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Knowledge Intensive Software Engineering Applications

J.UCS Special Issue


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The use of Information and Communication Technologies (ICTs) has become a competitive strategy that allows organizations to position themselves within their market of action. In addition, the evolution, advancement and use of ICTs within any type of organization have created new domains of interest. In this context, Knowledge-intensive software engineering applications are becoming crucial in organizations to support their performance. Knowledge-based technologies provide a consistent and reliable basis to face the challenges for organization, manipulation and visualization of the data and knowledge, playing a crucial role as the technological basis of the development of a large number of information systems. In software engineering, it involves the integration of various knowledge sources that are in constant change.

Knowledge-intensive software applications are becoming more significant because the domains of many software applications are inherently knowledge-intensive and this knowledge is often not explicitly dealt with in software development. This impedes maintenance and reuse. Moreover, it is generally known that developing software requires expertise and experience, which are currently also implicit and could be made more tangible and reusable using knowledge-based or related techniques. Furthermore, organizations have recognized that the software engineering applications are an optimal way for providing solutions, because it is a file that is constantly evolving due to the new challenges. Examples of approaches that are directly related to this tendency are data analysis, software architectures, knowledge engineering, ontologies, conceptual modelling, domain analysis and domain engineering, business rules, workflow management, human and cultural factors, to mention but a few. Therefore, tools and techniques are necessary to capture and process knowledge in order to facilitate subsequent development efforts, especially in the domain of software engineering.

With the use of new proposals on how using the knowledge intensive in a multitude of ways and in all phases of software development can be advantageous.

The goal of this Special Issue was to provide a forum for researchers to present and discuss their work which is related to trends among innovative and high-quality research in the form of theoretical foundations, case studies, techniques, tools, applications, frameworks, strategies, techniques, methodologies, informatics platforms and models for developing advanced knowledge-intensive software engineering applications and techniques and their application in industry. This Special Issue includes, among other submissions from the open call for papers, extended versions of accepted best papers from the International Conference on Software Process Improvement (CIMPS) 2019 (<http://cimps.cimat.mx>), which has taken place from October 23 to 25 in León, Guanajuato, Mexico.

As a result, to this Special Issue, we received a total of 21 submissions, these submissions were reviewed by domain experts who recommended 8 articles to be accepted and to be included in this Special Issue. We present a brief description of each paper.

The first article, presented by Mirna Muñoz, Mario Negrete and Magdalena Arcilla-Cobián entitled “Using a platform based on the Basic profile of ISO/IEC 29110 to reinforce DevOps environments”, discusses how organizations can properly implement DevOps. Therefore, this article presents a Reinforced DevOps Guidance, which aims to help teams to achieve an evolution of their software development, software delivery, and project management processes toward a proper DevOps implementation. The guidance uses a web platform that allows a dynamic implementation. This paper shows both an overview of the guidance, highlighting the web platform, and its application in a very small entity (VSE).

In the second article “An Instrument for Measuring Perception about Social and Human Factors that Influence Software Development Productivity”, the authors Liliana Machuca-Villegas, Gloria Piedad Gasca-Hurtado, Solbey Morillo Puente and Luz Marcela Restrepo Tamayo, showed a study on how the Social and Human Factors (SHF) in terms of productivity in software development are influenced. In this study, the authors first conducted a preliminary classification of the SHFs identified in the literature. Because this study sought to assess the factors from the standpoint of software development professionals, they developed and validated an instrument to measure the perception of software development team members about SHFs that may be affecting their productivity. The instrument included 79 items assessing 13 different SHFs. The results demonstrated that the instrument is a valid and reliable tool for measuring SHFs perception among software development team members.

In the third article “Business Patterns Catalogue and Selection Proposal for the Conceptual Model of a Software Product”, the authors Oscar Carlos Medina, Manuel Pérez Cota, Brenda Elizabeth Meloni and Marcelo Martín Marciszack, presented a proposal to manage a Business Patterns catalogue that can be applied to Conceptual Modelling of software products. Besides, the authors have developed an application, called “PatCat” (Pattern Catalogue), that was developed to test the proposal, using the Business Model of an Information System for a public education institution as a pilot. This proposal introduces patterns at the beginning of the Modelling Process because it allows to simplify and clarify the requirements elicitation among organizations in the software design task.

In the fourth article “Videogame development training approach: A Virtual Reality and open-source perspective”, the authors David Bonilla, Adriana Peña Pérez Negrón and Madeleine Contreras, presented a training strategy for videogame development projects oriented to software developers. The videogame projects require unusual developers’ technical and creative skills when compared with non-game projects. The training strategy is described in terms of videogames for immersive virtual reality with open source platforms, but it can be adjusted to other technologies. This proposal links Project-Based Learning (PBL) with the SUM videogames development process, by including material, tools, and a creative perspective. This strategy was based on the teaching experience of the Computer Simulation subject of the Computer Science Engineering program for undergraduate students.

In the fifth article “K-Step Crossover Method based on Genetic Algorithm for Test Suite Prioritization in Regression Testing”, the author P.K. Gupta, proposed a two-phase algorithm that considers test case selection and test case prioritization technique for performing regression testing on several modules ranging from a smaller line of codes to huge line codes of procedural language. In this context, in regression testing, an earlier created test suite is used to retest the modified module of a software system. Regression Testing works in three manners; minimizing test cases, selecting test cases, and prioritizing test cases. The proposed algorithm avoids retesting the entire software because in terms of money and time it is very costly. With the obtained results, a comparison of the proposed approach is also done with the previously proposed approaches and it is observed that APCC & APCCc values achieve higher percentage values faster in the case of the prioritized test suite in contrast to the non-prioritized test suite.

The sixth article, entitled “Communication architecture based on IoT technology to control and monitor pets feeding”, presented by Yadira Quiñonez, Carmen Lizarraga, Raquel Aguayo and David Arredondo, proposed two architectures that allow communication between the electronic device and the mobile application remotely, using the GSM/GPRS communication services, and the Twitter social network. The overall aim of the authors was to establish a dogs’ feeding control adequately and healthily, providing the ration of food a dog needs according to the daily energy requirements. Besides, the authors presented a nutritional assessment, it was performed considering different factors such as the size, breed, and weight of the dog to determine the daily ration of healthy and balanced food according to daily energy requirements.

In the seventh article “Toward a Knowledge-based Personalised Recommender System for Mobile App Development” presented by Bilal Abu-Salih, Hamad Alsawalqah, Basima Elshqeir, Tomayess Issa, Pornpit Wongthongtham and Khadija Khalid Premi, the authors proposed a new recommender system framework comprising a robust set of techniques that are designed to provide mobile app developers with a specific platform where they can browse and search for personalized artifacts. In particular, the new recommender system framework comprises the following functions: (i) domain knowledge inference module; (ii) profiling and preferencing; (iii) query expansion; and (iv) recommendation and information filtration. With these functions, the main goal of the recommender system is to recommend appropriate tools, IDEs, platforms, software components and other correlated artifacts to mobile application developers.

Finally, in the eighth article “Analysis on an Auto Increment Detection System of Chinese Disaster Weibo Text”, the authors Bai Hua, Yu Hualong, Yu Guang, Álvaro Rocha and Huang Xing, highlighted the importance of social media tools in disaster information emergency management. For this reason, in this article, the authors show the real-time intelligent identification and collection system for disaster situations. This system was developed on Weibo because it is the social media tool most widely used in China. The Weibo micro-blogging developed in this paper obtained large-scale and useful data for disaster emergency management, which proved that this system is effective and efficient.

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