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## Editorial

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**Biographical notes:** Vladimir Jotsov is a senior member of the Institute of Electrical and Electronic Engineers (IEEE), USA. He obtained the following scientific/education degrees through Higher Attestation Commission/Council of Ministers of Bulgaria: PhD in 1993 and DSc in 2010. His research has been focused on intelligent systems, knowledge discovery, self-organising systems, advanced analytics, evolving systems, multi-agent systems, and logic/security applications.

Vassil Sgurev is a senior member of the Institute of Electrical and Electronic Engineers (IEEE), USA. He received his PhD within the Leningrad Electrotechnical Institute in 1974 in Russia and DSc from Bulgarian Academy of Sciences (BAS, 1985). He is an Academician of BAS since 1997. His fields of interest are intelligent systems, discrete mathematics and mathematical logic.

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In recent years, multi-agent applications received strong growth, especially in security. This underlines the fact that even during the crisis times, the more expensive but universal agent-based software is becoming a favourite related to the traditional object programming. There are already many technologies that cannot be up-to-date without the applications of multi-agent methodologies and the number of such areas grows continuously. The transition from manual – via automatic – towards autonomous control can be observed for far space probes since long ago. Similarly for the nearest future the industrial production, traffic control/road service, military operations and the security of web applications will be inconceivable without the usage of multi-agent elements. Hence, collective evolution and co-evolution are one of the fastest developing areas in the field.

This special issue of this journal aims to show that multi-agent systems are a kind of a natural unifier of many other advanced intelligent technologies, amongst which there are: knowledge discovery and data mining, pattern recognition, homeland/information security applications, and lots of others. This number begins with multi-agent applications in security, in particular – for ATM devices. There is no doubt that transforming ATM devices into agents will significantly improve the safety of customers and the financial transactions, too. When ATM devices will transmit information about

intrusions in the region then on the one hand this will be much faster than in the traditional way and on the other hand it does not violate traditional banking secrecy rules, hence ATMs of different banks can coordinate their work without problems and much faster than today. The paper of František Čapkovič, 'Petri net-based approach to modelling ATM and minimising logistic costs in ATM network' explores in detail the possibility of elaborating parallel activities within ATM devices using Petri nets, thus reaching much faster response.

The paper of Damien Meere, Ivan Ganchev, Zhanlin Ji and Máirtín O'Droma, 'Contextualised mLearning service delivery through a multi-agent platform' presents a multi-agent platform for educational purposes, which involves the use of mobile devices, personalisation of user data and scenarios, distance learning improvements, etc. The platform is based on JADE, and also on the usage of agent communication language (ACL). Experiments continue with the application of the developed platform for secondary education and mLearning environments. Here, we have an example of a well-developed multi-agent educational platform, the advantages of which are clearly apparent related to analogical mLearning projects.

The paper of Irene Matzakou, Joao Sarraipa, Dimitris Askounis, Ricardo Jardim-Goncalves and Yannis Charalabidis, 'Towards a semantically enhanced interoperability service utility to support small-medium enterprises' discusses the development of an intelligent system using reference ontologies and other forms of knowledge management for communications between different small-medium enterprises (SMEs). Multi-agent implementation of similar technologies will allow better adaptation of modern SMEs in an ever changing business environment, rapid introduction and removal of rules for financial regulation, technological, legal and other changes, etc. Thus, interoperability between the various types of SMEs goes to a whole new level. For this purpose was developed a collaborative methodology for creating reference ontologies, called mentor. Mentor is the basis of applied innovative structure that may be suitable for the construction of modern multi-agent applications

The fourth paper of the authors Cveta Martinovska, Mimoza Klekovska, Igor Nedelkovski and Dragan Kaeovski, 'Methodologies for recognition of old Slavic Cyrillic characters' is devoted to the application of fuzzy classifiers to recognise Slavic characters. They are suitable for usage in different search engines and other intelligent applications of decision tree classifiers. The authors plan to combine multiple classifiers to achieve more accurate recognition results.

The next paper written by B. Shanmugapriya and M. Punithavalli, 'High dimensional data clustering through fuzzy possibilistic C-means with symmetry-based distance measure' is devoted to data mining applications, which, are becoming more and more prevalent in higher levels of different multi-agent systems. Using fuzzy logic algorithms of type C-means allows improve high-dimensional data clusterisation. Combining the authors' developed cluster analysis and other unsupervised approaches, among which it is advisable to have both statistical and logical data mining, helps expand the capabilities of modern machine learning systems. The authors note numerous opportunities to discover similarities in bioinformatics, to group similar documents during web browsing, in seismology and in many other areas with great scientific or applied interest.

The research of Murat Mala, 'R-AIMS: a reactive multi-agent system-based incident/emergency management system' explores multi-agent applications in emergency management. Notwithstanding, the application of high technology, the author presents data on inexpensive but effective method and application. Meanwhile, implemented

solutions using cognitive agents allowed minimisation of risk from human-made critical decisions during emergency/crisis management.

In the paper of Petia Georgieva, Filipe Silva and Nuno Figueiredo, 'IEETA brain computer interface technologies', advances in electroencephalogram (EEG)-based brain computer interface (BCI) architectures developed at the Institute of Electronics Engineering and Telematics of Aveiro (IEETA) are introduced. The work is focused into technical characteristics and the protocols of practical realisation of BCI for mobile robot control. The present innovative research will significantly enhance opportunities for man-machine communication in multi-agent systems.