Editorial

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Biographical notes: Nikos Manouselis has a Diploma in Electronics and Computer Engineering, an MSc in Operational Research, and an MSc in Electronics and Computer Engineering, all from the Technical University of Crete (Greece). He obtained a PhD on the Application of Metadata and Semantics for social information retrieval of agricultural resources from the Informatics Laboratory of the Agricultural University of Athens (Greece), and still remains and affiliated member since 2005. During 2001–2004 he was a member of the Informatics and Telematics Institute of the Centre for Research and Technology (CERTH-ITI), Greece. Currently, he is working as a researcher at the Greek Research and Technology Network (GRNET S.A.).

Gauri Salokhe is an Information Management Officer at the Food and Agriculture Organization (FAO) of the United Nations. She holds a BE in Industrial Engineering and an ME in Information Management. She is working on establishing metadata standards and domain ontologies, providing best practices and guidelines for their implementation, content management of FAO's multilingual Agricultural Thesaurus (AGROVOC) and management of the Agricultural Information Management Standards Website.

Johannes Keizer is an Information Systems Officer at the FAO. He has an MSc in Biochemistry from the University of Hannover, Germany (1989) and a PhD in Biology from the University of Mainz, Germany (1992). He has been working with the FAO since 1998 and is currently responsible for the FAO's Documentation Catalogue, an international network of documentation centres (AGRIS) and the multilingual agricultural thesaurus, AGROVOC. His team consists of about 18 experts, working in documentation, ontology and thesaurus development and metadata standards. Initiatives such as the AgMES and the AOS have been launched by the team under his leadership.

1 Introduction

A common vision that may serve as an enabler for sustainable development, environmental preservation, and fighting hunger in the world, is the involvement, collaboration and coordination of all stakeholders and initiatives that are working around the topics related to the production, organisation and exchange of agricultural knowledge. Numerous technical and subject experts are working on relevant topics, tackling issues such as classifications and taxonomies, controlled vocabularies, thesauri, authority files, glossaries, metadata specifications and their application profiles, as well as ontology-driven applications. In this direction, initiatives such as the Agricultural Information Management Standards (AIMS, http://www.fao.org/aims) and the Agricultural Learning Repositories Task Force (AgLR-TF, http://aglr.aua.gr) have been launched to identify, involve and coordinate the activities of as wide a community as possible. Their aim is to try to bring together information providers, research institutes, academic institutions, educational/extension institutions, as well as the private sectors to collectively discuss and bring together efforts of information description and exchange. Important results have been produced as an outcome of such collaborative efforts, and are already put in development and practice around the world.

The aim of the Special Issue on 'Agricultural Metadata and Semantics' is to assess the current status and technologies, as well as identify major challenges and future perspectives, in relation to agricultural knowledge production, organisation, and exchange from a Semantic Web perspective. It aims to provide an overview of the state of the art in this field, by including a wide range of interdisciplinary contributions. Overall, it aims to outline

the rich potential of the agricultural knowledge domain as an application field for advanced metadata- and semantic-driven systems and services.

Fifteen (15) submissions were attracted to this Special Issue, from all around the world. Since the majority of them have been of high quality, we have decided to give space to most contributors so that we have the opportunity to provide an overview of the landscape in this field, by including a wide range of interdisciplinary papers. Overall, we aimed to outline the rich potential of the agricultural knowledge domain as an application field for advanced metadata- and semantic-driven systems and services.

Thus, it has been decided to organise this Special Issue in two parts, one focusing on design and theoretical issues, and the other focusing on applications and systems.

2 Design part

The first paper in this part is 'Assessment of classification and indexing of an agricultural journal based on metadata in *AGRIS* and *CAB Abstracts* databases', by Tomaz Bartol. It illustrates variations among the AGRIS and CAB Abstracts databases, in regards to indexing and classification of the same documents. It achieves this by analysing an animal and plant journal (*Acta Agriculturae Slovenica*), by comparing subject headings in the two databases.

The next paper is 'The LOM application profile for agricultural learning resources of the CGIAR', by Thomas Zschocke, Jan Beniest, Courtney Paisley, Jehad Najjar, and Erik Duval. This paper deals with the development of a metadata application profile, the CG LOM Core, which has been developed on the basis of the IEEE Learning Object Metadata (LOM) standard. The CG LOM Core specifies which metadata elements from a selection of different metadata schemas users of the CGIAR training community are recommended to apply when describing their learning resources. It also provides a mechanism that best suits the needs of the CGIAR Centers in describing and sharing their agricultural learning resources with an international audience.

Then comes the paper 'Ontology learning from domain specific web documents', by Maryam Hazman, Samhaa R. El-Beltagy, and Ahmed Rafea. It focuses on accelerating an ontology-building process via semi-automatically learning a hierarchal ontology, given a set of domain specific web documents and a set of seed concepts. The approach is showcased in developing an ontology of an agricultural domain, using a set of Arabic extension documents.

The following paper, 'A service-oriented framework for controlling invasive species in agriculture', by Brahim Medjahed, Shamil Hadi, and William I. Grosky, deals with the problem of the Emerald Ash Borer (EAB), which has killed or infested millions of ash trees in the USA. It proposed a novel framework, called Sentinel, to automate the dissemination of EAB-related information among EAB partners. It proposes an ontology-based service-oriented dissemination model, and introduces three topic-based notification protocols.

The next paper is 'Modelling and simulating work practices in agriculture', by Roger Martin-Clouaire and Jean-Pierre Rellier. It presents a computer simulation framework that enables work organisation issues in agricultural production systems to be studied. The framework relies on a purposive frame-based ontology of the agricultural production system, and focuses on a subpart of the ontology that concerns the conceptualisation of technical production activities, their organisation in flexible plans, and the material resources required by the activities, together with the various restrictions on their availability and use.

The paper 'Developing rules and criteria for rice ontology construction' presents the work of Aree Thunkijjanukij, Asanee Kawtrakul, Supamard Panichsakpatana, and Uamporn Veesommai. It introduces a pilot project that develops an ontology for plant production, using rice production topic as a case study. This rice production ontology was manually created from scratch, and comprises more than 3,500 concepts and 5,500 terms.

The last paper of the first part is 'Towards a novel content organisation in agriculture using semantic technologies: a study with topic maps as a tool', by Shelly Patwar, Pritpal Kaur, Asil Gerard Sylvester, and Venkataraman Balaji. This paper introduces a framework that combines, for five crops, the technology of topic maps and the global agricultural thesaurus FAO AGROVOC. The framework reveals interesting possibilities when overlaid on a web-based collection of information objects, especially for presenting the repository content in noticeably different ways/audiences (e.g., to subject matter specialists vs. to extension workers).

3 Applications part

The second part starts with the paper 'An ontology-driven system architecture for precision agriculture applications', by Christos Goumopoulos, Achilles D. Kameas, and Alan Cassells. It presents an ontology-driven architecture for developing systems that can be used in precision agriculture applications. A central part of the approach is the use of an ontology that views plants and associated computation as an integral part, and allows the interaction of plants and artefacts in the form of synergistic mixed societies. PLANTS ontology sets up a concept framework that combines the knowledge about sensors, actuators and other domain concepts available on one hand and the biological studies about plant stressing and sensing

mechanisms, and consequent plant behaviour on the other hand, in order to make plants a pro-active component of agricultural systems.

The next paper is 'A mediator-based approach to ontology generation and querying of molecular and phenotypic cereals data', by Antonio Sala and Sonia Bergamaschi. It deals with the development of the CEREALAB ontology, an ontology of molecular and phenotypic cereals data, realised by integrating public web databases with the database developed by the research group of the CEREALAB laboratory. Integration is obtained by using the MOMIS system (Mediator envirOnment for Multiple Information Sources), a data integration system developed by the Database Group of the University of Modena and Reggio Emilia.

The paper 'Using XML data integration and ontology reuse to share agricultural data' has been contributed by Ousmane Sall, Moussa Lo, Fabien Gandon, Cheikh Niang, and Ibrahima Diop. It describes the approach that they have adopted to solve the data integration problem within SIC-Senegal project context, whose objective is to enable multi-agency partners to share their agricultural data sources through a Web platform.

Then, the paper 'TrAgLor, an implementation of IEEE LOM draft standard in agriculture and life sciences', by Zeynel Cebeci, Yoldas Erdogan, amd Murat Kara, is included. This presents the Turkish Agricultural Learning Objects Repository (TrAgLor), a multilingual IEEE LOM Draft Standard compatible learning objects repository. TragLor has been developed as a test-bed to enable the storage, search and retrieval of objects and/or their metadata related with agriculture, food, veterinary and environmental sciences for learners and educators in Turkey.

The following paper is 'A framework for semantic annotation of geospatial data for agriculture', by C.G.N. Macário and C.B. Medeiros. It introduces a framework to create and manage semantic annotations for digital content on the web, for agricultural planning and monitoring. The framework is being developed within the WebMAPS project, a web service-based platform to support agricultural planning in Brazil.

The last paper of the second part is 'Applying an agricultural ontology to web-based applications', by Michael T. Maliappis. This contribution describes the construction of a horticultural ontology, and examines its usage in particular application areas. The proposed ontology is used

- as a refining and classification tool facilitating indexing and searching processes in a repository environment
- as a domain model for a rule knowledge base construction.

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