

Preface

Intelligent Systems and Knowledge Management

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Intelligent systems refer broadly to computer embedded or controlled systems, machines and devices that possess a certain degree of intelligence. Much work in the area can be fairly characterized as integration on different levels of several technology directions – intelligent control, artificial intelligence, decision support, soft computing, knowledge discovery, data mining, data fusion, knowledge engineering, ontologies, machine learning and neural networks – with challenging applications to complex systems.

Knowledge management (KM) technology is used to rapidly capture, organize and deliver large amounts of corporate knowledge for business and/or e-learning processes. However, traditional KM is facing new problems triggered by the Web such as information overload, inefficient keyword searching, heterogeneous information integration and geographically-distributed intranet problems etc [1]. These problems will be tackled by the Semantic Web technologies which add formal structure and semantics (metadata and knowledge) to web content for the purpose of more efficient management and access. The Semantic Web technologies can make possible the generation of the kind of “intelligent” documents. An intelligent document is a document, which “knows about” its own content in order that automated processes can “know what to do” with it. Knowledge about documents has traditionally been managed through the use of metadata, which can concern the context of the document. The Semantic Web proposes annotating document content using semantic information from domain ontologies [2]. For modeling semantic concepts from multimedia features, the generic framework includes an annotation system to create a labeled training set, a learning framework for building models and a detection module for ranking unseen content based on detection confidence for the models (which can be interpreted as keywords). From another perspective, e-Learning technology is used primarily to handcraft training courses about carefully selected topics for delivery to employees registered for those courses.

This special issue of the Journal of Computational Methods in Sciences and Engineering (JCMSE) invited authors to submit their original work that communicates current research on intelligent systems, regarding both the theoretical and methodological aspects, as well as various applications of intelligent approaches to many real world problems from science, technology or business. The first three papers of this special issue investigate the integration of e-Learning and KM technology to improve the capture, organization and delivery of both traditional training courses and large amounts of corporate knowledge.

In the first paper, Lilia Cheniti-Belcadhi, Nicola Henze and Rafik Braham present a web-based personalized assessment system that offers a particularly promising outlook in the field of e-learning and more specifically in the area of Semantic Web. Personalization functionalities are available as web

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services that communicate via Semantic Web technologies without the need for centralized control. Appropriate assessment resources are searched after checking the learner's last saved performance. Their assessment techniques are formalized with First Order Logic (FOL) rules, which are able to reason over resources annotated with Semantic Web metadata formats according to the IEEE LOM and IMS/QTI standards. These rules were tested using TRIPLE language. Their methodology depicted seeks to eliminate complexity in the assessment exercise and maintain convenience, practicality, and personalization of evaluation techniques.

In the second paper, Dimitris Stavrinoudis and Michalis Xenos investigate the technological issues that affect the behavior of the users of a well-established e-learning system. They examine how user-based evaluation is influenced by the way the content of an e-learning system is structured, as well as by aesthetic issues (e.g. colors used). The authors present a case study, in which a representative sample of users evaluated two different implementations of the e-learning system, developed particularly for the purposes of this survey. The users' evaluation focuses on three specific factors: the content structure, the navigation and the aesthetics of the system. The main aim of this paper was to determine these factors' effect on e-learning systems users' behavior by gathering and analyzing the opinions of the users who participated in this case study.

The third paper focuses on a Computer Algebra System (CAS) application. CAS is a software program that facilitates symbolic mathematics, while the core functionality of a typical CAS is manipulation of mathematical expressions in symbolic forms. The expressions manipulated by CAS normally include polynomials in multiple variables, standard trigonometric and exponential functions, various special functions for example gamma, zeta, Bessel, etc. and also arbitrary functions like derivatives, integrals, sums, and products of expressions. In the third paper, Akbar Hussain, Shaiq Haq, Zafar Ullah Khan and Zaki Ahmed implemented a CAS system named SCAS that is based on the object oriented design (OOD) framework. The SCAS system is portable to other platforms and highly scalable. The other key features of SCAS include a very simple and interactive user GUI support for a formula editor, making it a self contained system. Additionally, the formula editor provides a real-time syntax checking for expressions and it can be very useful for educational purposes.

Statistical techniques assume arbitrarily the independence of the input variables. Regression assumes a linear relationship between the dependent (or the log of the dependent) variable and the independent variables. Data mining provides numerous assumption free methodologies. These methodologies have been successfully applied to address auditing related problems like bankruptcy prediction, fraud detection, or the prediction of qualified auditors' opinions. The results of these studies suggest that these methodologies perform at least equally well as the statistical techniques. However, these techniques have not been applied to address the auditor selection problem.

The fourth paper of this special issue by Efstathios Kirkos, Charalambos Spathis and Yannis Manolopoulos compared three classification methods (decision trees, backpropagation neural networks, and support vector machines) to predict the choice of an auditor. The sample the authors used contains data about 338 UK and Irish firms. The input vector contains financial ratios and account values, as well as qualitative variables indicating the qualification cases and the auditor change. The results were encouraging.

The list of the papers follows:

- L. Cheniti-Belcadhi, N. Henze, R. Braham. Assessment Personalization in the Semantic Web.
- D. Stavrinoudis, M. Xenos. On Technological Issues Affecting Online Learners' Behavior.
- D. M. Hussain, S. A. Haq, Z. U Khan, and Z. Ahmed. Simple Object Oriented Designed Computer Algebra System.

- E. Kirkos, C. Spathis, Y. Manolopoulos. Support Vector Machines, Decision Trees and Neural Networks for Auditor Selection.

The guest editors wish to thank Professor T. Simos (Editor-in-Chief of the Journal of Computational Methods in Sciences and Engineering) for providing the opportunity to edit this special issue on Intelligent Systems and Knowledge Management. We would also like to thank the referees who have critically evaluated the papers within the short stipulated time. Finally, we hope the reader will share our joy and find this special issue very useful.

References

- [1] P. Haase, J. Volker and Y. Sure, Management of dynamic knowledge, *Journal of Knowledge Management* 9(5) (2005), 97–107.
- [2] P. Warren, Knowledge Management and the Semantic Web: From Scenario to Technology, *IEEE Intelligent Systems* (January/February 2006), 53–59.