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Current Trends in Web Engineering

ICWE 2016 International Workshops
DUI, TELERISE, SoWeMine, and Liquid Web
Lugano, Switzerland, June 6–9, 2016
Revised Selected Papers

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Foreword

The International Conference on Web Engineering (ICWE) aims to promote research and scientific exchange related to Web engineering, and to bring together researchers and practitioners from various disciplines in academia and industry in order to tackle emerging challenges in the engineering of Web applications and associated technologies, as well as to assess the impact of these technologies on society, media, and culture.

This volume collects the papers presented at the workshops co-located with the 16th International Conference on Web Engineering (ICWE 2016), held during June 6–9, 2016, in Lugano, Switzerland. In the tradition of previous ICWE conferences, the workshops complement the main conference, and provide a forum for researchers and practitioners to discuss emerging topics, both within the ICWE community and at the crossroads with other communities. As a result, we accepted six workshops, of which the following four contributed papers to this volume:

- 2nd International Workshop on TEchnical and LEgal aspects of data pRIVacy and SEcurity (TELERISE 2016)
- 2nd International Workshop on Mining the Social Web (SoWeMine 2016)
- 1st International Workshop on Liquid Multi-Device Software for the Web (LiquidWS 2016)
- 5th Workshop on Distributed User Interfaces: Distributing Interactions (DUI 2016)

TELERISE 2016 collected papers discussing legal aspects of the Web, hereby focusing on issues such as data management, security, privacy, copyrights, and intellectual property rights. By reconciling the technical and legal perspectives, TELERISE lived up to the cross-disciplinary spirit of ICWE workshops. SoWeMine 2016 brought together researchers addressing engineering challenges related to social Web mining and associated applications. This workshop too embodies the cross-boundary nature of ICWE workshops, marrying data mining and application engineering disciplines. LiquidWS 2016 addressed the emerging topic of multi-device, decentralized Web applications, in which users seamlessly move from one device to another, and their applications and data seamlessly flows among them. Approaching the topic from a Web engineering perspective, LiquidWS brought together papers tackling architectural and engineering issues, as well as practical example applications. Finally, the DUI 2016 workshop shed light on distributed user interfaces in the multi-device Web. In the fifth edition of the DUI workshop series, the organizers specifically focused on distributed interactions, and succeeded in assembling papers addressing theoretical and practical issues alike.

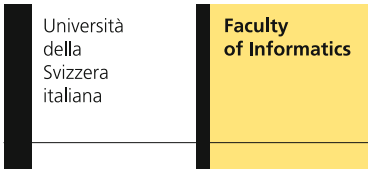
In addition to the four aforementioned workshops, the ICWE conference also hosted the ICWE2016 Rapid Mashup Challenge (RMC 2016), which traditionally has its own volume published as proceedings, and the 7th International Workshop on Web APIs and RESTful design (WS-REST 2016) which had a working session format with focus on collaboration and discussions, rather than paper presentations. All aforementioned workshops had a rigorous peer-review procedure with only quality papers accepted.

Special thanks are extended to ICWE's sponsors: the Faculty of Informatics at Università della Svizzera italiana, City of Lugano, Google, Nokia, Atomikos, InnoQ, lastminute.comgroup and ISWE, all of whose support made ICWE and the associated workshops possible. We are also grateful to Springer for publishing this workshop volume and for sponsoring travel grants to support student authors. In addition, we thank all the workshop organizers for their excellent work in identifying cutting-edge and cross-disciplinary topics in the rapidly moving field of Web engineering, and organizing inspiring workshops around them. A word of thanks also to the reviewers, for their meticulous work in selecting the best papers to be presented. Last, but not least, we would like to thank the authors who submitted their work to the workshops and all the participants who contributed to the success of these events.

July 2016

Sven Casteleyn
Peter Dolog
Cesare Pautasso

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Preface

The preface of this volume collects the prefaces of the proceedings of the individual workshops. The actual workshop papers, grouped by event, can be found in the body of this volume.

2nd International Workshop on TEchnical and LEgal aspects of data pRivacy and SEcurity (TELERISE 2016)

Organizers. Ilaria Matteucci, Paolo Mori, Marinella Petrocchi, Istituto di Informatica e Telematica – Consiglio Nazionale delle Ricerche (IIT-CNR), Pisa, Italy.

The present volume includes the proceedings of the 2nd International Workshop on TEchnical and LEgal aspects of data pRivacy and SEcurity (TELERISE 2016), held in conjunction with the 16th International Conference on Web Engineering (ICWE 2016), on June 9 at Università della Svizzera Italiana (USI), Lugano, Switzerland.

TELERISE aims at providing a forum for researchers, engineers, and legal experts, in academia as well as in industry, to foster an exchange of research results, experiences, and products in the area of privacy preserving, secure data management, and engineering on the Web, from a technical and legal perspective. The ultimate goal is to conceive new trends and ideas on designing, implementing, and evaluating solutions for privacy-preserving information sharing, with a view to the cross-relations between ICT and regulatory aspects of data management and engineering. Information sharing on the Web is essential for today's business and societal transactions. Nevertheless, such sharing should not violate the security and privacy requirements either dictated by law to protect data subjects or by internal regulations provided both at the organization and individual level. An effectual, rapid, and unfailing electronic data sharing among different parties, while protecting legitimate rights on these data, is a key issue with several shades. One of the main goals of TELERISE is to carry forward innovative solutions, such as the design and implementation of new software architectures, software components, and software interfaces, able to fill the gap between technical and legal aspects of data privacy and data security management.

This year, TELERISE received a total of ten submissions from 20 authors of eight countries. Each paper was reviewed by at least three Program Committee members and evaluated according to criteria of relevance, originality, soundness, maturity, and quality of presentation. Decisions were based on the review results and five submissions were accepted as regular papers. We have grouped the accepted papers into two main classes according to their topics: "Security and Privacy Aspects," and "Legal Aspects." The keynote speech was given by Benoit Van Asbroeck, partner in Bird&Bird Intellectual Property practice, based in Brussels, and it was titled "Technical and Legal Aspects of Data Privacy." The talk covered the main areas of interest of the workshop. The program was as follows:

- Session 1. Security and Privacy Aspects
 - Harald Gjermundrød, Ioanna Dionysiou, and Kyriakos Costa. “privacy-Tracker: A Privacy-by-Design GDPR-Compliant Framework with Verifiable Data Traceability Controls.”
 - Daniel Schougaard, Nicola Dragoni, and Angelo Spognardi. “Evaluation of Professional Cloud Password Management Tools.”
 - Neil Ayeb, Francesco Di Cerbo, and Slim Trabelsi. “Enhancing Access Control Trees for Cloud Computing.”
- Keynote Session
 - Benoit Van Asbroeck. “Technical and Legal Aspects of Data Privacy.”
- Session 2. Legal Aspects
 - Kevin McGillivray, Samson Esayas, and Tobias Mahler. “Is a Picture Worth a Thousand Terms? Visualising Contract Terms and Data Protection Requirements for Cloud Computing Users.”
 - Francesca Mauro and Debora Stella. “Brief Overview of the Legal Instruments and the Related Limits for Sharing Data While Complying with the EU Data Protection Law.”

The second edition of TELERISE was a real success and an inspiration for future workshops on this new and exciting area of research.

We would like to thank the ICWE Workshops Organizing Committee and collaborators for their precious help in handling all the organizational issues related to the workshop. Our next thanks go to the authors of the submitted papers. Special thanks are finally due to the Program Committee members for the high-quality and objective reviews they provided.

July 2016

Ilaria Matteucci
Paolo Mori
Marinella Petrocchi

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2nd International Workshop on Mining the Social Web (SoWeMine 2016)

Organizers. Spiros Sirmakessis, Technological Institution of Western Greece, Greece; Maria Rigou, University of Patras, Greece; Evanthia Faliagka, Technological Institution of Western Greece, Greece, Olfa Nasraoui, University of Louisville, USA.

The rapid development of modern information and communication technologies (ICTs) in the past few years and their introduction into people's daily lives have greatly increased the amount of information available at all levels of their social environment.

People have been steadily turning to the social web for social interaction, news and content consumption, networking, and job seeking. As a result, vast amounts of user information are populating the social Web. In light of these developments the social mining workshop aims to study new and innovative techniques and methodologies on social data mining.

Social mining is a relatively new and fast-growing research area, which includes various tasks such as recommendations, personalization, e-recruitment, opinion mining, sentiment analysis, and searching for multimedia data (images, video, etc).

This workshop is aimed at studying (and even going beyond) the state of the art in social Web mining, a field that merges the topics of social network applications and Web mining, which are both major topics of interest for ICWE. The basic scope is to create a forum for professionals and researchers in the fields of personalization, Web search, text mining etc. to discuss the application of their techniques and methodologies in this new and very promising research area.

The workshop tried to encourage a discussion on new emergent issues related to current trends derived from the creation and use of modern Web applications. The following papers were presented:

- Evanthia Faliagka, Maria Rigou, and Spiros Sirmakessis: “Identifying Great Teachers Through Their Online Presence.” Teacher evaluation is a very tricky task as there are many criteria, objective and not, that are important in identifying the suitability of a teacher to a specific class. A teacher's background as well his or her education and experience, personality, and even the students of the class are some of the important criteria that take part in the evaluation. In this work, the authors propose a novel approach and a prototype system that extracts a set of objective criteria from the teacher's LinkedIn profile, and infers their personality characteristics using linguistic analysis on their Facebook and Twitter posts.
- Paolo Missier, Alexander Romanovsky, Tudor Miu, Atinder Pal, Michael Danilakis, Alessandro Garcia, Diego Cedrim, and Leonardo Da Silva: “Tracking Dengue Epidemics Using Twitter Content Classification and Topic Modelling.” The paper used Twitter for a very interesting topic detection: mosquito-borne diseases. Detecting and preventing outbreaks of mosquito-borne diseases such as dengue and Zika in Brazil and other tropical regions has long been a priority for governments in affected areas. Streaming social media content, such as Twitter, is

increasingly being used for health vigilance applications, such as flu detection. The authors contrast two complementary approaches to detecting Twitter content that are relevant for Dengue outbreak detection, namely, supervised classification and unsupervised clustering using topic modelling.

- Vittoria Cozza, Van Tien Hoang, Marinella Petrocchi, and Angelo Spognardi: “Experimental Measures of News Personalization in Google News.” The authors present their work with filter bubbles. Search engines and social media keep trace of profile- and behavioral-based distinct signals of their users, to provide them with personalized and recommended content. The authors focus on the level of Web search personalization, to estimate the risk of trapping the user into these filter bubbles with experimentation carried out on the Google News platform. The aim of the paper is to measure the level of personalization delivered under different contexts: logged users, expected (in SGY sections), and unexpected (in Google News home) personalization.

July 2016

Spiros Sirmakessis
 Maria Rigou
 Evanthia Faliagka
 Olfa Nasraoui
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1st International Workshop on Liquid Multi-Device Software for the Web (LiquidWS 2016)

Organizers. Kari Systä, Tommi Mikkonen, Tampere University of Technology, Finland; Cesare Pautasso, USI Lugano, Switzerland; Antero Taivalsaari, Nokia Technologies, Finland.

The era of standalone computing devices is coming to an end. Device shipment trends indicate that the number of Web-enabled devices other than PCs and smartphones will grow rapidly. In the future, people will commonly use various types of Internet-connected devices in their daily lives. Unlike today, no single device will dominate the user's digital life. In general, the world of computing is rapidly evolving from traditional client-server architectures to decentralized multi-device architectures in which people use various types of Web-enabled client devices, and data are stored simultaneously in numerous devices and cloud-based services. This new era will dramatically raise the expectations for device interoperability, implying significant changes for software architecture as well. Most importantly, a multi-device software architecture should minimize the burden that the users currently have in keeping devices in sync. Ideally, when the users move from one device to another, they should be able to seamlessly continue doing what they were doing previously, e.g., continue playing the same game, watching the same movie, or listening to the same song on the other device. This way the users can take full advantage of all their devices, either using them together at the same time or switching between them at different times.

By "liquid software," we refer to an approach in which applications and data can seamlessly move from one device to another, allowing the users to roam freely across all the computing devices that they have. The users of liquid software do not need to worry about data copying, manual synchronization of device settings, application installation, or other burdensome device management tasks. Rather, things should work with minimal effort. From the software development perspective, liquid software should dynamically adapt to the set of devices that are available to run it, as opposed to responsive software, which adapts to different devices, under the assumption that only one device at a time is used to run the application.

The 1st International Workshop on Liquid Multi-Device Software was arranged to present the latest research and discuss the aforementioned topics from the Web engineering point of view. The workshop was held on June 8, 2016, and it was co-located with International Conference in Web Engineering (ICWE 2016) in Lugano, Switzerland. We envision that HTML5 and Web technologies will be used as the basis for a broader, industry-wide multi-device software architecture, enabling seamless usage of applications not only with devices from a certain manufacturer or native ecosystem, but more broadly across the entire industry. HTML5 and Web technologies could serve as the common denominator and technology enabler that would bridge the gaps between currently separate device and computing ecosystems.

After the peer-review process, four papers were selected to be presented at the workshop. The papers covered various aspects of liquid software sharing a focus on user interface design challenges.

The first paper was “XD-Bike: A Cross-Device Repository of Mountain Biking Routes” by Maria Husmann, Linda Di Geronimo, and Moira Norrie from ETH Zurich. The paper presented by Maria Husmann showed how multiple devices can collaboratively provide the users with the needed information. The system used a Web-based framework (XD-MVC) for building MVC cross-device applications. This presentation included a nice demonstration, too.

The second paper was “Multi-Device UI Development for Task-Continuous Cross-Channel Web Applications” by Enes Yigitbas, Thomas Kern, Patrick Urban, and Stefan Sauer from Paderborn University and Wincor Nixdorf. The paper – presented by Enes Yigitbas – continued the theme of multi-device user interfaces and described how bank customers can use different devices in different contexts. The researchers were targeting a system in which bank customers are able to flexibly access their banking service – where, when, and how the service suits them best.

The third paper “Liquid Context: Migrating the User’s Context Across Devices” by Javier Berrocal, Jose Garcia-Alonso, Carlos Canal, and Juan Manuel Murillo Rodriguez from the University of Extremadura and the University of Malaga extended the discussions to the management of user context. This paper, presented by Javier Berrocal, explained how the user profile and preferences should be taken into account in liquid applications and how the context information should be available wherever the applications migrate.

The fourth paper “Synchronizing Application State Using Virtual DOM Trees” by Jari-Pekka Voutilainen from Gofore Ltd., and Tommi Mikkonen and Kari Systä from Tampere University of Technology described one solution for synchronization of the application state. The paper was presented by Jari-Pekka Voutilainen and it described how a virtual DOM tree can be used to implement state synchronization for liquid applications.

We are grateful to the Program Committee members for their work on the paper review and selection process. We would also like to thank all the authors and workshop participants for the lively discussions.

July 2016

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5th Workshop on Distributed User Interfaces: Distributing Interactions (DUI 2016)

Organizers. María D. Lozano, José A. Gallud, Víctor M.R. Penichet, Ricardo Tesoriero, Computer Systems Department, University of Castilla-La Mancha, Albacete, Spain; Jean Vanderdonck, Catholique University of Louvain, Belgium; Habib M. Fardoun, King AbdulAziz University, Jeddah, Saudi Arabia; Juan Enrique Garrido, Computer Science Research Institute, University of Castilla-La Mancha, Albacete, Spain; Félix Albertos Marco, Computer Systems Department, University of Castilla-La Mancha, Albacete, Spain.

The 5th Workshop on Distributed User Interfaces was focused on distributing interactions. Current technology and ICT models generate configurations in which the same user interface can be offered through different interactions. These new technological ecosystems appear as a result of the existence of many heterogeneous devices and interaction mechanisms. Consequently, new conditions and possibilities arise, which not only affects the distribution of the user interfaces but also the distribution of the user's interactions. Thus, we shift the focus from addressing the distribution of user interfaces to the distribution of the user's interactions, which poses new challenges that need to be explored. In this context, Web engineering appears as a fundamental research field since it helps to develop device-independent Web applications with user interfaces that are capable of being distributed and accessed through different interaction modes. This fact makes Web environments especially interesting within the scope of this workshop. As in the previous workshops in this series, the main goal is to bring together people working on distributed interactions and enable them to share their knowledge in aspects related to new interaction paradigms such as movement-based interaction, speech recognition, gestures, touch and tangible interaction, etc., and the way we can manage them in a distributed setting.

The workshop started with Session 1, which was a somewhat mad session in which each participant introduced himself/herself. This session continued with two research presentations:

- Michael Krug and Martin Gaedke: “AttributeLinking: Exploiting Attributes for Inter-Component Communication.” The authors propose exploiting attributes of client-side Web components to provide inter-component communication by external configuration. With the integration of a multi-device supporting MessagingService, components can even be linked across multiple connected devices. This enables the development of distributed user interfaces.
- Juan Enrique Garrido Navarro, Victor M. R. Penichet, and Maria-Dolores Lozano: “Improving Context-Awareness in Healthcare Through Distributed Interactions.” This paper describes a significant step forward in the concept of context-awareness with a comprehensive solution: Ubi4Health. The solution enhances context-awareness by adapting the user experience with the appropriate device, interface, and interaction mechanism on the basis of the given context.

Session 2 took place with six presentations:

- Amira Bouabid, Sophie Lepreux, and Christophe Kolski: “Distributed Tabletops: Study Involving Two RFID Tabletops with Generic Tangible Objects.” This paper describes a study on an innovative system designed to support remote collaborative games running on tabletops with tangible interaction. In addition, the authors model a set of collaborative styles that are possible between the tabletops users. The goal is to obtain objects that provide remote collaboration among users of interactive tabletops for tangible interaction.
- Félix Albertos Marco, Víctor M.R. Penichet, and Jose A. Gallud: “Distributing Interaction in Responsive Cross-Device Applications.” In this work the authors introduce the foundations of a new approach called responsive cross-device applications (RCDA). RCDA applies the idea of responsive Web applications distributing user interactions across the new cross-device ecosystem, taking into account the interactive capacities of devices and users.
- Audrey Sanctorum and Beat Signer: “Towards User-Defined Cross-Device Interaction.”
The authors provide an overview of existing DUI approaches and classify the different solutions. In addition, they propose an approach for user-defined cross-device interaction where users can author their customized user interfaces based on a hypermedia metamodel and the concept of active components.
- Antonio Jesús Fernández-García, Luis Iribarne, Antonio Corral, Javier Criado, and James Z. Wang: “Optimally Storing the User Interaction in Mashup Interfaces Within a Relational Database.” Storing the data generated from the interaction performed over the user interface can be challenging. To achieve this goal, in this paper a relational database for storing this interaction information generated on distributed user interfaces is proposed.
- Félix Albertos Marco, Víctor M.R. Penichet, and Jose A. Gallud: “Virtual Spatially Aware Shared Displays.” In this work, the authors present a technique for distributing content and devices in shared workspaces using cross-device displays. This technique, referred to as the virtual spatially aware technique, allows the creation of virtual shared displays and the coordination of cross-device interactions. By using this technique, they propose a method for arranging content and devices on virtual displays.
- Sergio Firmenich, Gabriela Bosetti, Gustavo Rossi, and Marco Winckler: “Flexible Distribution of Existing Web Interfaces: An Architecture Involving Developers and End-Users.” This paper describes an architecture that allows end-users to collect UI objects into a distributed UICoMponent-oriented PIM, accessible from different users’ devices. Once in the PIM, different DUI-based behaviors (that may be triggered by the user) are added to the collected UI components as PIM object plug-ins.

The workshop finished with an interesting Session 3, in which the participants collaborated by working together. The objective was to discuss the main ideas and results from the previous sessions, future research lines, and possible collaborations. The organization of the sessions involved all the participants. In particular, during Sessions 1 and 2, the participants listed concepts to be considered in the last session on post-it notes. These concepts were

stuck on a board and categorized in Session 3. This activity allowed participants to discuss definitions, links, related and future concepts, etc. The results were an interesting exchange of ideas. Finally, this collaborative work involved the possibility of continuing to collaborate as an initial community related to distributed user interfaces and the topics included in the workshop.

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