; ²Toyohashi University of Technology, Japan</p> <p>Quality Assessment of Social Media: Lessons Learnt from the Literature <u>Alejandro Ossorio</u>, Teresa Onorati, Paloma Diaz Universidad Carlos III de Madrid, Spain</p>	<p>< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F7 ></p> <p>Session iV2018_1.9: Learning Analytics Chair: Filippo Sciarrone, Sapienza University, Rome, Italy</p> <p>Learning Analytics in Competitive Programming Training Systems William Di Luigi, PaoloFantozzi, <u>Luigi Laura</u>, Gemma Martini, Edoardo Morassutto, Giorgio Piccardo, Luca Versari Sapienza University of Rome, Italy</p> <p>Using Note-taking Instructions to reform student's note taking activities and improve learning performance in a blended learning course <u>Minoru Nakayama</u>, Kouichi Mutsuura, Hiroh Yamamoto Tokyo Institute of Technology, Japan</p> <p>Dimensional Morphing Interface for Dynamic Learning Evaluation <u>Paolo Mengoni</u>, Alfredo Milani, Valentina Franzoni University of Florence, Italy</p> <p>Visualizing student flows to track retention and graduation rates Dániel Márton Horváth, <u>Roland Molontay</u>, Mihály Szabó Budapest University of Technology and Economics, Hungary</p>
17:10 - 17:40	<p>< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • P1 ></p> <p>Session iV2018_1.10: The 15th Annual Animation and Digital Effects Film Chair: Prof. Mark Bannatyne, IUPUI, USA</p>	

18:30 **Wednesday 11th July 2018 -****Visualisation Social Networking Event****Cultural walk****Time: 18:30 – 20:00**

Date / Date: Wednesday 11th July 2018

Time / tempo: 18:30 – 20:00

Location / Posizione: Salerno

Description: Enjoy an unforgettable walk along the fascinating historic center of Salerno. Discover the religious structures and narrow charming streets through the words of experienced guides. You will admire the vestiges of the medieval period and the beautiful Salerno Cathedral (11th century), dedicated to Saint Matthew (<http://www.livesalerno.com/salerno-cathedral>).

At the sunshine the tour will finish at the Lungomare Trieste, offering a breathtaking view over the Gulf of Salerno. After that you are on your own – Salerno's movida night awaits!

COST:

Registered Delegates: Free

Guest of delegates: Free

Pre-Registration is required: Please confirm your attendance for this social event by Friday 29th June 2018

Thursday 12 July 2018

09:00	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer >	
	Registration	
09:30 - 11:15	<p>< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • P1 ></p> <p>Session iV2018_2.1: Music Visualization Chair: Delfina Malandrino, Università di Salerno, Italy</p> <p>MixMash: A Visualisation System for Musical Mashup Creation <u>Catarina Maças¹</u>, <u>Ana Rodrigues¹</u>, <u>Gilberto Bernardes²</u>, <u>Penousal Machado¹</u> ¹CISUC - Department of Informatics Engineering, University of Coimbra, Portugal; ²INESC TEC and University of Aveiro, Portugal</p> <p>A Visual Exploration of Melodic Relationships within Traditional Music Collections <u>Chris Walshaw</u> University of Greenwich, United Kingdom</p> <p>A Visualization Framework for Feature Investigation in Soundscape Recordings <u>Clausius Duque Gonçalves Reis^{1,2}</u>, <u>Thalisson Nobre Santos¹</u>, <u>Maria Cristina Ferreira de Oliveira¹</u> ¹University of São Paulo - USP, São Carlos, Brazil; ²Federal University of Viçosa - UFV, Brazil</p> <p>Consumption as a Rhythm: A Multimodal Experiment on the Representation of Time-Series <u>Catarina Maças</u>, <u>Pedro Martins</u>, <u>Penousal Machado</u> CISUC - Department of Informatics Engineering, University of Coimbra, Portugal, Portugal</p> <p>Evaluation study of Visualisations for Harmonic Analysis of 4-part Music <u>Roberto De Prisco</u>, <u>Delfina Malandrino</u>, <u>Donato Pirozzi</u>, <u>Gianluca Zaccagnino</u>, <u>Rocco Zaccagnino</u> Università degli Studi di Salerno, Fisciano, Italy</p> <p>Visualization and Music Harmony: Design, Implementation, and Evaluation <u>Delfina Malandrino</u>, <u>Donato Pirozzi</u>, <u>Rocco Zaccagnino</u> University of Salerno, Italy</p> <p><Poster Paper > "Olhos Music Fest" - branding <u>Daniel Filipe Santos Lopes</u>, <u>Pedro Martins</u>, <u>Fernando Penousal Machado</u> Universidade de Coimbra, Portugal</p>	<p>< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F4 ></p> <p>Session iV2018_2.2: Visualization, Art, and Design Chair: Theodor Wyeld, Flinders University, Australia</p> <p>Concept as a Bridge between Abstraction and Concretization in Design Knowledge Visualization <u>Buthayna Hasan Eilouti</u> PSU, Saudi Arabia</p> <p><Short Paper > Visualization, Art, and Design: A brief History of the Graphic Novel: from sequential art as a visual narratological device in the antiquities, its printed form in the comic strip, to the digital graphic novel. <u>Rafal Miroslaw Banasiak</u>, <u>Theodor Wyeld</u> Flinders University, Australia</p> <p><Short Paper > Visualization, Art, and Design: Visualizing Design Process by Using Lean UX to Improve Interdisciplinary Team's Effectiveness – A Case Study <u>Teng-Wen Chang</u>, <u>Yingying Lee</u>, <u>Hsin-Yi Huang</u> National Yunlin University of Science and Technology, Taiwan</p> <p><Short Paper > Visualization, Art, and Design: Convergence thinking path visualization: Explore brainstorming results for multiple participants <u>Yi-Sin Wu¹</u>, <u>Teng-Wen Chang²</u> ¹National Yunlin University of Science and Technology, Taiwan; ²National Yunlin University of Science and Technology, Taiwan</p>

iV2018 _ Programme

09:30 -	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F5 >	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F1 >
11:15	<p>Session iV2018_2.3: Human computer interaction for Information Visualization Chair: Prof. Minoru Nakayama, Tokyo Institute of Technology, Japan</p> <p>A Revision Control System for Image Editing in Collaborative Multimedia Design Fabio Calefato, Giovanna Castellano, Veronica Rossano Department of Computer Science, University of Bari, Italy</p> <p>ApplInventory: a Visual Catalogue of Web 2.0 and Mobile Applications for Supporting Teaching and Learning Activities Marco Corbato, Antonina Dattolo SASWEB Research Lab, Department of Mathematics, Computer Science and Physics, University of Udine, Italy</p> <p>Modeling Teachers and Learning Materials: a Comparison Among Similarity Metrics Carlo De Medio, Fabio Gasparetti, Carla Limongelli, Filippo Sciarrone Roma Tre University, Italy</p> <p>Game-based learning as effective learning method: an application of digital storytelling Veronica Rossano, Teresa Roselli Department of Computer Science, University of Bari, Italy</p> <p>Moving object detection and summarization in a video sequence Omar ELHARROUSS, Noor Al-Maadeed, Somaya Al-Maadeed</p> <p><Short Paper > Augmented Human-Workplace Interaction: Revisiting Email Thomas Bertrand², Laurent Moccozet¹, Jean-Henry Morin¹ ¹University of Geneva, Switzerland; ²Octree, Geneva, Switzerland</p>	<p>Session iV2018_2.4: Information Visualisation Chair: Prof. Fatma Bouali, University of Lille 2, France</p> <p>Time-tunnel: 3D Visualization Tool and Its Aspects as 3D Parallel Coordinates Yoshihiro Okada Kyushu University, Japan</p> <p>VR System for Spatio-Temporal Visualization of Tweet Data Kaya Okada¹, Mitsuo Yoshida², Takayuki Itoh¹, Tobias Czauderna³, Kingsley Stephens³ ¹Ochanomizu University, Japan; ²Toyohashi University of Technology, Japan; ³Monash University, Australia</p> <p>Integration of ChronoView and pseudo MDS for Visualization of Temporal Data Yasuhiro Anzai, Kazuo Misue University of Tsukuba, Japan</p> <p>Visualizing multidimensional data in treemaps with adaptive glyphs Anderson Gregório Marques Soares^{1,2}, Diego Hortencio Santos¹, Elvis Thermo Miranda¹, Cleyton Luiz Ramos Barbosa¹, Carlos Gustavo Resque dos Santos¹, Aruanda Simoes Gonçalves¹, Bianchi Serique Meiguins¹ ¹Federal University of Para, Brazil; ²Federal Rural University of Amazônia, Brazil</p> <p>Data-driven Logotype Design Jéssica Parente, Tiago Martins, João Bicker CISUC - Department of Informatics Engineering, University of Coimbra, Portugal</p> <p>The Many-Faced Plot: Strategy for Automatic Glyph Generation João Miguel Cunha, Evgheni Polisciuc, Pedro Martins, Penousal Machado University of Coimbra, Portugal</p> <p><Poster Paper > Information Visualisation Theory & Practice:: Generic Data Visualization Platform Ahmed Roshdy, Nada Ahmed Hamed Sharaf, Madeleine Saad, Slim Abdennadher The German University in Cairo, Egypt</p>
11:15	<p>< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer ></p> <p><i>Break</i></p>	

11:45 - 13:00	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • P1/F8 >	
	Session iV2018_2.5: Knowledge Visualization and Visual Thinking Chair: Paul Zellweger, ArborWay Labs, United States of America SmartEducation: Prototyping a Configurable Learning App using Gamification <u>Andreas Zinnen</u> ¹ , Eicke Godehardt ² ¹ RheinMain University of Applied Sciences, Germany; ² Frankfurt University of Applied Sciences, Germany QueryCrumbs for Experts: A Compact Visual Query Support System to Facilitate Insights into Search Engine Internals <u>Jörg Schlötterer</u> ¹ , Christin Seifert ^{1,2} , Michael Granitzer ¹ ¹ University of Passau, Germany; ² University of Twente, Netherlands CrowdRetouch: An At-once Image Retouch System Applying Retouching Parameter Visualization <u>Yuri Saito</u> , Takayuki Itoh Ochanomizu University, Japan	
13:00	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer >	
	<i>Lunch Break</i>	
14:15 - 15:30	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F1 > Session iV2018_2.6: Visual Analytics Chair: Prof. Rita Francese, University of Salerno, Italy A Visual Physical-Chemical Parameters Analysis Approach for Evaluating the Influence of Ports Facilities in Surface Water Quality Cynthia Teles Oliveira, Cleyton Luiz Barbosa, Rodrigo Santos Lima, Hugo Brito Lima, Jefferson Magalhães Moraes, Carlos Gustavo Resque dos Santos, <u>Bianchi Serique Meiguins</u> Federal University of Para, Brazil Big data Visualisation and Visual Analytics of Frequent Patterns Carson Leung ¹ , <u>Alfredo Cuzzocrea</u> ² ¹ University of Manitoba, Canada; ² University of Trieste, Italy Cartographies of the Legal World. Rise and challenges of Visual Legal Analytics <u>Nicola Lettieri</u> ^{1,3} , Delfina Malandrino ² ¹ National Institute for Public Policy Analysis, Rome Italy; ² Department of Computer Science - University of Salerno; ³ Department of Law, Economics Management and Quantitative Methods - University of Sannio Beyond Transparency: making the Italian Public Administration more accessible through data storytelling Francesca De Chiara ¹ , <u>Matteo Moretti</u> ² , Maurizio Napolitano ¹ ¹ Fondazione Bruno Kessler, Italy; ² Free University of Bozen - Bolzano, Italy	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F4 > Session iV2018_2.7: Digital Humanities Knowledge Visualisation Chair: Theodor Wyeld, Flinders University, Australia <u><Short Paper></u> Cultural Heritage Knowledge Visualisation Challenges to the ubiquity of perspective since the photograph: an essay on alternatives and alterations <u>Theodor Wyeld</u> Flinders University, Australia GIS-based Procedural Modeling in Contemporary Urban Planning Practice <u>Cem Demir</u> , Turgay Kerem Koramaz Istanbul Technical University, Turkey A Preliminary Study of Metrics and Methods for Readable Spatial OLAP Maps: VGI4Bio case study <u>Vincenzo Del Fatto</u> ¹ , Sandro Bimonte ² , Ali Hassan ³ , Monica Sebillo ⁴ ¹ Free University of Bozen-Bolzano, Italy; ² TSCF IRSTEA Aubiere, France; ³ CESCO MNHN Paris, France; ⁴ Dipartimento di Informatica, University of Salerno Salerno, Italy

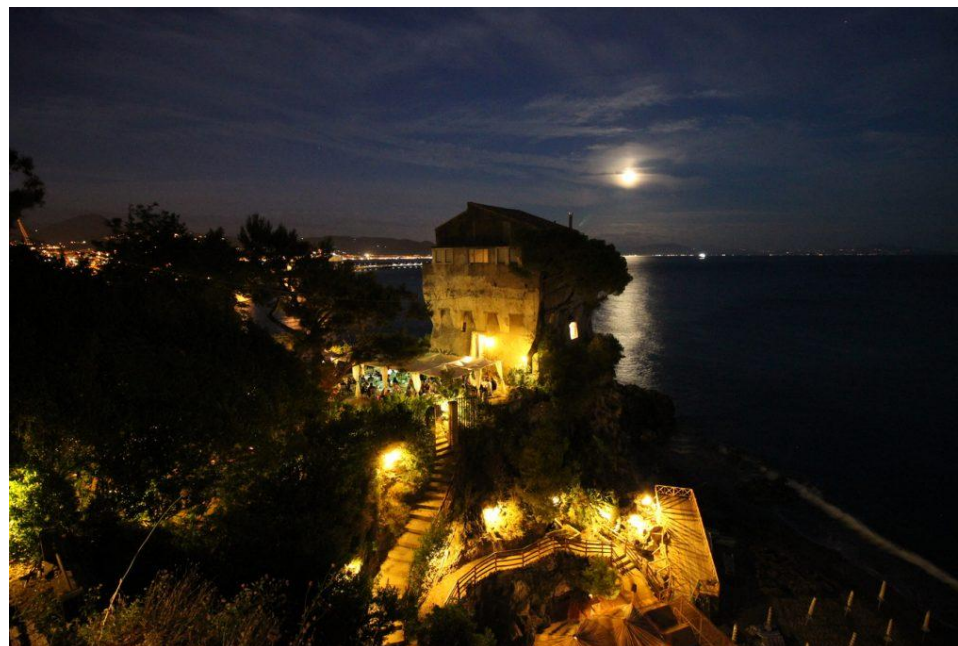
14:15 - 15:30	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F5 > Session iV2018_2.8: Visual Thinking for Researchers: Enabling insights, crafting clarity, making progress – Part 1 Language: English Speaker: Dr. Sebastian Kernbach	
15:15	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer > <i>Break</i>	
15:45 - 17:00	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F1 > Session iV2018_2.9: Geometric Modelling & Imaging Chair: Prof. Mark Bannatyne, IUPUI, USA A Bézier-like curve with two shape parameters <u>Imre Juhász</u> University of Miskolc, Hungary G2-Approximation of Circular Arcs by C-Bézier Curve: An Alternate Approach <u>Malik Zawwar Hussain¹</u> , <u>Ayesha Shakeel¹</u> , <u>Maria Hussain²</u> ¹ University of the Punjab, Lahore, Pakistan; ² Lahore College for Women University, Lahore, Pakistan The Application of New Cubic B-spline Approximations for Solving Non-linear Third Order Korteweg--de Vries Equation <u>Muhammad Abbas¹</u> , <u>Muhammad Kashif Iqbal²</u> ¹ University of Sargodha, Sargodha, Pakistan, Pakistan; ² Department of Mathematics, Government College University, Faisalabad, Pakistan Mesh Region Classification Based on Discrete Curvature <u>Mohamed Yaghmorasan Benzian¹</u> , <u>Nacéra Benamrane²</u> ¹ University of Tlemcen Abou Bekr Belkaid, Algeria; ² University of Science and Technology Oran USTO-MB, Algeria	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F4 > Session iV2018_2.10: Information Visualization Evaluation Chair: Prof. Michele Risi, University of Salerno, Italy A review of visualization assessment in terms of user performance and experience <u>Ana Raquel Figueiras</u> iNOVA Media Lab, IC NOVA, FCSH, Universidade NOVA de Lisboa A Prototype Application to Generate Synthetic Datasets for Information Visualization Evaluations <u>Yvan Pereira Santos Brito</u> , <u>Carlos Gustavo Resque dos Santos</u> , <u>Sandro de Paula Mendonça</u> , <u>Tiago Davi Oliveira de Araújo</u> , <u>Alexandre Abreu de Freitas</u> , <u>Bianchi Serique Meiguins</u> Federal University of Pará, Brazil Improving Perception Accuracy in Bar Charts with Internal Contrast and Framing Enhancements <u>Jose Díaz¹</u> , <u>Oscar Meruvia-Pastor²</u> , <u>Pere-Pau Vázquez¹</u> ¹ Universitat Politècnica de Catalunya, Spain; ² Memorial University of Newfoundland, Canada An Instrument for Evaluating the Quality of Data Visualizations <u>Raissa Barcellos</u> , <u>José Viterbo</u> , <u>Flavia Bernardini</u> , <u>Daniela Trevisan</u> UFF, Brazil
15:45 - 17:00	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F5 > Session iV2018_2.11: Visual Thinking for Researchers: Enabling insights, crafting clarity, making progress – Part 2 Language: English Speaker: Dr. Sebastian Kernbach	
17:10	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F5 > iV2019 - Committee Members Meeting	

Thursday 12th July 2018 -**Visualisation Social Networking Event****Cultural walk in Vietri sul Mare and social dinner****Time: 18:30 – 22:30**Date / Date: Thursday 12th July 2018

Time / tempo: 18:30 – 22:30

Location / Posizione: Vietri Sul Mare (Salerno)

Vietri sul Mare is near Salerno, at the beginning of Amalfi's coast. It is the ceramics capital of Campania. Vietri's pottery have been produced since Roman times. Many little and pretty shops in the small town center sell ceramics of all shapes and sizes. Wandering in the Vietri's vicoli (small streets) we will reach the Neapolitan Renaissance Church of Saint John the Baptist (1732), with its colored bell tower and its dome decorated by ceramics. At the end of the tour we will reach the Torre Crestarella, a medieval watch-towers built along the Amalfi coast to defend against Saracen invasion. Here, the evening dinner has been organized for the conference delegates.

**COST:**

Registered Delegates: Free

Guest of registered delegates at subsidised rate: 65 Euro per person

Pre-Registration is required: Please confirm your attendance for this social event by Friday 29th June 2018

Friday 13 July 2018

09:00	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer >	
	Registration	
09:30	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • P1 >	< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F8 >
11:15	<p>Session iV2018_3.1: Visual Data Mining and Analytics Chair: Prof. Masood Masoodian, Aalto University, Finland</p> <p>Visual Analysis of vertex-disjoint path connectivity in networks Paolo Fantozzi, <u>Luigi Laura</u>, Umberto Nanni, Marco Temperini</p> <p>Designing a Semi-automatic Taxonomy Generation Tool Belen Carrion, Teresa Onorati, <u>Paloma Diaz</u> Universidad Carlos III de Madrid, Spain</p> <p>Dynamic Choropleth Maps - Using Amalgamation to Increase Area Perceivability <u>Liam McNabb</u>¹, Robert S. Laramée¹, Richard Fry² ¹Swansea University, United Kingdom; ²National Centre for Population Health and Wellbeing Research, Swansea University Medical School</p> <p>Visualising hidden spatiotemporal patterns at multiple levels of detail <u>Ricardo Almeida Silva</u>^{1,2}, João Moura Pires², Nuno Miguel Soares Datia^{1,2}, Maribel Yasmina Santos³, Bruno Martins⁴, Fernando Birra² ¹ISEL - Instituto Politécnico de Lisboa, Portugal; ²NOVA LINCS, FCT, Universidade NOVA de Lisboa, Portugal; ³ALGORITMI Research Centre, University of Minho, Portugal; ⁴INESC-ID and IST, University of Lisbon, Portugal</p> <p>Morphological analysis of 3D skull models for ancestry estimation Paulo Dias¹, Bruno Andrade¹, Catarina Coelho², João Coelho², David Navega², Sofia Wasterlain², Maria Teresa Ferreira², <u>Beatriz Sousa Santos</u>¹ ¹University of Aveiro/IEETA, Portugal; ²University of Coimbra, Portugal</p> <p>Interactive Network Visualization of Gene Expression Time-Series Data <u>António Cruz</u>, Joel P. Arrais, Penousal Machado CISUC - Department of Informatics Engineering, University of Coimbra, Portugal</p>	<p>Session iV2018_3.2: Knowledge Visualisation Chair: Nuno Datia, ISEL - Instituto Politécnico de Lisboa, Portugal</p> <p>Knowledge Representation in a Visual Typed Language: from Principles to Practice Florence Dupin de Saint-Cyr¹, Denis Parade² ¹Toulouse University, France; ²Scenário Interactif, Toulouse, France</p> <p>Visual Design Thinking: Understanding the role of knowledge visualization in the design thinking process <u>Sebastian Kernbach</u>^{1,3}, Anja Svetina Nabergoj^{2,3} ¹University of St. Gallen; ²University of Ljubljana; ³Stanford University</p> <p>Education and Culture Affect Visualization's Effectiveness for Health Communication Sabrina Bresciani¹, Pavithra Arora², Sebastian Kernbach¹ ¹University of St. Gallen, Switzerland; ²University of Ottawa</p> <p>Storytelling Canvas: A visual framework for developing and delivering resonating stories <u>Sebastian Kernbach</u>^{1,2}</p> <p>Time°diff: a Visual Approach to Compare Period Data <u>Vincenzo Del Fatto</u>, Anton Dignös, Johann Gamper Free University of Bozen-Bolzano, Italy</p> <p>A tool for the digital edition of interactive fiction using Stretchtext Covadonga Díez-Sanmartín, José Luis Sierra-Rodríguez, <u>Antonio Sarasa-Cabezuelo</u> Complutense University of Madrid, Spain</p>

iV2018 Programme

09:30 - 11:15	<p>< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F5 ></p> <p>Session iV2018_3.3 : Information Visualisation Applications Chair: Vincenzo Deufemia, University of Salerno, Italy</p> <p>Analysing Player Performance with Animated Maps <u>Tiago Gonçalves</u>¹, <u>Pedro Vieira</u>¹, <u>Ana Paula Afonso</u>¹, Maria Beatriz Carmo², <u>Tiago Moucho</u>¹ ¹LASIGE, Faculdade de Ciências, Universidade de Lisboa, Portugal; ²BiolSI, Faculdade de Ciências, Universidade de Lisboa, Portugal</p> <p>A Multi-Sensor Visualization Tool for Harvested Web Information: Insights on Data Quality <u>Zied Ben Othmane</u>¹, <u>Damien Bodénès</u>¹, <u>Cyril De Runz</u>², <u>Amine Ait Younes</u>² ¹Kantar Media; ²University of Reims</p> <p>Discovery multiple data structures in Big Data through global optimization and clustering methods <u>Ida Bifulco</u>, <u>Stefano Cirillo</u> University of Salerno, Italy</p> <p>Depth-Enhanced Tag Cloud Maps <u>Yasuto Murakami</u>, <u>Takamasa Kawagoe</u>, Michael Cohen, Shigeo Takahashi University of Aizu, Japan</p> <p>Synthetic Chart Image Generator: An application for generating chart image datasets <u>Rafael Daisuke Akiyama</u>, <u>Tiago Davi Araújo</u>, <u>Paulo Roberto Chagas</u>, <u>Brunelli Pinto Miranda</u>, <u>Carlos Gustavo Resque dos Santos</u>, <u>Jefferson Magalhães Morais</u>, <u>Bianchi Serique Meiguins</u> Federal University of Para, Brazil</p> <p>VisualBib: Narrative Views for Customized Bibliographies <u>Antonina Dattolo</u>, <u>Marco Corbato</u> SASWEB Research Lab, Department of Mathematics, Computer Science and Physics, University of Udine, Italy</p> <p>Guess what I want: I am in hurry and I am using my phone while driving <u>Marco Angelini</u>, <u>Graziano Blasilli</u>, <u>Simone Lenti</u>, <u>Giuseppe Santucci</u> University of Rome "La Sapienza", Italy</p>	<p>< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • F6 ></p> <p>Session iV2018_3.4 : Visualization, Art, and Design Chair: Theodor Wyeld, Flinders University, Australia</p> <p>GraphVR: A Virtual Reality Tool for the Exploration of Graphs with HTC Vive System <u>Ugo Erra</u>¹, <u>Nicola Felice Capece</u>², <u>Jari Grippa</u>³ ¹Università della Basilicata, Italy; ²Università della Basilicata, Italy; ³Università della Basilicata, Italy</p> <p>Visualising the code-in-action helps students learn programming skills <u>Theodor Wyeld</u>¹, <u>Minoru Nakayama</u>² ¹Flinders University, Australia; ²Tokyo Institute of Technology</p> <p><Short Paper> Visualization, Art, and Design Development of Emotional Communication in Persons with Disabilities Through Graphic Art <u>Eduardo César Contreras Delgado</u>^{1,2}, <u>Isis Ivette Contreras González</u>¹, <u>Aldo Francisco Contreras González</u>³, <u>Raquel Alejandra Vásquez Torres</u>⁴ ¹National Technology of Mexico, Mexico; ²Autonomous University of Coahuila; ³Polytechnic University of Madrid; ⁴Albert-Ludwigs-Universität Freiburg</p> <p><Short Paper> CAivDE - Computer Animation, Information Visualisation, and Digital Effects: Visually Realistic Plankton Models for Simulating Underwater Environments <u>Ori Ganoni</u>, <u>Ramakrishnan Mukundan</u>, <u>Richard Green</u> University Of Canterbury, New Zealand</p> <p><Short Paper> CAivDE - Computer Animation, Information Visualisation, and Digital Effects: Animating Objects and Classes in Virtual Reality <u>Waleed Zakaria</u>, <u>Nada Ahmed Hamed Nada Ahmed Hamed</u>, <u>Jailan Salah</u>, <u>Slim Abdennadher</u> The German University in Cairo, Egypt</p>
11:15	<p>< Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer ></p> <p><i>Break</i></p>	

11:45 < Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • P1 >

- **Session iV2018_3.5: Information Visualisation**

13:00 Chair: Prof. Andreas Zinnen, RheinMain University of Applied Sciences, Germany

A Graph-Based Visualization of Time-Series Information in Multiple Texts

Hironari Kawada¹, Mina Akaishi², Hiroshi Hosobe²

¹Graduate School of Computer and Information Sciences, Hosei University, Japan; ²Faculty of Computer and Information Sciences, Hosei University, Japan

Volume-Based Large Dynamic Graph Analytics

Valentin Bruder¹, Marcel Hlawatsch¹, Steffen Frey¹, Michael Burch², Daniel Weiskopf¹, Thomas Ertl¹

¹University of Stuttgart, Germany; ²Eindhoven University of Technology, Netherlands

Visualizing symmetric square matrices with rainbow boxes: methods and application to character co-occurrence matrices in literary texts

Jean-Baptiste Lamy

University Paris 13, France

[Best Paper Award]

[CLOSE]

13:00 < Università degli Studi di Salerno • DIPARTIMENTO DI INFORMATICA • Foyer >

Lunch Break

iV2018 _ Abstract

Session iV2018_1.1: Information Visualisation

Chair: Prof. João Moura Pires, Univ. NOVA de Lisboa, Portugal

Temporal visualization of sets and their relationships using time-setsMasood Masoodian, Laura Koivunen

Aalto University, Finland

Visual representation of sets and their relationships is valuable in many application areas. There are numerous categories of set visualizations, each with their own particular representation of sets using areas, lines, matrices, etc. All these existing visualizations, however, represent sets statically in time, without much consideration for comparisons of set cardinalities and relationships across time. In this paper, we describe a new visualization, called time-sets, which has been designed to support temporal comparisons of set cardinalities and their intersections. We also present a comparative case study of articles published by several online news sources over a period of time, to demonstrate the application of time-sets in this novel area using a prototype visualization tool we have developed for this specific purpose.

Visual Analytics for Decomposing Temporal Event Series of Production LinesDominik Herr¹, Fabian Beck², Thomas Ertl¹¹University of Stuttgart, Germany; ²paluno, University of Duisburg-Essen, Germany

The temporal analysis of events in a production line helps manufacturing experts get a better understanding of the line's performance and provides ideas for improvement. Especially the identification of recurring error patterns is important, because these patterns can be an indicator of systematic production issues. We present a visual analytics approach to analyze event reports of a production line. Reported events are shown as a time series plot that can be decomposed into a trend, seasonal, and remainder component by applying Seasonal Trend decomposition using Loess (STL). To find specific event patterns, the data is filtered based on aspects such as the event description or the processed product. Identified temporal patterns can be extracted from the original event series and compared visually with each other. In addition to predefined settings, experts can define a subseries of the event series and the period length of STL's seasonal component through an automatically optimized brushing of the undecomposed plot. We developed the approach together with an industry partner. To evaluate our approach, we conducted two pair analytics sessions with experts from our industry partner. We demonstrate use cases from these sessions that showcase our approach's analytical potential. Moreover, we present general expert feedback that we collected through semi-structured interviews after the pair analytics sessions.

Session iV2018_1.2: InfVis- Information Visualisation Theory & Practice

Chair: Prof. Gilles Venturini, University Francois Rabelais of Tours, France

Visual Search in digital libraries and the usage of external termsArben Hajra, Klaus Tochtermann

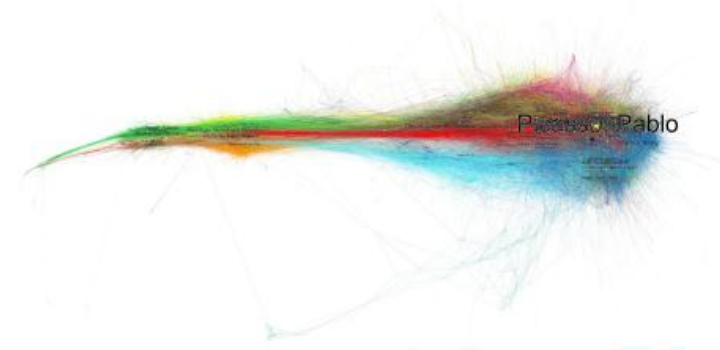
Leibniz Information Centre for Economics - ZBW, Germany

This paper focuses on the application of visual search interfaces in the context of digital libraries. The main objective is to represent a simplified and intuitive interactive approach for retrieving similar publications based on a preselected one. This would enable the scholar to perform more detailed research with the reduced mental workload, in comparison to traditional keyword-based search. The proposed approach, in an innate and conceptual manner, makes possible the application of suggested terms from other external resources. Accordingly, the set of terms can be extended with synonyms, narrowed, broadened or closely related terms. Such suggestions may result from a simple language thesaurus, any SKOS modelling scheme, and the deployment of word embedding approaches, such as word2vec. To provide a better picture of why a particular publication is presented in the results list, the matched terms are colourized.

Visualizing Art Historical Developments using the Getty ULAN, Wikipedia and WikidataDoron Goldfarb, Dieter Merkl

Vienna University of Technology, Austria

Graphical representations of art historical developments have a long tradition in scholarly communication and education. The recent availability of openly accessible, domain specific data sources invites to explore the possibility of creating such diagrams by automatic means in order to support research as well as navigation through extensive art collections online. Following this approach, our work uses data from the Getty Union List of Artist Names, Wikidata and DBpedia to create large scale network visualizations of a) historical artist networks and b) bi-partite networks of persons and art & architecture styles. We describe technical issues regarding data processing, discuss the resulting visualizations in light of their historic predecessors and show how they can be used to compare related data collections of differing provenance.



iV2018 _ Abstract

A new diagram for amino acids: User study comparing rainbow boxes to Venn/Euler diagram

Jean-Baptiste Lamy

University Paris 13, France

Euler diagrams are commonly used for visualizing small datasets, especially in biology. A well-known example is the diagram of amino acid properties. However, Euler diagrams are not always easy to read for students, and they are complex to produce when the number of sets is above 6. Other approaches exist for set visualization, such as rainbow boxes, but they have not been evaluated properly yet. In this paper, we propose a new diagram for amino acids, using rainbow boxes. We present a crossover user study that compares the new diagram with the usual Euler diagram (often misnamed "Venn diagram"). 78 students in biology were recruited; they responded to questions using the diagrams. We show that rainbow boxes lead to twice fewer errors (p value = 0.013) and also performed significantly better in terms of response time and user preference. We also explore the possibility of enriching the amino acid diagram with additional information, beyond the 8 properties commonly presented. We discuss the limitations of each technique.

Session iV2018_1.3: InfVis- Information Visualisation Theory & Practice

Chair: Prof. Masood Masoodian, Aalto University, Finland

Tourist Spot Recommendation Applying Generic Object Recognition with Travel Photos

Risa Kitamura, Takayuki Itoh

Ochanomizu University, Japan

Thanks to the recent spread of smartphones, tablets and digital cameras, people can take photos easily anytime, and anywhere. Therefore, photos can be a tool to record life logs. We can estimate patterns of actions and movements of people by analyzing their photos. Based on this discussion, we are developing a technique to recommend tourist spots based on the estimation of users' preferences of traveling plans from their past personal travel photos by using generic object recognition. We applied a generic object recognition system to acquire keywords of subject information taken in the photos and represented the co-occurrence of the keywords by a graph visualization technique. This paper presents our travel recommendation technique and a visual user interface that represents a graph with travel photos based on our graph visualization technique. This paper also introduces our case study with real travel photos.

A Graphical Simulator for Modeling Complex Crowd Behaviors

Yu Hao^{1,2}, Zhijie Xu², Ying Liu¹, Jing Wang³, Jiulun Fan¹

¹Xi'an University of Posts and Telecommunications, China; ²The University of Huddersfield, United Kingdom; ³The University of Sheffield, United Kingdom

Abnormal crowd behaviors within varied real-world settings could represent or pose serious ongoing situations public safety. However the video data needed for relevant analysis and research are often difficult to acquire due to security, privacy and data protection issues. Without large amount of realistic crowd data, it is difficult to develop and verify crowd behavioral models, corresponding event detection algorithms, and never mention the necessary test and evaluation work. This paper presented a synthetic method for generating crowd movement and dynamic data based on existing social and behavioral studies, graph and tree search algorithms and, game engine techniques. The two main outcomes of this research: 1) the categorization of entity-based Crowd Behavior Types based on a linear aggregation model; and 2) an innovative agent behavior model based on A-Star (A*) path-finding algorithm and an enhanced Social Force Model. A Spatial-Temporal Texture (STT) technique has been adopted for the evaluation of the model's effectiveness. The experimental results have shown the visual and behavioral pattern similarities of the simulated crowd scenes against their real-world recordings.

Visualization techniques representing effects of coordination of vessels' movements

Sosuke Fukaya¹, Kazuo Misue²

¹College of Media Arts, Science and Technology, School of Informatics, University of Tsukuba, Japan; ²Faculty of Engineering, Information and Systems, University of Tsukuba, Japan

Coordinating the movements of vessels may reduce the risk of their collision. When computer simulation finds such coordination, analysts, including designers of the simulation, desire to understand the effects of such coordination. The risks can be treated as a type of spatio-temporal data. The authors have tried to visualize the difference between pre-coordination data and post-coordination data to represent such coordination considering factors such as target, time, area, direction, distance, purpose, and effect. Developed visualization techniques enable analysts to intuitively understand vessels' movements and collision risks at each time point.

Session iV2018_1.4: Visual Data Mining and Analytics

Chair: Prof. Clausius Duque Reis, University of São Paulo - USP, Brazil

A Web App for Visualizing Electronic Nose Data

Paolo Buono², Fabrizio Balducci¹

¹Università degli studi di Modena e Reggio Emilia, Italy; ²Università degli studi di Bari

The analysis of air quality data may reveal the quality of life and can prevent dangers for the citizen health. This paper presents an approach for air quality data analysis, which exploits Data Mining and InfoVis techniques to support the analysts daily work. The proposed approach specifically addresses data generated by the electronic nose, a device that detects chemical compounds that humans perceive through smell. It is provided a working pipeline that exploits workflow for data processing, clustering techniques and a powerful calendar visualization combined with more traditional line graph and geo-referenced visualizations.

iV2018 _ Abstract

A Visual Analytic approach to analyze Highway Vehicular Traffic

Paolo Buono, Alessandra Legretto, Stefano Ferilli, Sergio Angelastro

University of Bari "Aldo Moro", Italy

The Italian National Police started a research on vehicular traffic to improve road safety and reduce the number of theft victims. Our proposal to support their activities consists in a method for data analysis aimed at automatically detecting relevant hypotheses, and specifically in the application of a data mining technique to extract information to be visualized and discover anomalous behaviors. Traffic flow analysis is a challenging and complex task, due to the huge size of the data involved. Actually, it falls in the realm of Big Data. Visual Analytics tools are also needed to reduce and improve the search by representing a large amount of data in a small space with smart visualizations.

Using Visualization to improve Clustering Analysis on Heterogeneous Information Network

Wenbo Wang¹, Yuwei Li¹, Xiaopei Liu¹, feng wang², youyi Zheng³

¹ShanghaiTech University; ²Jilin University; ³Zhejiang University

The exploration and analysis of data mining methodologies is an important task for effective knowledge discovery, especially in today's heterogeneous information networks. Previously presented approaches for mining optimization aim primarily at the improvements of time complexity, space complexity, accuracy, and robustness. We extend the state-of-the-art by concentrating on user-availability, algorithm understandability. Specifically, we use Rankclus, a classic clustering algorithm as an example. After transforming unseen computing process to be displayed in a visual form, the whole clustering processes are transparent to users, this may help them clearer and quicker understand how the algorithms are computing, how does each object influence each other, and more intuitively to discover patterns and effectively adjust parameters. In addition, we use a density approach to improve the visualization quality; A heatmap matrix and a DOItree were also implemented to help on the further analysis of visualized results.

Session iV2018_1.5: Knowledge Visualization and Visual Thinking

Chair: Prof. Fatma Bouali, University of Lille 2, France

Progressive Annotation of Schematic Railway Maps

Yuka Yoshida¹, Ken Maruyama¹, Takamasa Kawagoe¹, Hsiang-Yun Wu², Masatoshi Arikawa³, Shigeo Takahashi¹

¹University of Aizu, Japan; ²TU Wien, Austria; ³Akita University, Japan

Orthogonal network layouts are commonly used as the schematic representation of railway maps due to their enhanced readability. However, it is often time-consuming to place station names on such railway maps by trial and error, especially within the limited labeling space around interchange stations. This paper presents a progressive approach to placing station names around stations in schematic railway maps for better automation of map labeling processes. The idea behind our approach is to annotate stations in dense downtown areas around the

interchange stations first and then those in sparse rural areas. This is achieved by introducing the sum of geodesic distances over the railway network to identify the proper order in which to annotate stations. In the actual annotation process, we progressively stretch railway line segments while retaining their directions, which allows us to spare more labeling space around the railway network and respect the original schematic layout as much as possible. We present several experimental results to demonstrate the effectiveness of the proposed approach, together with a discussion on parameter tuning in our formulation.

4D-UX: User Experience Design Principles for Coupling Multidimensional Visual Representations in Presentations

Remo Burkhard¹, Jan Perhac¹, Simon Schubiger², Shiho Asada¹, Anastasia Troyanov¹, Sailin Zhong¹, Yingying Jiang¹

¹Future Cities laboratory, Singapore-ETH Centre, Singapore; ²Institute of Interactive Technologies, University of Applied Sciences and Arts, Northwestern Switzerland

This paper presents three design principles to couple multidimensional visualization methods for presentations of urban design scenarios using an intuitive interactive software application.

Novel visual representation methods have been developed and used in research and practice, both in terms of interactive visualization as well as two, three and four dimensional (2D, 3D, 4D) tools.

This paper presents 4D User Experience design principles (4D-UX), as well as a software implementation and applications of how to communicate spatial and temporal data. The foundation is built on tightly coupling multiple dimensions into one application, adding a sequential story line and finally decluttering the front-end to enhance the emotional and cognitive functions of audiences. The framework suggests a combination of a sequential storytelling approach with 2D, 3D, 4D elements such as interactive sliders added to the flow of argumentation. With those design principles in place, the authors then present a software implementation in "Unity" game engine. The communication challenge of research groups that had to convey the insights on their studies about the "Urban Heat Island Effect" and "Dense and Green Building Typologies" in Singapore to a diverse group of stakeholders were taken as examples.

The paper presents a multi-disciplinary approach with authors from computer science, architecture, design, communication, business administration and urban development. It contributes to the current discussion of how to visualize knowledge and plan future cities.

Scrollytelling – An Analysis of Visual Storytelling in Online Journalism

Michael Zeiller, Doris Seyser

University of Applied Sciences Burgenland, Austria

Scrollytelling – the long-form used in journalism – uses long, narrative types of text (e.g., report, feature) to tell complex stories. Scrollytelling articles published online often use multimedia content, especially information graphics which is a powerful tool to communicate complex information. We analyze which types of infographics are used for visualizing complex data in long-form journalism published online. This study investigates the utilization of infographics in scrollytelling and how they are integrated in long-form articles.

Using Rules for the Visualization of Tableaux Proof Techniques for Propositional Logic

Nada Ahmed Hamed Sharaf¹, Slim Abdennadher¹, Thom Frühwirth²

¹The German University in Cairo, Egypt; ²Ulm University, Germany

This paper discusses a rule-based approach for visualizing proofs using tableaux techniques. Semantic Tableau is usually used to prove by refutation. Visualization is an effective teaching methodology. In addition, tableaux techniques are commonly studied in different courses. The availability of visualization methods that could be used by instructors is thus important.

Session iV2018_1.6: InfVis- Information Visualisation Theory & Practice

Chair: Beatriz Sousa Santos, Universidade de Aveiro, Portugal

2.5D Extension of ChronoView for Exploring Periodic Features of Temporal Data

Takahiro Ishii, Kazuo Misue

University of Tsukuba, Ibaraki, Japan

ChronoView is one of the visualization methods for temporal data. It arranges points representing event groups on a circle according to a rule so that it can visualize temporal features of many event groups together. However, the rule is based on a pre-specified display period; therefore, it is not suited to exploring periodic features for unknown periods. The authors extend ChronoView to a 2.5D representation and develop a visualization tool that can analyze temporal data about various periods efficiently. The visual representation has enabled analysts to search for the display periods expressing periodicity of events by displaying several charts of ChronoView in a 3D space and emphasizing the difference in positions of the events due to the difference of the display periods. The tool has functions to assist searching by showing the spectrum and the histogram calculated from the occurrence distribution of events. To demonstrate the effectiveness of the tool, the authors describe a use case of searching for periodic features from actual event data.

Radial Calendar of Consumption

Catarina Maçãs, Penousal Machado

CISUC - Department of Informatics Engineering, University of Coimbra, Portugal

In the analysis of time-series, it is common to focus on the identification of changing behaviours and patterns that repeat over time. In this article, we propose a visualisation model based on a radial calendar to analyse the Portuguese's consumption data. The model is intended to assist the analysts within a Portuguese Retail Company in the identification of periodic patterns and deviations from the normal consumption values. Our main contributions are: (i) the representation and characterisation of the Portuguese's consumption behaviour over time; (ii) a radial visualisation model to identify consumption patterns and their deviations; and (iii) a user

case study to compare this visualisation model to a regular calendar layout. Our model has as main requirement the representation of the maximum amount of data in one single space. As such, it is ideal for analysts without prior knowledge of the data, since it provides an effective and efficient qualitative overview of the Portuguese's consumption.

The Branching Data Model, the Foundation for Automated Tree Visualization

H. Paul Zellweger

ArborWay Labs, United States of America

The paper presents the newly discovered Branching Data Model, a fundamental tree component. Its arrangement of data originates in the relational table by standardizing its so-called parent-child data relations. Theoretical mathematics formalizes its construction according to a well-defined SQL SELECT statement. The query exposes a uniform pattern of data relations in the table as a tree structure. Program logic on models of these data relations enable tree structures to expand and grow larger. Labels on these trees allow end-users to visualize the table's data content. An early form of artificial intelligence (AI) generalizes this data relationship. It uses brute force to verify that another Branching Data Model exists between tables in a database system. The former type of data model is a conceptual model, and the latter is a linkage model. Together, these two types of Branching Data Models enable program logic to generate database applications by automation. These applications allow end-users to locate information in a database using an interactive decision tree as a visualization device

Session iV2018_1.7: Human-Computer Interaction for Information Visualization

Chair: Theodor Wyeld, Flinders University, Australia

Augmented Treasure Hunting Generator for Edutainment

Rita Francese¹, Michele Risi¹, Riccardo Siani², Genoveffa Tortora¹

¹University of Salerno, Italy; ²Dedagroup Wiz

In this paper we present the Hunting Game Generator (HGG) system, a tool and a methodology for supporting geolocalized learning activities in Augmented Reality modality. The tool enables the teacher to create treasure hunting games directly on the mobile device. The teacher defines also the quizzes and advancing mechanism of the game.

In this study we also conducted a qualitative investigation in terms of a focus group involving secondary school students aiming at evaluating their viewpoint on the relevance of the support the tool provides in learning activities. Students appeared very motivated by the tool, which is seen as a relevant support to traditional lectures.

OpenLL: an API for Dynamic 2D and 3D Labeling

Daniel Limberger, Anne Gropler, Benjamin Wasty, Jürgen Döllner

Hasso Plattner Institute, Faculty of Digital Engineering, University of Potsdam, Germany

Today's rendering APIs lack robust capabilities for dynamic, real-time text rendering and labeling. As a consequence, most rendering systems are barely or not at all equipped with respective capabilities. This paper drafts a unified text rendering and labeling API intended to complement common rendering APIs, frameworks, and transmission formats. For it, various uses of static and dynamic placement of labels are showcased and a text interaction technique is presented. Furthermore, API design constraints with respect to state-of-the-art text rendering techniques are discussed. This contribution is intended to initiate a community driven specification of a free and *open label library*, OpenLL.

Extending Attention Span for Children with ADHD using an Attentive Visual Interface

Othman Asiry¹, Haifeng Shen¹, Soher Balkhy², Theodor Wyeld¹

¹Flinders University, Australia; ²King Faisal Specialist Hospital and Research Center, Jeddah, Saudi Arabia

Attention Deficit Hyperactivity Disorder (ADHD) is a common developmental disorder usually accompanying other developmental disorders including speech, language and reading. Children with ADHD tend to lose attention after a short period of time. Extending the attention span for those children could help them do better in school and in life. The aim of this work is to assess the role of text color (highlighting, contrast, sharpening) on the attention of children with ADHD while they are reading. Attention is tracked via the two modalities of webcam and mouse as some ADHD children have difficulties in maintaining the calibration of webcam. Interface color schemes are modified to evaluate different ways of maintaining attention. The results reveal that: (a) all color schemes have a significant effect on attention span, (b) highlighting has the greatest effect regardless of tracking modality, and (c) the degree of effect is subject to the tracking modality.

A Pilot Study: VR and Binaural Sounds for Pain Management

Francisco Perales, Miguel Sanchez, Laia Riera

UIB, Spain

Virtual Reality is defined as the implementation of a virtual world that the user perceives as the real one. This can lead having the physical feeling of teleportation into another environment, forgetting the real world and even the physical body. This sensation of immersion affects the stimulus (visual, acoustic and haptic) perceived by the user and it is able to modify the brainwaves power. We think that this can be profitable for pain relief, as the patient feels many synchronized stimulus and he/she needs to be concentrated to process all the information and attenuate the pain sensation. For that reason, this work proposes a pilot study of a VR environment combined with binaural beats, colors and movements to evaluate the perception the user has. It is believed that the use of different binaural beats in a long period of time can help patients to induce a relaxation state and consequently the perception to pain. The results

of this work can be helpful for developing a pain management system with several configurable situations (VR scene, Colour & Sound combination, etc.). In this pilot study we apply 8 types of binaural sounds in a standard common VR scenario and we propose the end users to select the experimented feeling they felt in any case.

Session iV2018_1.8: Information Visualization Evaluation

Chair: Chair: Prof. Zhijie Xu, University of Huddersfield , UK

A Visual Analytics GUI for Multigranular Spatio-Temporal Exploration and Comparison of Open Mobility Data

Sergio Di Martino¹, Camilla Robino², Laura Di Rocco², Giovanna Guerrini², Michela Bertolotto³

¹University of Naples, Italy; ²University of Genoa, Italy; ³University College Dublin

Recent technological developments in the fields of positioning and mobile communications gave rise to the availability of massive spatio-temporal open datasets about cities. A proper exploitation of these big datasets by decision makers of smart cities could be very useful to analyse and understand mobility patterns, with the final goal of easing many transportation problems, like parking search and traffic.

While many research efforts have been aimed at defining powerful visual analytics tools for exploring vehicular trajectory data, to date almost no specifically tailored tools are available to analyse (on-street) parking data and dynamics.

To fill this gap, in this paper we present the current state of an on-going research on the development of a visual analytics tool, meant to support decision makers of smart cities in performing multigranular spatio-temporal explorations of mobility open data, like those about parking. Moreover, the proposed GUI offers the possibility to overlay external spatio-temporal datasets as well as to customize the way this data is rendered, to get a better insight on the parking dynamics and its influencing factors.

From Linguistic Linked Open Data to Natural Interaction: a case study

Marco Grazioso, Valeria Cera, Maria Di Maro, Antonio Origlia, Francesco Cutugno

University of Naples, Italy

We present here the conversion of Linguistic Linked Open Data into Semantic Maps to be used to produce contents in a set of technological applications for Cultural Heritage. The paper describes the architectural data collection and annotation procedure adopted in the Cultural Heritage Orienting Multimodal Experiences (CHROME) project (PRIN 2015 funded by Italian University and Research Ministry). Such data will be used to let non-expert users obtain information about Architectural Heritage by means of a Multimodal Dialogue System. In particular, we design conversational agents accessing fine-detailed semantic data linked to available 3D models of historical buildings. The starting point of our scientific approach is the Getty Vocabulary on Art & Architecture Thesaurus, integrated with the Getty Thesaurus of Geographic Names (TGN) and the Union List of Artist Names (ULAN). These data are related to 3D mesh of the considered buildings in order to associate abstract concepts to architectural

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elements. In the field of 3D architectural survey, a significant amount of research has been conducted to allow domain experts represent semantic data while keeping spatial references. We will discuss how this will make it possible to support multimodal user interaction and generate Cultural Heritage presentations.

<Short Paper> Social Issues analysis and visualisation in Online Social Networks:

Visualization of diffusion behavior pattern of influencers by genre on SNS

Chisae Iwashina¹, Mitsuo Yoshida², Takayuki Itoh¹

¹Ochanomizu University, Japan; ²Toyohashi University of Technology, Japan

A large number of organizations and individuals use Social Networking Services (SNS) to spread announcements nowadays. Among SNSs, Twitter is particularly well-used to spread announcements and messages easily. Various commercial organizations including entertainers, fashion brands, and enterprises use Twitter to announce news and other information. Highlighted users who tweet actively on Twitter are called "influential users." Many users around influential users often spread their messages by the "retweet" function. This study visualizes the relationship between the tweets by the influential users and the surrounding user groups applying dendrogram and heat map. From the visualization results, we found groups of users surrounding the influential users, numbers of retweets, and intervals between original tweets and their retweets depend on contents of tweets and aspects of surrounding users.

Quality Assessment of Social Media: Lessons Learnt from the Literature

Alejandro Ossorio, Teresa Onorati, Paloma Diaz

Universidad Carlos III de Madrid, Spain

Social networks are a subject of great interest worldwide. Year after year we have experienced an increase in the number of new users and, even, the creation of new technologies (i.e. augmented reality, 360° cameras, ...) and new social networks. However, this phenomenon is contrasted with the appearance of automatic programs (bots) and fake news that can affect the quality of published information. This paper presents the state of the art of the quality of the information found in different social networks. In addition, we propose a series of learnt lessons to be followed in order to develop a theoretical application that measures the quality of a user generated information for a given event.

Session iV2018_1.9: Learning Analytics

Chair: Filippo Sciarrone, Sapienza University, Rome, Italy

Learning Analytics in Competitive Programming Training Systems

William Di Luigi¹, Paolo Fantozzi², Luigi Laura³, Gemma Martini¹, Edoardo Morassutto¹, Giorgio Piccardo², Luca Versari⁴

¹Italian Association for Automated Calculus (AICA); ²CTL, Sapienza University, Rome, Italy; ³DIAG, Sapienza University, Rome, Italy; ⁴DI, University of Pisa, Italy

In this paper we discuss the use of Analytics in oii-web, an online programming contest training system. We first provide an overview of the challenges in training for programming contests. Then we discuss the data collected in these years using oii-web, a platform devoted to the training of students for the Italian Olympiads in Informatics (Olimpiadi Italiane di Informatica - OII), and analyze them.

Using Note-taking Instructions to reform student's note taking activities and improve learning performance in a blended learning course

Minoru Nakayama¹, Kouichi Mutsuura², Hiroh Yamamoto²

¹Tokyo Institute of Technology, Japan; ²Shinshu University, Japan

Lexical feature patterns of notes students took during a blended learning course were classified and the student's transitions between clusters were analysed using a formative evaluation.

The lexical features were extracted from relationships between the contents of notes student took and the contents presented by the lecturer.

Five clusters were extracted using four dimensional features and cluster analysis, and most participant's note taking patterns in the first half of the course transformed from one of two clusters to one of five clusters, which included three additional new clusters, in the second half. This was due to note taking skills instruction given by the lecturer.

The contributions of participants' improved note taking skills and their reflections were evaluated quantitatively, and the mean features of notes taken and mean learning performance between clusters were also compared.

Dimensional Morphing Interface for Dynamic Learning Evaluation

Paolo Mengoni¹, Alfredo Milani², Valentina Franzoni³

¹University of Florence, Italy; ²University of Perugia, Italy; ³University of Roma "La Sapienza", Italy

In this paper an innovative dynamic dimensional morphing metaphor is introduced to monitor students' engagement and cohort dynamic. Teachers using eLearning monitoring tools find them usually lacking usability and inadequate to give significative feedback about their learning designs. Learning analytics tools mostly focus on after course analysis with the assumption that user competence in data analysis is high. The tool we propose is based on visual interface morphing:

reshaping of the interface elements, such as learning objects' links and icons, is put in place to reflect some key performance indicators of learners' activities. Quantitative and temporal analytics data, aggregated using different functions, is used to present animated enhanced information to teachers. Experiments for the effectiveness assessment of the proposed tool has been conducted on data from higher education courses. Through logs' analysis and teachers' questionnaires the usability and validity of the proposed metaphor has been assessed. The proposed tool outperforms traditional monitoring techniques.

Visualizing student flows to track retention and graduation rates

Dániel Márton Horváth, Roland Molontay, Mihály Szabó

Budapest University of Technology and Economics, Hungary

Understanding, modeling and visualizing student performance and academic progress have attracted considerable research attention recently. In particular, early leaving and retention of students are central problems associated with significant personal and social cost. In this study, we provide an efficient visualization tool to analyze student flow patterns by alluvial and Sankey diagrams.

We tracked the progress of more than 30,000 undergraduate students from Budapest University of Technology and Economics enrolled between 2010 and 2017. Our method allows decision-makers to gain better insight on how students are progressing. This tool also makes easier to understand the effects of some policy changes on retention and graduation rates.

Session iV2018_2.1: Music Visualization

Chair: Delfina Malandrino, Università di Salerno, Italy

MixMash: A Visualisation System for Musical Mashup Creation

Catarina Maçãs¹, Ana Rodrigues¹, Gilberto Bernardes², Penousal Machado¹

¹CISUC - Department of Informatics Engineering, University of Coimbra, Portugal; ²INESC TEC and University of Aveiro, Portugal

We present MixMash, an interactive tool to assist users in the creation of music mashups based on cross-modal associations between musical content analysis and information visualisation. Our point of departure is a harmonic mixing method for musical mashups by Bernardes et al. (2018). To surpass design limitations identified in the previous method, we propose a new interactive visualisation of multidimensional musical attributes—hierarchical harmonic compatibility, onset density, spectral region, and timbral similarity—extracted from a large collection of audio tracks. All tracks are represented as nodes whose distances and edge connections indicate their harmonic compatibility as a result of a force-directed graph. In addition, we provide a visual language that aims to enhance the tool usability and foster creative endeavour in the search for meaningful music mixes.

A Visual Exploration of Melodic Relationships within Traditional Music Collections

Chris Walshaw

University of Greenwich, United Kingdom

The aim of this paper is to discuss a technique for visually exploring melodic relationships within traditional tune collections. It stems from related work known as TuneGraph which uses a melodic similarity measure to derive a proximity graph representing relationships between tunes in the abc notation corpus, and which allows users of abcnotation.com to explore melodic similarity. As it stands TuneGraph only gives a localised view of the melodic relationships: this paper aims to look at exploring those relationships at a global (corpus-based) level.

A Visualization Framework for Feature Investigation in Soundscape Recordings

Clausius Duque Gonçalves Reis^{1,2}, Thalisson Nobre Santos¹, Maria Cristina Ferreira de Oliveira¹

¹University of São Paulo - USP, São Carlos, Brazil; ²Federal University of Viçosa - UFV, Brazil

Studies in soundscape ecology can generate large volumes of audio recordings collected over extensive time intervals. Extracting information from such data is challenging and time demanding. Important tasks, in this context, are to identify occurrences of acoustic events of interest and find out which combination of audio features are suitable for characterizing specific events or describing a particular soundscape. Researchers in soundscape ecology have been investigating approaches to accomplish such tasks effectively, and there is a demand for tools capable of assisting analysts in investigating large databases of ecological recordings. In this paper we describe a visualization framework for this purpose. The system includes multiple functionalities for soundscape analysis, comprising audio feature extraction, identification of

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relevant acoustic events by means of visualizations associated with audio playbacks, and event characterization by means of subspace feature analysis, also assisted by visualizations. The system implements a user-driven iterative pipeline that gives domain experts means to search for, identify and characterize acoustic events, gathering insight on which features better describe them and their originating soundscape.

Consumption as a Rhythm: A Multimodal Experiment on the Representation of Time-Series

Catarina Maças, Pedro Martins, Penousal Machado

CISUC - Department of Informatics Engineering, University of Coimbra, Portugal, Portugal

Through Data Visualisation and Sonification models, we present a study of multimodal representations to characterise the Portuguese consumption patterns, gathered from Portuguese hypermarkets and supermarkets over the course of two years. We focus on the rhythmic nature of the data to create and discuss audio and visual representations that highlight disruptions and sudden changes in the normal consumption patterns. For this study, we present two distinct visual and audio representations and discuss their strengths and limitations.

Evaluation study of Visualisations for Harmonic Analysis of 4-part Music

Roberto De Prisco, Delfina Malandrino, Donato Pirozzi, Gianluca Zaccagnino, Rocco Zaccagnino

Università degli Studi di Salerno, Fisciano, Italy

In order to master the harmonic analysis of musical compositions, a musician needs to profoundly understand the music theory, have an extensive training, and put a considerable effort in the task. For learners it can be a time-consuming and tedious task due to the steep learning curve. The idea throughout this paper is to visually annotate musical compositions with the objective to support users in performing the harmonic analysis, in which the task is mainly based on the identification of similar tonalities and relevant degrees. The paper proposes two visualisations that use rectangles to represent tonalities and the degree and exploit colours to represent similarities. The design of visualisations is based on guidelines drawn from informal interviews with teachers of the "Conservatorio G. Martucci", a conservatory in Salerno, and from literature. The evaluation study by involving 30 participants showed that overall the 30 participants of the evaluation study achieved better results performing the harmonic analysis using the musical composition enhanced with visualisations compared to the standard musical composition; it is a promising result that encourages further investigation in the field.

Visualization and Music Harmony: Design, Implementation, and Evaluation

Delfina Malandrino, Donato Pirozzi, Rocco Zaccagnino

University of Salerno, Italy

Music expertise is the ability to understand the structural elements of music compositions by reading musical scores or simply listening to music performance. Although the most common way to learn music is through the study of musical scores, this approach is demanding in terms of learning ability, given the required implicit knowledge of music theoretical concepts.

Learning musical rules is hard, especially for classical music. To simplify this task, visualization is one of the most promising approaches, also thanks to the human visual cognition ability (i.e., visual memory, visual attention, and so on).

This work aims at building a visual tool, named VisualHarmony, to help people in composing music pieces in a quick and efficient way (i.e., avoiding specific errors as dictated by classical music theory rules).

More specifically, a visualization technique able to represent harmonic structures has been evaluated by teachers of Conservatory classes and from domain experts in order to collect requirements used to define graphical features needed to facilitate the study of the rules used

in classical music, and to implement VisualHarmony.

We have focused our attention on a specific type of music compositions, i. e., the chorale style (4-voice music).

VisualHarmony was tested in order to analyze system usability and user satisfaction. Results of these studies provided us with positive feedback about the effectiveness of the idea, the pleasantness of the graphical choices, the satisfaction of the users with regard to the easiness and the usefulness of the provided tool.

<Poster Paper> "Olhos Music Fest" - branding

Daniel Filipe Santos Lopes, Pedro Martins, Fernando Penousal Machado

Universidade de Coimbra, Portugal

This project is about the creation of a music festival's dynamic brand, which reacts to music and customizes itself to any person participating in the event.

Session iV2018_2.2: Visualization, Art, and Design

Chair: Theodor Wyeld, Flinders University, Australia

Concept as a Bridge between Abstraction and Concretization in Design Knowledge Visualization

Buthayna Hasan Eilouti

PSU, Saudi Arabia

A framework for concept processing is introduced and discussed. It comprises the major phases of concept development from raw data into final product. It is enhanced with the main tasks needed to proceed from one stage into the next and with the main areas of focus in each phase. Concept derivation represents the core of the concept processing framework. Consequently, it is represented as the main nexus between the knowledge abstraction and concretization in design. Eight methods of concept derivation are described. In addition, eight elements of concept translation into tangible design products are presented. The scope of the research is architectural design, but many components of the framework may be applicable in other design fields.

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<Short Paper > Visualization, Art, and Design:

A brief History of the Graphic Novel: from sequential art as a visual narratological device in the antiquities, its printed form in the comic strip, to the digital graphic novel.

Rafal Mirosław Banasiak, Theodor Wyeld

Flinders University, Australia

The main visual device used in a comic book or graphic novel is a sequential array of images. As a visual communicative device, the sequential array of images has a long history. We see it in prehistoric cave art, the wall art of ancient Egyptian tombs, comic strips in newspapers, and most recently the digitally promulgated graphic novel, among other instances. As a visual narrative it is both impactful and highly recognisable. This is because it reduces the amount of information needed to communicate a succinct message using abstract iconography. This iconography evolved over the millennia until it formed its own lexicon and lingua franca within its media genre. Most recently, its conventions can now be relied on to communicate complex stories using digital media and the internet. This paper reviews the literature on the origins of the comic book art form, its current state and possible future directions. It provides an argument for the efficiency and enjoyment of this art form as a method for communicating information visually.

<Short Paper > Visualization, Art, and Design:

Visualizing Design Process by Using Lean UX to Improve Interdisciplinary Team's Effectiveness – A Case Study

Teng-Wen Chang, Yingying Lee, Hsin-Yi Huang

National Yunlin University of Science and Technology, Taiwan

This is an ongoing project investigating on how to improve interdisciplinary teams to collaborate efficiently and effectively. Based on our prior experiment, we found that new formed interdisciplinary teams struggled with poor team communication and coordination which resulting ineffective work progress and may lead to a project failure. In this paper we described such challenges the new formed interdisciplinary teams encountered in an experimental course where undergraduates from design and engineering disciplines collaborate on a project. We then proposed the use of Lean UX methods to visualize their design process so that all members' ideas and the idea exchange process can be "seen". It would help members in the same team getting more familiar with team's pace and well-coordinated with each member and then they may make the most of team effectiveness.

<Short Paper > Visualization, Art, and Design:

Convergence thinking path visualization: Explore brainstorming results for multiple participants

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At the stage of creative thinking, many designers often produce many design strategies. As the number increases, many implied information may be lost in the process of convergence.

Through creative thinking with encoded design thinking process and the represented nodes that define the convergence path, we might be able to find the hidden and unfocused hidden points. Through the display of paths, designers can repeatedly review the design strategies of each stage. This preliminary exploration shows the development and positioning of future auxiliary tools.

Session iV2018_2.3: Human computer interaction for Information Visualization

Chair: Prof. Minoru Nakayama, Tokyo Institute of Technology, Japan

A Revision Control System for Image Editing in Collaborative Multimedia Design

Fabio Calefato, Giovanna Castellano, Veronica Rossano

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Revision control is a vital component in collaborative development of artifacts such as software code and multimedia. While revision control has been widely deployed for text files,

very few attempts to control the versioning of binary files can be found in the literature. This can be inconvenient for graphics applications that use a significant amount of binary data, such as images, videos, meshes, and animations. Existing strategies such as storing whole files for individual revisions or simple binary deltas, which respectively consume significant storage and obscure semantic information. To overcome these limitations, in this paper we present a revision control system for digital images that stores revisions in form of graphs. Besides, being integrated with Git, our revision control system also facilitates artistic creation processes in common image editing and digital painting workflows. A preliminary user study demonstrates the usability of the proposed system.

AppInventory: a Visual Catalogue of Web 2.0 and Mobile Applications for Supporting Teaching and Learning Activities

Marco Corbato, Antonina Dattolo

SASWEB Research Lab, Department of Mathematics, Computer Science and Physics, University of Udine, Italy

We are witnessing a meaningful transformation of teaching practices and widespread experimentation of new didactic methodologies. The availability of a huge amount of contents and learning objects on the Web is progressively transforming traditional learning design (LD) activity of teachers: nowadays, they can count on a potentially unlimited number of information sources to devise lesson plans for their students.

However, the Web can also offer another great opportunity in helping teachers adopt student centred methodologies: the availability of hundreds of Web 2.0 and mobile applications. These applications give users the opportunity to create and share digital artefacts, support the collaboration and communication between workgroups and to aggregate, remix and share heterogeneous materials. When incorporated into daily teaching and learning activities (TLA),

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such applications can improve the collaborative, cognitive and creative work of the students, enhancing and redefining traditional educational practices.

Nevertheless, although these applications are generally easy to find and use, there is a lack of knowledge about their existence, their functions and their potential in an educational setting. In this paper we describe ApplInventory, a novel platform which contains a digital catalogue of applications: they are organized by applying an original taxonomy; the users can browse among them benefiting from a visual approach and semantic connections modelled using zz-structures.

Modeling Teachers and Learning Materials: a Comparison Among Similarity Metrics

Carlo De Medio, Fabio Gasparetti, Carla Limongelli, Filippo Sciarrone

Roma Tre University, Italy

Wikipedia is one of the most used repositories of free learning materials published by communities of experts: most of students, and teachers do great use of it, despite the criticism about its reliability. Here we address the problem of helping teachers to build courses with Wikipedia pages to prepare on-the-fly courses. We use a web-based system called Wiki Course Builder, which allows teachers to query Wikipedia, by submitting a set of keywords, and having as a response four different ranked lists of retrieved Wikipedia pages, depending each list on a given retrieval metric. In addition to the classic tf-idf, Information Gain and Latent Semantic Indexing metrics, we propose a metric that highlights specific didactic aspects. This metric is based on the teacher's Teaching Styles namely, the Grasha teaching styles. Wikipedia pages are indexed with the Teaching Styles of the teachers that selected the given page; then, this value is compared with the Teaching Style of the teacher who is doing the search. The metric assigns higher rank to the Wikipedia pages that have a Teaching Style closer to the teachers'. We present an evaluation of the four retrieval metrics showing that the teacher-styles-based metric, Vs. the other three content-based metrics, allows for a better Wikipedia retrieval from a didactic point of view.

Game-based learning as effective learning method: an application of digital storytelling

Veronica Rossano, Teresa Roselli

Department of Computer Science, University of Bari, Italy

The success and effectiveness of the use of technology to support education and training are universally recognized. In the recent years, the use of ICT is spreading as tools to support therapeutic education. The European Community with the call of Horizon 2020 work programme is sponsoring and encouraging this trend. Many ICT solutions, in fact, are addressed to the patient. The concept of empowerment can have different meanings: strengthening, enhancement of self, increasing of power, increased personal responsibility, increasing of knowledge, etc. This is especially true when patients are very young, as in the case of type I diabetes mellitus, that occurs in children and it is caused by a congenital lack of insulin production. When the hospitalization starts it is necessary to tell them what is happening to their body, then both practitioners and parents spend much time in explaining to children the new healthy behaviors they should have. Because of both the patients' particular emotional fragility and the complexity of the blood glucose control, it is necessary to use the right form of

communication that should be engaging and effective. In this context, the storytelling could be very useful since very appreciate by the children. With these premises the paper presents the idea of a Digital Storytelling CMS that allows users to build online personal narrative in digital format. A first pilot study has outlined the appreciation of the users.

Moving object detection and summarization in a video sequence

Omar ELHARROUSS, Noor Al-Maadeed, Somaya Al-Maadeed

Qatar University, Qatar

Motion detection based on background subtraction technique requires estimating a background model that represents the unchanged part of the scene in a sequence video. The background subtraction approaches have many limitations: sensor noise (noise of acquisition and digitization) and the illumination changes in the scene and others. In this paper, we present our approach based on the combining of the background subtraction and the Structure-Texture-Noise Decomposition. Firstly, each gray-level image of the sequence will be decomposed into three components, Structure, Texture and Noise. The Structure and Texture components of each image of the sequence are taken to generate the background model. The absolute difference used to subtract the background before computing the binary image of moving objects. We, also, propose a video summarization based on the background subtraction results. The generated background model is used to compute the change during all time of the sequence. The experimental results demonstrate that our approach is effective and accurate for moving objects detection and also yields a good summarization of the video sequence.

<Short Paper > Augmented Human-Workplace Interaction: Revisiting Email

Thomas Bertrand², Laurent Moccozet¹, Jean-Henry Morin¹

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Augmenting humans with technology has become a common paradigm. In this study, we argue there is a particular area in the interaction between people and their workplace considering applications and services where augmentation could bring interesting perspectives and a new approach to Human-Workplace Interaction. Our study focuses on the case of email through a design and prototype implementation to investigate this paradigm. Among the challenges to be solved is the dynamic spatial visualization of long texts to enable them to be read without obstructing the field of vision. Existing approaches are assessed and compared to our design. Evaluations show promising results in the direction of extending this approach in the area of Mixed Reality Human-Service Interactions.

Session iV2018_2.4: Information Visualisation

Chair: Prof. Fatma Bouali, University of Lille 2, France

Time-tunnel: 3D Visualization Tool and Its Aspects as 3D Parallel Coordinates

Yoshihiro Okada

Kyushu University, Japan

This paper treats a 3D visualization tool called Time-tunnel, especially describes its aspects as 3D Parallel Coordinates by showing its actual visualization examples. Originally, Time-tunnel is a multidimensional data visualization tool and it was extended to support Parallel Coordinates called PCTT (Parallel Coordinates version of Time-tunnel). Furthermore, as its aspects of 3D Parallel Coordinates, 2Dto2D visualization functionality was added. Although PCTT can visualize network data because IP packets consist of many attributes and such multiple-attributes data can be visualized using Parallel Coordinates, 2Dto2D visualization functionality can more effectively visualize patterns of IP packets that seem network attacks. The authors have already proposed the combinatorial use of PCTT and 2Dto2D visualization for the intrusion detection of the Internet. This paper also introduces Spline Parallel Coordinates representation as one of the new features of PCTT. The authors also proposed the use of PCTT for learning analytics by visualizing learners' learning activity data and introduced 3D mode into PCTT to visualize each learner's learning pattern more efficiently. This 3D mode is regarded as 3D Parallel Coordinates. However, because such 3D mode was not enough to distinguish each learner's leaning pattern, the authors implemented more effective 3D mode, and clarify the usefulness of the new 3D mode by showing visualization results.

VR System for Spatio-Temporal Visualization of Tweet Data

Kaya Okada¹, Mitsuo Yoshida², Takayuki Itoh¹, Tobias Czauderna³, Kingsley Stephens³

¹Ochanomizu University, Japan; ²Toyohashi University of Technology, Japan; ³Monash University, Australia

Social media analysis is helpful to understand the behavior of people. Human behavior in social media is related to time and location, which is often difficult to understand the characteristics appropriately and quickly. We chose to apply virtual reality technologies to visualize the spatio-temporal social media data. This makes us easier to develop interactive and intuitive user interfaces and explore the data as we want. This paper presents our visualization of tweets of microblogs with location information. Our system features a three-dimensional temporal visualization which consists of the two-dimensional map and a time axis. In particular, we aggregate the number of tweets of each coordinate and time step, calculate scores and display them as piled cubes. We highlight only specific cubes so that users can understand the overall tendency of datasets. We also developed user interfaces for operating these cubes and panels which indicate details of tweets.

Integration of ChronoView and pseudo MDS for Visualization of Temporal Data

Yasuhiro Anzai, Kazuo Misue

University of Tsukuba, Japan

In various fields handling event data, exploring periodicity and similarity of occurrence times of events is important task. When we analyze event data, we often focus on temporal features of

event groups, periodic characteristics of events, and similarity among event groups for the temporal features. This paper illustrates a visualization method to observe such features of many events efficiently. The method represents the temporal features of each event group with a glyph, and represents the periodic characteristics and their similarity with the arrangement of glyphs. In order to determine an arrangement of glyphs, ChronoView representing periodic characteristics of event groups and pseudo multidimensional scaling (MDS) are integrated in a three-dimensional space. This paper also shows effectiveness of the visualization method for temporal data analysis by using a use case exploring signature events from an actual data set.

Visualizing multidimensional data in treemaps with adaptive glyphs

Anderson Gregório Marques Soares^{1,2}, Diego Hortencio Santos¹, Elvis Thermo Miranda¹, Cleyton Luiz Ramos Barbosa¹, Carlos Gustavo Resque dos Santos¹, Aruanda Simoes Gonçalves¹, Bianchi Serique Meiguins¹

¹Federal University of Para, Brazil; ²Federal Rural University of Amazônia, Brazil

— Treemap is one of the most well-known and used techniques for data analysis in InfoVis. However, it still presents some challenges concerning data representation, such as small items, a large number of hierarchies limiting the visual space, few options for visual data representation (restricted to size, color, label), and others. Thus, this paper presents an InfoVis tool that allows the analysis of multidimensional data using treemaps with glyphs, once they represent more data visually combined visual variables. Besides that, considering treemap scenarios with small area items, an algorithm was developed to analyze which part of the glyph the application should draw since parts of the glyph can still provide useful information. In this way, the glyphs become adaptative to available space. The application has a multilabel decision tree technique that decides which part of the glyph should appear. Visualization specialists supplied the training data through a system that showed a diverse range of glyphs' representations. The system varied the glyph's size, the number and the value of the visible visual variables and registered the response of specialists in the training data. Finally, this paper presents images using the treemap with adaptive glyphs approach versus treemap+glyphs and showed that the adaptive approach clears information clutter when treemap items are small.

Data-driven Logotype Design

Jéssica Parente, Tiago Martins, João Bicker

CISUC - Department of Informatics Engineering, University of Coimbra, Portugal

This work explores the intersection of type design, visual identity, and information visualisation. We study how data can influence the logotype design, and how a logotype can convey information. To do this, we developed a data-driven logotype for each faculty of our institution, the University of Coimbra, in Portugal. The design of the glyphs, or letterforms, that compose the logotypes, is influenced by data on the current spectrum of students in each faculty. Overall, the created logotypes are able to provide a layer of information by visualising and comparing the number, gender, and nationality of the students in the different faculties. Plus, the generative process that designs the logotypes allows them to react to the input data in an automatically fashion and, this way, be alive and evolve over time.

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The Many-Faced Plot: Strategy for Automatic Glyph Generation

João Miguel Cunha, Evgheni Polisciuc, Pedro Martins, Penousal Machado

University of Coimbra, Portugal

Despite some authors stating that data-relatedness help interpretation, glyphs are often used unrelated to the represented data. In order to automatically produce data-related glyphs, a large visual repository is required, as well as, image structure suitable for data representation. In this paper, we propose a strategy that fulfills the two requirements and allows the production of glyphs related to the data thematic (literal and metaphorical). We compare used approach with current glyph techniques and discuss the results.

<Poster Paper> Information Visualisation Theory & Practice:

Generic Data Visualization Platform

Ahmed Roshdy, Nada Ahmed Hamed Sharaf, Madeleine Saad, Slim Abdennadher

The German University in Cairo, Egypt

Excessive Data with their vast types and formats are being handled through out the whole process of computation from its ever beginning till the current time. through continuous. The continuous flowing data in all devices forms a challenge for the performance as these big numbers of data require a fast yet effective processing of illustrating their information. Such data could be scientific files on a certain cloud architecture, operating systems data or even media being uploaded on a personal website. The simpler the data is displayed the faster actions might be performed. With big data, it is important to be able to find out what is really happening in these data details. This could be done with visualization through flexible displaying of data with efficient forms using advanced visualization technologies.

Session iV2018_2.5: Knowledge Visualization and Visual Thinking

Chair: Paul Zellweger, ArborWay Labs, United States of America

SmartEducation: Prototyping a Configurable Learning App using Gamification

Andreas Zinnen¹, Eicke Godehardt²

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This paper summarizes the ongoing process of designing a wearable system that augments the learning environment by modeling learning content as competences, by providing feedback on how the user is acquiring these competences, and by enhancing the environment by Gamification elements. We evaluate the impact of the Interactive Learning Environment (ILE) in a preliminary user study. The application of design patterns facilitates the integration of any learning content, question types, or learning strategies. Extensions can be done at any time, without affecting the functionality of the existing application. An agile approach to platform selection (from Ionic to React Native) guarantees good technical results despite many uncertainties and difficulties encountered.

QueryCrumbs for Experts: A Compact Visual Query Support System to Facilitate Insights into Search Engine Internals

Jörg Schlötterer¹, Christin Seifert^{1,2}, Michael Granitzer¹

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Search experts use advanced query language and search tactics to formulate their queries. However, the effectiveness of those advanced techniques depends on the search engine internals.

We propose QueryCrumbs for Experts, a compact visualization, which facilitates insights to the search engine internals and therefore allows the searcher to determine effective search strategies. Treating the search engine as a black box, QueryCrumbs can be seamlessly integrated into existing search interfaces, guiding the user's exploration and assessment of results. QueryCrumbs for Experts visualize the recent search history alongside with a simple and also a qualitative comparison of the result sets, from which conclusions about the search engine internals can be drawn.

The evaluation shows that, by identifying specific patterns in the visualization, expert users can gain valuable insights into search engine internals, empowering them to adapt their search accordingly.

CrowdRetouch: An At-once Image Retouch System Applying Retouching Parameter Visualization

Yuri Saito, Takayuki Itoh

Ochanomizu University, Japan

This paper proposes a new image retouch system "CrowdRetouch" which reflects users' tendency of image retouch for a set of similar photos. CrowdRetouch firstly asks initial users to manually retouch sample training images and then divides the initial users based on the image retouch parameters. It then applies regression analysis to each of user clusters to solve the relationship between the retouch parameters and image features and automatically retouches rest of similar photos based on the regression analysis results. After forming the user clusters, CrowdRetouch specifies the clusters of new users with a smaller number of training images by visualizing the learning processes, and therefore we do not need to require heavy preprocesses to the new users. CrowdRetouch realizes personalized automatic image retouching to a large number of photos while reflecting preferences of novice users. This paper introduces our user experiments which demonstrate the parameter visualization is effective for appropriate learning of users' preferences.

Session iV2018_2.6: Visual Analytics

Chair: Prof. Rita Francese, University of Salerno, Italy

A Visual Physical-Chemical Parameters Analysis Approach for Evaluating the Influence of Ports Facilities in Surface Water Quality

iV2018 _ Abstract

Cynthia Teles Oliveira, Cleyton Luiz Barbosa, Rodrigo Santos Lima, Hugo Brito Lima, Jefferson Magalhães Moraes, Carlos Gustavo Resque dos Santos, Bianchi Serique Meiguins

Federal University of Para, Brazil

Water is one of the most precious assets on the planet, being essential for life and used for a wide range of purposes, such as irrigation of crops, power generation, navigation and transportation of cargo and passengers, among other activities. In the context of cargo handling, ports in Brazil have increased in importance at both national and international levels. In this sense, this work aims to propose a visual analysis of the physical-chemical parameters of the surface water to evaluate the influence of the port activity on its quality, using visualization techniques such as treemap, parallel coordinates, and histogram. The scenario evaluated corresponds to water around port facilities of Belém, Miramar and Vila do Conde, which are managed by Companhia Docas do Pará, located in the northern region of Brazil, in the state of Pará. The water quality assessment guideline will have as basis the influence of the cargo with a higher volume of movement, the anthropic actions near the port, and Brazilian environmental legislation. The results indicate that the port activity has no relevant impacts on the quality of surface water compared to the launch of domestic sewage without adequate treatment near the port units and that the excessive rains potentiate this scenario.

Big data Visualisation and Visual Analytics of Frequent Patterns

Carson Leung¹, Alfredo Cuzzocrea²

¹University of Manitoba, Canada; ²University of Trieste, Italy

As high volumes of a wide variety of valuable data of different veracity can be easily generated or collected at a high velocity in the current era of big data, big data visualisation and visual analytics tools are needed. In this paper, we present a system for visualising and analysing big data. In particular, our system focuses on the big data science task of the discovery and exploration of frequent patterns (i.e., collections of items, events, or individuals that frequently occurring together).

Cartographies of the Legal World. Rise and challenges of Visual Legal Analytics

Nicola Lettieri^{1,3}, Delfina Malandrino²

¹National Institute for Public Policy Analysis, Rome Italy; ²Department of Computer Science - University of Salerno; ³Department of Law, Economics Management and Quantitative Methods - University of Sannio

In recent years, together with the adoption of data driven approaches and the development of computational heuristics, visualization has become part of a process that is gradually changing methods of social sciences. In this paper we present some applications of visual computing in the legal science and practice. After a brief introduction to the rise and challenges of what we define as Visual Legal Analytics, we briefly sketch the results of three research projects dealing with visualization at the boundaries between law and computer science discussing their objectives, advantages and perspectives.

Beyond Transparency: making the Italian Public Administration more accessible through data storytelling

Francesca De Chiara¹, Matteo Moretti², Maurizio Napolitano¹

¹Fondazione Bruno Kessler, Italy; ²Free University of Bozen - Bolzano, Italy

In Italy, the “Piano AntiCorruzione e Trasparenza” (Anti-corruption and transparency plan), with the reform of the Decree n.33/2013, requires all the public administrations to make their data (financial data, personnel, etc.) public and available, as a matter of transparency. Despite that, we are still far from reaching fully the goal of transparency. Due to the lack of a shared protocol, each administration is free to choose the format to publish and present the data, resulting in a proliferation of different formats, different website structures and table of contents, which makes the exploration and discovering of facts and figures harder.

Transparency without accessibility, is a lost opportunity. The paper will discuss these issues in the light of a new design and data storytelling-oriented paradigm, intended to turn the mere online publication of data into a more engaging and immersive experience. We focus on a particular case study, the project Data Explorer, a prototype informed by a new way of visualizing and exploring data, with the aim of improving the informative process, and making sense of the transparency and making it accessible to a wider audience.

Session iV2018_2.7: Cultural Heritage Knowledge Visualisation

Chair: Theodor Wyeld, Flinders University, Australia

<Short Paper > Cultural Heritage Knowledge Visualisation

Challenges to the ubiquity of perspective since the photograph: an essay on alternatives and alterations

Theodor Wyeld

Flinders University, Australia

The perspective image, first formularized in the fourteenth century Italian Renaissance, was chemically automated by the photograph in the mid-nineteenth century. While at its zenith, the Dutch realists had achieved astonishingly mimetic reproduction of the visual world in their paintings, the photograph threatened to automate and commodify their work. The unerring catch-all monotony of the scenes depicted in early photography also questioned the value artists invested in what they included in their paintings. As such, many artists rejected the photograph, and perspective realisms more generally. From the mid-nineteen century to the late twentieth century, many challenges to the verisimilitudinal nature of the photograph and perspective image were mounted. These ranged from impressionist patches of light and dark, patches of colour, compression of space to the surface of the painting, layering of multiple temporal images in a single frame, to the complete voiding of spatial references altogether. Their campaigns waged across the twentieth century, computer graphics (CG) has since reestablished the perspective image as a dominant media. However, CGs too has its alternatives and alterations which generate new effects, both extending and challenging its

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presumed norms. This paper is a brief essay about the cycle that has been the dominance, decline and reemergence of the perspective image since the Renaissance.

GIS-based Procedural Modeling in Contemporary Urban Planning Practice

Cem Demir, Turgay Kerem Koramaz

Istanbul Technical University, Turkey

The cities keep developing rapidly all over the world. Urban-related disciplines are striving to enhance new theoretical concepts to keep up with these changes. Various researchers commonly claim that the outcomes that are generated with the traditional planning techniques fall short in providing the livability of urban space and the design quality. Unstable structure of the planning regulations causes frequent changes in the tools and rules applied in spatial planning. These changes make it harder to investigate the indirect consequences in the spatial changes that would take place in the cities on the long term. On the other hand, the new information-based techniques are increasingly offering remarkable tools for spatial planning practices. Especially novel techniques in semantic 3D modelling field are offering workflows for aiding the design phase. Procedural modelling steps forward, as quite remarkable outcomes can be produced by means of the operations that identify the small data entries with procedural codes.

In this study, the codes and tools identified in the current urban planning legislation in Turkey are converted into procedural modelling parameters. Then, the current implementation plan of the selected field is transformed into an interactive framework. Plan is interpreted in two different design alternatives within this parametric system. After these alternative designs are modelled in compliance with the criteria specified in the plan and regulations, the quantitative evaluation of these models is conducted. Consequently, the response capacity of produced three-dimensional GIS based procedural modelling system on urbanization and planning policies is investigated. Additionally, opinions on the utilization of this system within the framework of sustainable planning practices are expressed.

A Preliminary Study of Metrics and Methods for Readable Spatial OLAP Maps: VGI4Bio case study

Vincenzo Del Fatto¹, Sandro Bimonte², Ali Hassan³, Monica Sebillio⁴

¹Free University of Bozen-Bolzano, Italy; ²TSCF IRSTEA Aubiere, France; ³CESCO MNHN Paris, France; ⁴Dipartimento di Informatica, University of Salerno Salerno, Italy

Spatial OLAP systems are GeoBusiness Intelligence systems allowing the exploration and analysis of huge volume of spatial data by means of tabular, graphic and cartographic displays. Although map readability is crucial for decision-making processes, readability of SOLAP maps has not been deeply investigated. In this paper, a initial study on readability

metrics for SOLAP maps and methods to improve them are presented and discussed. The results are validated by using a real case study concerning farmland biodiversity analysis. Some open issues associated to this topic are also discussed.

Session iV2018_2.8: Visual Thinking for Researchers: Enabling insights, crafting clarity, making progress – Part 1

Language: English

Speaker: Dr. Sebastian Kernbach

Period required: 3.5 hours

Abstract

The overall aim of this workshop is to help participants enhance their thinking and communication skills through the use of visual thinking such as diagrams, knowledge maps or visual metaphors. Working on the dissertation or research papers can be frustrating at times. Sometimes it may be because we feel overloaded with ideas and thoughts (cognitively), or we may feel overwhelmed and not motivated (emotionally), or we feel disconnected from our supervisor or peers (socially). Visual thinking is a tool to help overcome those challenges and work more productively and enjoyable.

This workshop will provide participants with the foundation of what visual thinking is and why it is beneficial for thinking and communication for individuals and groups. Based on these foundations participants will learn more about the benefits and risks of visual thinking. Participants will see different visual formats through examples (tree diagrams, empathy maps and many more) and acquire basic sketching skills to express themselves visually. (You don't have to be creative or good in the arts to be able to sketch!) Participants will apply what they have learned to visualize their literature review, research design, research proposal, and story of their PhD or any other research project.

The workshop is open for all levels. In the past, researchers from 1st year PhD students up to senior Professors have benefited from using the benefits of visual thinking for their research projects. No further prerequisites are required, you do not have to be creative or good at drawing. All you need is an open mindset and some level curiosity.

Biography: Dr. Sebastian Kernbach works as lecturer, project manager and visual coach in the area of Knowledge Visualization and Visual Thinking at the University of St. Gallen in Switzerland. He is visiting fellow at Stanford University and Guest Professor at the African Doctoral Academy and the Central University of Beijing.

He is interested in using creativity, visual thinking, storytelling and design thinking to help individuals and teams to be more productive and have more impact on society. He is a member of the Organizing Committee of the International Symposium on Knowledge Visualization and Visual Thinking and founder of the Visual Collaboration Lab (www.visualcollaborationlab.org).

Session iV2018_2.9: Geometric Modelling & Imaging

Chair: Prof. Mark Bannatyne, IUPUI, USA

A Bézier-like curve with two shape parameters

Imre Juhász

University of Miskolc, Hungary

Modifying the factorization of Bernstein polynomials, we propose a system of functions with two free parameters, which can be used for control point based curve modeling. Essential properties of functions such as nonnegativity, partition of unity, Hermite-like end properties, asymptotic behavior, symmetry, linear independence are shown. Consequently, the control point based curve obtained by these functions is closed for the affine transformation of its control points and has the convex hull, endpoint interpolation and endpoint tangency properties. The influence of the free parameters on the shape of the curve is studied as well.

G2-Approximation of Circular Arcs by C-Bézier Curve: An Alternate Approach

Malik Zawwar Hussain¹, Ayesha Shakeel¹, Maria Hussain²

¹University of the Punjab, Lahore, Pakistan; ²Lahore College for Women University, Lahore, Pakistan

An alternate scheme is presented for the approximation of a circular arc using cubic C-Bézier curve. The G^2 -constraints at the end points of the curves are used for the evaluation of the control points. The proposed approximation scheme yields smaller absolute radius error than the prevailing methods.

The Application of New Cubic B-spline Approximations for Solving Non-linear Third Order Korteweg--de Vries Equation

Muhammad Abbas¹, Muhammad Kashif Iqbal²

¹University of Sargodha, Sargodha, Pakistan; ²Department of Mathematics, Government College University, Faisalabad, Pakistan

In this work, the numerical solution of third order non-linear Korteweg--de Vries equation is studied. The proposed numerical technique engages finite difference formulation for temporal discretization, whereas, the discretization in space direction is achieved by means of a new cubic B-spline approximation. To corroborate this effort, a test problem has been considered and the approximate results are compared with those found in the open literature. It is observed that, the new approximation technique involves straight forward computations and operates superior to the existing methods.

Mesh Region Classification Based on Discrete Curvature

Mohamed Yaghmorasan Benzian¹, Nacéra Benamrane²

¹University of Tlemcen Abou Bekr Belkaid, Algeria; ²University of Science and Technology Oran USTO-MB, Algeria

The purpose of this work is the classification of a 3D object composed of triangular planar meshes into separate regions based on discrete curvature. The curvature value is computed for

each vertex of the mesh then it is labeled with a value belonging to a curvature class. An iterative and recursive region growing process builds regions of neighbor vertices belonging to the same curvature class and starting from a seed vertex. Then, another iterative merging process eliminates poor regions, and particularly merges neighbor regions with the same curvature class. Final obtained regions are colored in order to distinguish between different parts of the 3D object. Experimental results are tested on sample triangular meshes, and the method can be generalized to other 3D models

Session iV2018_2.10: Information Visualization Evaluation

Chair: Prof. Michele Risi, University of Salerno, Italy

A review of visualization assessment in terms of user performance and experience

Ana Raquel Figueiras

iNOVA Media Lab, IC NOVA, FCSH, Universidade NOVA de Lisboa

Traditionally, information visualization research tends to focus only on performance related metrics such as task completion time and correctness. However, a recent interest on goals such as memorability, engagement, and fun has also sparked. We propose a reflection on visualization assessment supported by a profound analysis of research that includes user studies of visualization tools and techniques. The motivation for this study is to explore the possible benefits of having a unified standardized metric for usability and user experience that can become a clearer quantitative model of both. Such a metric can provide visualization researchers and practitioners a more succinct and accurate way to assess their visualizations.

A Prototype Application to Generate Synthetic Datasets for Information Visualization Evaluations

Yvan Pereira Santos Brito, Carlos Gustavo Resque dos Santos, Sandro de Paula Mendonça, Tiago Davi Oliveira de Araújo, Alexandre Abreu de Freitas, Bianchi Serique Meiguins

Federal University of Pará, Brazil

The evaluation is an essential step of works that propose new information visualization techniques or tools. A common type is the controlled experiment in which the researchers measure the user performance to execute specific tasks using the proposed method. Furthermore, the dataset used for these tests must contain known desired features to be evaluated (e.g., level of noise, the percentage of missing values) in a controlled way. Thus, this article proposes an application to generate synthetic databases for evaluating information visualization techniques and tools. The system aims to create a dataset generator model that allows the construction of datasets with a diversity of profiles in a controlled manner. The creator of the model can save it for future experiments or updates and can export it enabling other groups to replicate the experiments easily. For a better understanding of application

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features and how to use it, this work also shows two use scenarios explaining the created model for each situation.

Improving Perception Accuracy in Bar Charts with Internal Contrast and Framing Enhancements

Jose Díaz¹, Oscar Meruvia-Pastor², Pere-Pau Vázquez¹

¹Universitat Politècnica de Catalunya, Spain; ²Memorial University of Newfoundland, Canada

Bar charts are among the most commonly used visualization graphs. Their main goal is to communicate quantities that can be visually compared. Since they are easy to produce and interpret, they are found in any situation where quantitative data needs to be conveyed (websites, newspapers, etc.). However, depending on the layout, the perceived values can vary substantially. For instance, previous research has shown that the positioning of bars (e.g. stacked vs separate) may influence the accuracy in bar ratio length estimation. Other works have studied the effects of embellishments on the perception of encoded quantities. However, to the best of the authors' knowledge, the effect of perceptual elements used to reinforce the quantity depicted within the bars, such as contrast and inner lines, has not been studied in depth. In this research we present a study that analyses the effect of several internal contrast and framing enhancements with respect to the use of basic solid bars. Our results show that the addition of minimal visual elements that are easy to implement with current technology can help users to better recognize the amounts depicted by the bar charts.

An Instrument for Evaluating the Quality of Data Visualizations

Raissa Barcellos, José Viterbo, Flavia Bernardini, Daniela Trevisan
UFF, Brazil

Visualizing data in tables or lists may not be the best way to help users to understand large amounts of data. In this way, data visualization in graphical format, such as charts, scientific visualizations and statistical charts, has been used to explore available data. A good data visualization is defined as a well-designed presentation of interesting data, aiming to communicate ideas with clarity, precision and efficiency. It can be very powerful in revealing trends, highlighting outliers, showing clusters, and exposing information gaps that could not be easily identified when data is visualized in table format. Nowadays, considering the open data movement, many open data portals offer different types of data visualization, specially the ones historically used in statistics. However, when browsing some of these portals, we can find many bad data visualizations, frequently ambiguous, confusing and unusable. Hence, it is essential to have an instrument capable of analyzing the quality of data visualizations, helping the designer to use the full capacity of a data visualization to provide a more efficient resource information to the users. The main purpose of this work is to present an instrument that integrate a set of heuristics, to assess the quality of data visualizations. Such heuristics were chosen due to have been previously proposed in several works in literature, and proved successful. In order to evaluate the proposed instrument, we conducted an experiment with a group composed by computer science graduate students. We analyzed the results using Cohen's Kappa and Any-two agreement statistical tests, which indicated that the instrument is adequate.

Session iV2018_2.11: Visual Thinking for Researchers: Enabling insights, crafting clarity, making progress – Part 2

Language: English

Speaker: Dr. Sebastian Kernbach

Abstract

The overall aim of this workshop is to help participants enhance their thinking and communication skills through the use of visual thinking such as diagrams, knowledge maps or visual metaphors. Working on the dissertation or research papers can be frustrating at times. Sometimes it may be because we feel overloaded with ideas and thoughts (cognitively), or we may feel overwhelmed and not motivated (emotionally), or we feel disconnected from our supervisor or peers (socially). Visual thinking is a tool to help overcome those challenges and work more productively and enjoyable.

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He is interested in using creativity, visual thinking, storytelling and design thinking to help individuals and teams to be more productive and have more impact on society. He is a member of the Organizing Committee of the International Symposium on Knowledge Visualization and Visual Thinking and founder of the Visual Collaboration Lab (www.visualcollaborationlab.org).

Session iV2018_3.1: Visual Data Mining and Analytics

Chair: Prof. Masood Masoodian, Aalto University, Finland

Visual Analysis of vertex-disjoint path connectivity in networks**Paolo Fantozzi, Luigi Laura, Umberto Nanni, Marco Temperini**

Sapienza University of Rome, Italy

The visualization of large graphs in interactive applications, specifically on small devices, can make harder to understand and analyze the displayed information. We show as simple topological properties of the graph can provide an efficient automatic computation of features which improves the “readability” of a large graph by a proper selection of the displayed information. The *connectivity* (existence of a path) is a very intuitive structural property of a network; in this paper we propose an approach to the visualization of a network based on connectivity and related concepts as effective tools for visual analysis. In particular, given a root vertex r and a target vertex t , it is possible to check at a glance if there are some *dominators*, i.e., mandatory vertices that are on every path from r to t . Furthermore, using a recent graph algorithm from Georgiadis and Tarjan, by selecting a target vertex it is possible to see two distinct paths from r to t : the paths are vertex-disjoint if there are no dominators from r to t , otherwise the paths have only the dominators in common. We conclude by presenting, as a relevant case study that motivated our work, as this approach improves a personalized eLearning application. In a framework, previously presented, for dynamic configuration of paths of learning activities for both individual and group education, we can add visual analysis capabilities for both the final user/learner, and for the administrator of a repository.

Designing a Semi-automatic Taxonomy Generation Tool**Belen Carrion, Teresa Onorati, Paloma Diaz**

Universidad Carlos III de Madrid, Spain

In this paper, we propose a tool to build taxonomies in a semi-automatic way. Taxonomies are key structures to model and categorize knowledge focusing on the semantics. Designing a taxonomy means finding meaningful concepts respect to a domain of application. This complex task requires the involvement of domain experts to define a representative dictionary. To keep a human-in-the-loop approach, taxonomies have been mostly created manually with a great cost in time and resources. Our goal is to design a general-purpose and multi-language tool that will automatize the process of building a taxonomy from a document corpus. The proposed architecture can be used in different domains, as well as in different languages.

Dynamic Choropleth Maps - Using Amalgamation to Increase Area Perceivability**Liam McNabb¹, Robert S. Laramée¹, Richard Fry²**¹Swansea University, United Kingdom; ²National Centre for Population Health and Wellbeing Research, Swansea University Medical School

Choropleths are a common and useful way of depicting area-coupled data on a geo-spatial map. One advantage they provide is combining area-based data accurately with geo-space.

However perceptual problems arise when areas are too small, i.e. when they only cover a few pixels or less. This is a very common occurrence when zooming or in densely populated areas like capital cities. We present a novel algorithm that ensures the user is able to observe area-based data coupled to geo-space based on their interactive level of zoom without distorting the original geo-spatial map. This is resolved by building a hierarchical data structure in which each area and its data is merged with one of its smallest neighbor recursively until only one polygon covers each contiguous region. The benefits are that the viewer can always view area-based data contained in the map regardless of how small any individual area becomes during interactive zooming. We break down each step of the algorithm and provide pseudo-code to enable reproducibility. We also discuss unique test cases that challenge the robustness of the algorithm with 30,000 polygons and 4,652,800 vertices as well as the performance.

Visualising hidden spatiotemporal patterns at multiple levels of detail**Ricardo Almeida Silva^{1,2}, João Moura Pires², Nuno Miguel Soares Datia^{1,2}, Maribel Yasmina Santos³, Bruno Martins⁴, Fernando Birra²**¹ISEL - Instituto Politécnico de Lisboa, Portugal; ²NOVA LINCS, FCT, Universidade NOVA de Lisboa, Portugal; ³ALGORITMI Research Centre, University of Minho, Portugal; ⁴INESC-ID and IST, University of Lisbon, Portugal

Crimes, forest fires, accidents, infectious diseases, human interactions with mobile devices (e.g., tweets) are being logged as spatiotemporal events. For each event, its geographic location, time and related attributes are known with high levels of detail (LoDs). The LoD plays a crucial role when analyzing data, enhancing the user's perception of phenomena. From one LoD to another, some patterns can be easily perceived or different patterns may be detected. Modeling phenomena at different LoDs is needed, as there is no exclusive LoD at which data can be analyzed.

Current practices work mainly on a single LoD, driven by the analysts perception, ignoring the fact that the identification of the suitable LoDs is a key issue for pointing relevant patterns.

This paper presents a Visual Analytics approach called VAST, that allows users to simultaneously inspect a phenomenon at different LoDs, helping them to see in what LoDs patterns emerge or in what LoDs the perception of the phenomenon is different. In this way, the analysis of vast amounts of spatiotemporal events is assisted, guiding the user in this process.

The use of several synthetic and real datasets allowed the evaluation of VAST, which was able to suggest LoDs with different interesting spatiotemporal patterns and the type of expected patterns.

Morphological analysis of 3D skull models for ancestry estimation**Paulo Dias¹, Bruno Andrade¹, Catarina Coelho², João Coelho², David Navega², Sofia Wasterlain², Maria Teresa Ferreira², Beatriz Sousa Santos¹**¹University of Aveiro/IEETA, Portugal; ²University of Coimbra, Portugal

Skull analysis is the main tool used in anthropology to identify several characteristics such as ancestry, gender, and variations between populations. Yet, skull analysis methods used by anthropologists still rely heavily on direct manipulation and measurement of the skulls producing significant inter and intra observer errors. Direct manipulation also involves risks of damaging the specimens while handling. In recent years computer methods for skull analysis that rely on

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3D models of skulls acquired with a 3D scanner have been proposed. This approach gives the possibility to perform analysis otherwise not possible, simultaneously easing the overall process of skull analysis and reducing variability. This paper describes the development of automatic and semi-automatic methods for morphological analysis of 3D skull models through the extraction and classification of structures aiming to support the estimation of ancestry. Results with fifty specimens are presented.

Interactive Network Visualization of Gene Expression Time-Series Data

António Cruz, Joel P. Arrais, Penousal Machado

CISUC - Department of Informatics Engineering, University of Coimbra, Portugal

Visualization models have shown to be remarkably important in the interpretation of datasets across many fields of study. In the field of Biology, data visualization is used to better understand processes that range from phylogenetic trees to multiple layers of molecular networks. The latter is especially challenging due to the large quantities of varying elements and complex relationships, often with no perceptible structure. Although various tools have been proposed to improve the visualization of molecular networks, many challenges still persist. In this paper, we propose a tool that uses interactive visualization models to represent the dynamic behaviors of molecular networks. The tool employs various methods to explore and organize the data, including clustering, force-directed layouts, and a timeline for navigating through time-series data. To further analyze temporal attributes, the timeline can be distorted through a force-directed layout to spatially position time points according to their similarity. Additionally, gene expression can be annotated through an integrated biological database. The visualization model was validated with the use of time-series gene expression RNA-Seq data from the HIV-1 infection.

Session iV2018_3.2: Knowledge Visualisation

Chair: Nuno Datia, ISEL - Instituto Politécnico de Lisboa, Portugal

Knowledge Representation in a Visual Typed Language: from Principles to Practice

Florence Dupin de Saint-Cyr¹, Denis Parade²

¹Toulouse University, France; ²Scenario Interactif, Toulouse, France

This paper presents a set of principles that a visual representation language should satisfy. Then after a presentation of the visual typed language MOT, we show that MOT may be criticized which leads us to introduce an improvement of MOT called VTL. VTL is a Visual Typed Language which satisfies most of the principles that we have introduced.

Visual Design Thinking: Understanding the role of knowledge visualization in the design thinking process

Sebastian Kernbach^{1,3}, Anja Svetina Nabergoj^{2,3}

¹University of St. Gallen; ²University of Ljubljana; ³Stanford University

This paper sheds light on the role of visualization methods within the design thinking process. It provides a conceptual framework showing illustrative examples of visualization for each phase indicating its functions and benefits. Based on a thorough understanding of the functions and benefits of knowledge visualization in general, this paper seeks to provide a first overview of the use of visualization in design thinking informing and supporting practitioners and researcher for more conscious selections of visualization methods in their design thinking efforts.

Education and Culture Affect Visualization's Effectiveness for Health Communication

Sabrina Bresciani¹, Pavithra Arora², Sebastian Kernbach¹

¹University of St. Gallen, Switzerland; ²University of Ottawa

In this research we focus on analyzing which contextual variables moderates the effectiveness of knowledge visualization. Through a Field Experiment we compare the same content expressed in a textual and in a multimodal format (here intended as composed of text and icons together, organized spatially in a meaningful way). The application context is Polycystic Ovary Syndrome which is the most common cause of infertility. We conducted a field experiment in India and found that all subjects are more engaged by the content when read it in a visual format, but that the intention to change behavior is moderated by educational level.

Storytelling Canvas: A visual framework for developing and delivering resonating stories

Sebastian Kernbach^{1,2}

¹University of St. Gallen, Switzerland; ²Stanford University

In this article, I attempt to bring together key elements of storytelling in a visual framework, the Storytelling Canvas. The Canvas aims to bring together various strategies for developing and delivering resonating stories. The strategies are organized in three stages that are relevant for every story: beginning, middle and end. Before working on the strategies, storytellers need to consider the topic, the audience including their needs and the goal of the story. This framework has been used for managers, academics and students around the world including organizations such as the African Doctoral Academy, University of St. Gallen, Hilti, European Central Bank,

Stanford University and others. This article aims to introduce the framework to foster a debate about what constitutes good storytelling in management and academia.

Time°diff: a Visual Approach to Compare Period Data

Vincenzo Del Fatto, Anton Dignös, Johann Gamper

Free University of Bozen-Bolzano, Italy

Temporal data, and in particular time periods, are crucial to many applications in different sectors, such as industry, medicine, insurance, finance, tourism, and management. Such applications often consult historical information in order to compare and optimize processes. Generally, the time periods in this data represent the period of validity in the real-world, such as the period of a specific assignment, but may

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also represent the periods when the data was stored, i.e., believed to be true. Inferring new information from this data is eased by visualizing and comparing their different time periods. In this paper, we present Time^odiff, a novel visualization approach based on timebar charts, which is suitable for comparing data with time periods and enabling decision makers to easily analyze information containing period data.

A tool for the digital edition of interactive fiction using Stretchtext

Covadonga Díez-Sanmartín, José Luis Sierra-Rodríguez, Antonio Sarasa-Cabezuelo

Complutense University of Madrid, Spain

Interactive fiction is an area of work within digital literature that aims to insert elements within the content of a digital book that force the reader to participate actively in reading the book. For this, strategies are used such as for the reader to make decisions about which is the next chapter to read or how the story told at a certain point in the book should continue. In this article we present a software tool oriented to the edition of digital books that implements diverse functionalities to insert elements of interactive fiction following the stretchtext hypertext paradigm.

Session iV2018_3.3 : Information Visualisation – Applications

Chair: Vincenzo Deufemia, University of Salerno, Italy

Analysing Player Performance with Animated Maps

Tiago Gonçalves¹, Pedro Vieira¹, Ana Paula Afonso¹, Maria Beatriz Carmo², Tiago Moucho¹

¹LASIGE, Faculdade de Ciências, Universidade de Lisboa, Portugal; ²BioISI, Faculdade de Ciências, Universidade de Lisboa, Portugal

Over the last years, with the increasing use of telemetry techniques, the extraction of data from video games became a much easier and reliable task. Among many types of video games, MOBAs (Multiplayer Online Battle Arena) are one of the most widely played and, consequently, the analysis of game events has received attention of players, spectators, coaches and analysts to assess the performance of players. This data can range from players' position, to more specific events, such as, the position of a player's death. Our main goal is to get a better understanding of which techniques are more adequate to handle the visualization of this type of spatio-temporal information data, associated to player performance analysis in video games. This paper addresses this problem presenting a user study to evaluate the adequacy of animated maps and the analytical strategies followed by players when using spatio-temporal data to analyse player performance. To support the user study, we developed the VisuaLeague prototype for the visualization of in-game player trajectories and events during a match in the MOBA game League of Legends. The results support the adequacy of using the animated maps technique to convey information to users in this context. Moreover, they also point out towards a high degree of importance given to the spatio-temporal components of the data for player performance analysis.

A Multi-Sensor Visualization Tool for Harvested Web Information: Insights on Data Quality

Zied Ben Othmane¹, Damien Bodénès¹, Cyril De Runz², Amine Ait Younes²

¹Kantar Media; ²University of Reims

In order to inform about sensors veracity and handle the uncertainty of data, an interactive visualization tool for industrial needs has been developed and presented in this paper.

The tool allows user to get deep understandings in a multi-sensor context, especially when considering harvested web data.

In order to deal with data uncertainty, our methodology is based on quantiles and on the specific modeling for missing values. We present diverse dashboards and visual indicators serve to validate common flow data and help to discover hidden knowledge. According to a use case, we show how our visualization approaches can assist to review data quality about possible critical situations.

Discovery multiple data structures in Big Data through global optimization and clustering methods

Ida Bifulco, Stefano Cirillo

University of Salerno, Italy

In this paper, we propose an approach to Big Data visualization, based on clustering techniques, in order to find a structure of them and to facilitate their visualization. However, the main problem of clustering is that sometimes converge to a local minimum showing only one solution, so an optimization of the K-means algorithm has been proposed with the aim to escape from local minimum and to visualize different solutions of the same problem. In particular, we use the K-means algorithm with multiple random starting points, in order to find several solutions to the same problem. This algorithm considers the data of the Italian calls for tenders, extracted through a crawling technique, and optimized through the proposed approach to obtain multiple solutions. These are used to achieve a repository of products that can be easily displayed and inquired during the formulation of an offer from a bidder company willing to participate to a call for tenders. The case study results show the feasibility and validity of the proposed approach.

Depth-Enhanced Tag Cloud Maps

Yasuto Murakami, Takamasa Kawagoe, Michael Cohen, Shigeo Takahashi

University of Aizu, Japan

We present an approach to synthesizing tag cloud ("wordle"s) maps that produce illusionary visual depth fields based on stereoscopic imaging. By using a 3D scalar field (such as elevation or weather data) as input, the synthesized map yields a visual illusion that suitably simulates the 3D shape of the field; this is done by applying stereoscopic rendering effects to individual word tags. In the generated tag cloud maps, we employed chromastereoptic and anaglyphic 3D as the primary and secondary mechanisms for controlling the rendering styles of respective place names. Our technical contribution also lies in the formulation for optimizing the layout of place names in a tag cloud by using a genetic algorithm, which effectively simulates the 3D visual depth illusion of the given scalar field over the map domain. Design examples are presented to

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demonstrate the capability of the proposed approach as well as a discussion of the possible limitations.

Synthetic Chart Image Generator: An application for generating chart image datasets

Rafael Daisuke Akiyama, Tiago Davi Araújo, Paulo Roberto Chagas, Brunelli Pinto Miranda, Carlos Gustavo Resque dos Santos, Jefferson Magalhães Moraes, Bianchi Serique Meiguins

Federal University of Para, Brazil

The scarcity of chart images public datasets and its generators makes difficult the comparative studies between works in areas such as information visualization, usability, computer vision, and machine learning. Therefore, this paper presents a Web tool for generating data chart images called Synthetic Chart Image Generator (SCIG). The tool uses VEGA declarative language, and the chart features are fully parameterizable for every eleven different classes, as well as image quantity and its resolution. Additionally, the charts are constructed from synthetic data, randomly generated by probability distributions functions, and rendered in PNG format. Finally, this paper presents a performance test of the chart images generation.

VisualBib: Narrative Views for Customized Bibliographies

Antonina Dattolo, Marco Corbato

SASWEB Research Lab, Department of Mathematics, Computer Science and Physics, University of Udine, Italy

Peer-reviewed scientific literature citation indexes, like Scopus, WOS, Google Scholar, OpenAire, collect metadata of papers, projects, research groups. By using appropriate queries, it is possible to access these metadata, find specific papers and all the associated contents, retrieve indices and metrics and list the details about authors. However, a big issue with search engines is that they generally do not aggregate the results of subsequent searches and do not offer explicit representations of author/citation relationships between found items.

One way to overcome this problem has been provided by a new Web application prototype called VisualBib. It has been conceived to support researchers who wish to create, modify, visualize and share bibliographies. Starting with a small set of papers or with a restricted number of authors, it generates, in real-time, an interactive visual representation of the corresponding bibliography; the user can explore the network of cited/citing references and dynamically add new papers in order to build up customized bibliographies which are represented using holistic, aggregated and graphical views. The papers are grouped by publication years and are linked to each other by authorship and citing relations.

The aim of this paper is to introduce this new application and present the results of a comparative user test.

Guess what I want: I am in hurry and I am using my phone while driving

Marco Angelini, Graziano Blasilli, Simone Lenti, Giuseppe Santucci

University of Rome "La Sapienza", Italy

In this paper a system that prioritizes user actions according to the domain context and user preferences, in order to provide the adaptation process with a partial order of functionalities is presented, useful to optimize the user interface with the main goal of minimizing screen usage and user interaction. The solution is instantiated in a smart home environment in the form of a smart user interface exploiting visual means to convey information. An user evaluation based on this use case is provided, confirming the benefits of the solution in terms of utility and easiness of usage.

Session iV2018_3.4 : Visualization, Art, and Design

Chair: Theodor Wyeld, Flinders University, Australia

GraphVR: A Virtual Reality Tool for the Exploration of Graphs with HTC Vive System

Ugo Erra¹, Nicola Felice Capece², Jari Grippa³

¹Università della Basilicata, Italy; ²Università della Basilicata, Italy; ³Università della Basilicata, Italy

This work examines the use of virtual reality to visualize and interact with three-dimensional graphs. We developed the design to be as natural and intuitive as possible, through analysis, study, and use of several layout algorithms, which allow the nodes of a graph to be positioned to reduce entropy levels. We chose to use this schematic visualization of graphs because it can describe the graphical data synthetically and the links between the data while presenting the data in a visual format. The application was developed entirely using Unreal Engine version 4, and the visualization was performed using the head-mounted display HTC Vive.

Visualising the code-in-action helps students learn programming skills

Theodor Wyeld¹, Minoru Nakayama²

¹Flinders University, Australia; ²Tokyo Institute of Technology

The need to know how to code for university graduates has become crucial if they are to achieve their goals of employment after graduation. Post-graduation jobs increasingly require some understanding of how programs work and are developed. The project reported here used HTML and JavaScript to introduce students to the core structure of coding. It uses code that produces a visual result which helps non-IT students overcome their fear of coding. Using an online HTML and JavaScript editor to create a 2D game for a mobile device introduces students to some basic programming skills in a fun and creative way. This paper reports on a project that tracked before and after sentiment towards learning coding skills. It shows a shift in sentiment from a fear of coding to a better understanding of the potential of coding to produce creative outcomes. However, despite the shift in sentiment across the project, there was still too much reliance on external help – students were not able to initiate programming without some assistance. This suggests, along with the method described in this paper, other methods should also be explored.

<Short Paper > Visualization, Art, and Design

Development of Emotional Communication in Persons with Disabilities Through Graphic Art

Eduardo César Contreras Delgado^{1,2}, Isis Ivette Contreras González¹, Aldo Francisco Contreras González³, Raquel Alejandra Vásquez Torres⁴

¹National Technology of Mexico, Mexico; ²Autonomus University of Coahuila; ³Polytechnic University of Madrid; ⁴Albert-Ludwigs-Universität Freiburg

People with intellectual or hearing disabilities have difficulty to communicate in oral or written form. Since they need specialized training for a long time, this becomes a very complex problem. An alternative to communicate is to use graphic art to express their emotions and feelings. A study was developed with a group of disabled children who attended a graphic design workshop using drawings to express themselves and improve their communication.

<Short Paper > CAivDE - Computer Animation, Information Visualisation, and Digital Effects:

Visually Realistic Plankton Models for Simulating Underwater Environments

Ori Ganoni, Ramakrishnan Mukundan, Richard Green

University of Canterbury, New Zealand

Plankton are very small marine organisms found in large numbers in aquatic environments. Some of the plankton are bioluminescent, which makes them glow. This characteristic of plankton interferes with the vision systems of remotely operated underwater vehicles (ROVs). As ROVs are becoming increasingly used for various underwater exploration and farming activities, there is a need for creating visually realistic simulation of underwater environments, and plankton is one of the key influencing organic material of that environment. In this paper, we deal with two different types of plankton, phytoplankton and zooplankton and their different optical characteristics. We propose a novel approach to this underwater simulation by using a particle engine for the zooplankton simulation and Exponential Height Fog for the phytoplankton simulation. The realism of the images was successfully demonstrated by visual comparison of the simulated images generated using Unreal Engine 4 with real images.

<Short Paper > CAivDE - Computer Animation, Information Visualisation, and Digital Effects:

Animating Objects and Classes in Virtual Reality

Waleed Zakaria, Nada Ahmed Hamed Nada Ahmed Hamed, Jailan Salah, Slim Abdennadher

The German University in Cairo, Egypt

The aim of the tool provided in the paper is to provide a virtual reality enabled platform for teaching programming. The focus is on the concepts of objects and classes. The platform allows users to customize and see almost everything to see their effects.

Session iV2018_3.5: Information Visualisation

Chair: Prof. Andreas Zinnen, RheinMain University of Applied Sciences, Germany

A Graph-Based Visualization of Time-Series Information in Multiple Texts

Hironari Kawada¹, Mina Akaishi², Hiroshi Hosobe²

¹Graduate School of Computer and Information Sciences, Hosei University, Japan; ²Faculty of Computer and Information Sciences, Hosei University, Japan

Newspapers and other media often describe particular topics over some periods by giving a series of texts that introduces new information and corrects previous information. By analyzing such texts, we can understand how a topic changed over time and how the media treated it. However, analyzing such texts manually is time-consuming. To solve this problem, we propose a method for visualizing texts that describe a topic changing over time. For this purpose, we first generate an event information graph from such texts by using an existing method. Then we transform it into two different graphs. The first graph shows changes in the topic that we obtain by separating the initial graph and comparing the resulting time-dependent graphs. The second graph depicts a summary of the topic that we obtain by extracting high-frequency words from the initial graph. The results of our experiment show that our method can visualize changes and important information described in the texts.

Volume-Based Large Dynamic Graph Analytics

Valentin Bruder¹, Marcel Hlawatsch¹, Steffen Frey¹, Michael Burch², Daniel Weiskopf¹, Thomas Ertl¹

¹University of Stuttgart, Germany; ²Eindhoven University of Technology, Netherlands

We present an approach for interactively analyzing large dynamic graphs consisting of several thousand-time steps, with a particular focus on temporal aspects. We employ a static representation of the time-varying graph based on the concept of space-time cubes, i.e., we create a volumetric representation of the graph by stacking the adjacency matrices of each of its time steps. To achieve an efficient analysis of this complex data, we discuss three classes of analytics methods of particular importance in this context: data views, aggregation and filtering, and comparison. For these classes, we provide respective analysis techniques, with our GPU-based implementation enabling the interactive analysis of large graphs. We demonstrate the utility as well as the scalability of our approach by presenting application examples for analyzing different time-varying data sets.

Visualizing symmetric square matrices with rainbow boxes: methods and application to character co-occurrence matrices in literary texts

Jean-Baptiste Lamy

University Paris 13, France

A symmetric square matrix is a type of dataset frequently found in various domains. An example is character co-occurrence matrices in digital humanities. However, the visualization of these matrices is difficult. In this paper, we propose a method for visualizing symmetric square

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matrices, by transforming a matrix into overlapping sets, and then by visualizing these overlapping sets using rainbow boxes, a recent set visualization technique. We apply this method to the visualization of character matrices in novels, using two datasets: a small one (21 characters) and a large one (80 characters). We show that this visualization allows the finding of several insights. Finally, we discuss the advantages and drawbacks of this method, and we compare it to other approaches in the literature.

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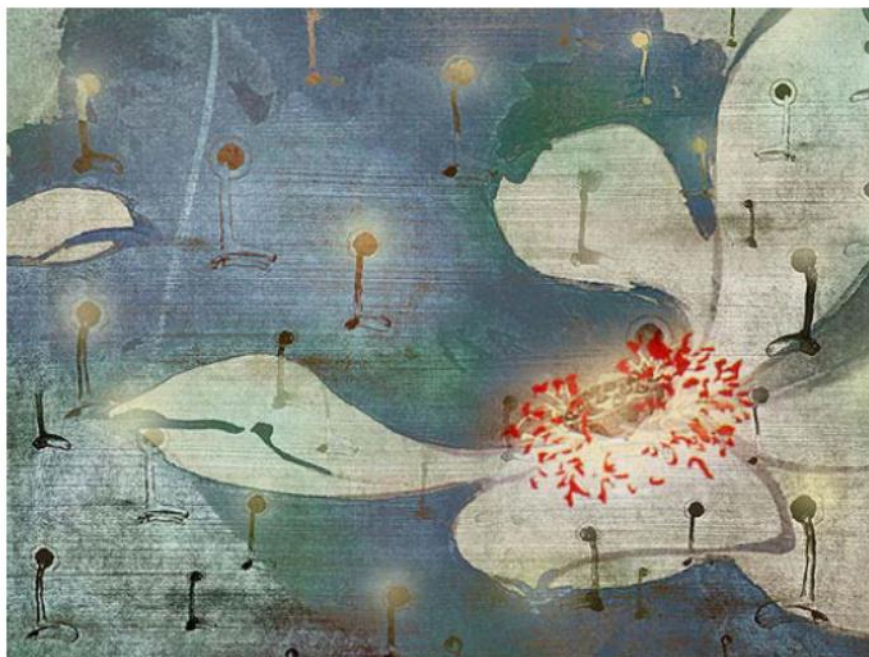


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Information Visualisation

SCOPE of the Special Issue

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In particular, the topic of interest includes but is not limited to

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- **Visualising Network**
- **Visual Analytics**
- **Knowledge Visualisation**
- **Knowledge Visualization and Visual Thinking**
- **Human computer interaction for Information Visualization**

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Current business moves along two areas:

IMMERSIVE ENVIRONMENTS

SpinVector has developed an innovative Mixed Reality platform that upgrades existing VR projects to Augmented Reality. Using this technology, clients can implement an interactive, real-time interaction paradigm, ideal for Industry 4.0 applications for Maintenance, Training and simulation in general. Users can finally walk around freely while keeping contact with their actual bodies and any physical object in the environment.

GAMING

In the gaming business, the company has exceeded 3 Million downloads, of the premium versions of its mobile games. The most recent title developed for the Italian Institution Treccani has reached a 20\$ MARPPU.



Kineton

SIDoCH: “Avataring” IoT information in the Virtual

The SIDoCH project adopts Unity 3D engine aiming at building a visualization/control interface to the modern Smart Home. Indeed, VR and AR settings developed by Kineton overcome the physical limits (as small dimension or screen lack) of IoT devices and are capable of visualizing and contextualizing information provided by the cloud or, directly, by the smart objects. As an information medium, the proposed system, when possible, directly adopts Unity physical engine for the simulation: lighting subsystem is directly involved in the light sensor/actuator mechanism while the thermal characteristics of the environment, not directly supported by the engine, have been surrogated via message exchange.

The system adopts also semantics for data classification and command mining and, via inference, proposes to its users an automatic and natural home behavior. All sensors send their measurements to the Semantic Back-End that automatically replies to the messages (the status vector of measurements, collected by sensors) sending the appropriate commands to the Smart Home actuators. The proposed inference mechanism is also user customizable: at this aim, SIDoCH embeds a starting domotic ontology that models average wellness conditions of the environment and extends it by training the automatic rule-based inference engine on direct user commands.

The highly modular design enables IoT practitioners to easily incorporate new sensors and actuators, as well as to integrate additional micro-services and new user interfaces in the proposed eco-system.

presenter **Ignazio Passero**
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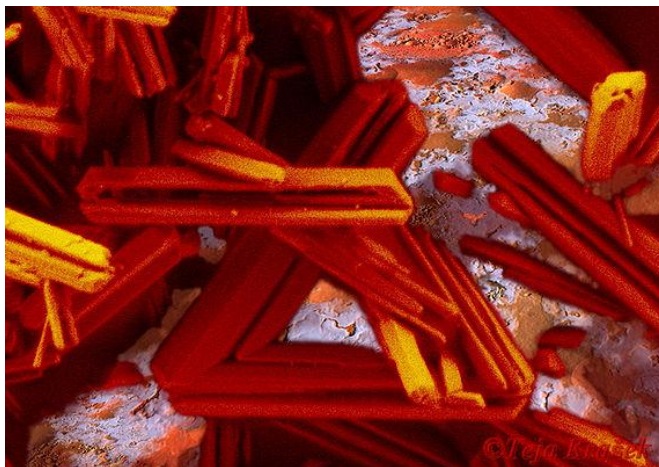
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