PRIAMOS: A system for the real time extraction of multimedia semantics and its integration in advanced surveillance and conferencing applications

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Abstract. This paper presents the PRIAMOS research project, aiming to develop reusable core technology for the real-time extraction and management of semantics from combined multimedia sources. The ultimate goal is the use of this technology towards adaptive decision-making systems capable of handling large bulks of multimedia data, within realistic varying environments. Research topics, such as the definition of application specific ontologies describing physical and virtual objects, the construction of knowledge base and intelligent queries inferring information from semantic metadata will be addressed in the scope of this project. Two applications will be enhanced with this core technology: «*Security and Surveillance for Citizen Security*» *and «Smart Room for Meetings and Conferences*».

1 Introduction

PRIAMOS is a GSRT[1] funded research project, which has just started aiming at the development of reusable core technology, for the real-time extraction and management of semantics from combined multimedia sources, towards adaptive decision-making systems. Specifically, the project will investigate

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- Dynamic extraction of multimedia semantics and events of interest (e.g. application specific alerts) within a realistic and varying environment, based on advanced multimedia processing algorithms
- Metadata annotation of semantics, based on application-specific ontologies
- Composition of intelligent queries, inferring information from semantic metadata

The following applications will be developed based on the core technology

- *Security and Surveillance for citizen security*: A distributed, wireless system for monitoring public and private places will be implemented, supporting both real-time emergency handling, and post-processing of large bulks of audiovisual data.
- *Smart room for meetings and conferences*: A system for intelligent monitoring of a smart conferencing room (equipped with sensors) aiming at the organization and management of information produced during a conference or meeting (e.g. who said what, when, high-level conclusions).

2 Research topics of interest

The state-of-the-art of two major research areas will be investigated. Where appropriate available solutions will be incorporated to the PRIAMOS solution while novel methods are expected to be the outcome of PRIAMOS in some of these areas.

Extraction of multimedia semantics: Research on multimedia semantics extraction will be based on existing systems of AIT for monitoring the location and characteristics of humans and objects (e.g. monitoring moving targets, face/eye detection, face orientation detection) [Stergiou05], [Pnevmatikakis05]. AIT will also provide a location tracking system based on processing of acoustic signals [Talantzis05], and other systems for detecting speech and face recognition based on sound processing. By using and combining those systems that are capable of processing multiple multimedia sources, AIT has developed higher-level systems, models and algorithms [Soldatos05] capable of tracking high level situations and metadata. Research will be conducted towards advancing the above systems for use in varying environmental conditions and for real-time object detection [Chang99].

Organization and management of semantics metadata: Three main research issues will be taken into account:

- *Knowledge Conceptualization*: Structuring of physical and virtual objects and concepts (room, person, door, meeting, speaker etc.) as OWL-RDF ontologies
- *Knowledge Base construction*: Person, object and situation recognition and tracking and instantiation within their ontology
- *Intelligent Queries*: Inferring information from semantic metadata (e.g., Which camera is closest to the speaker? Who is closest to the speaker? Who is arguing? Who left before the presentation?) [Pandis05], [Soldatos, Stamatis]

Attending this workshop will help the participants acquire knowledge on the state-of-the-art advances on the above topics, and especially the definition of ontologies and metadata encoding.

3. Participants' short profile

Institute of Communication and Computer Systems (ICCS), National Technical University of Athens (NTUA) (http://www.iccs.ntua.gr/): ICCS was founded in 1989, by the Greek Ministry of Education, and is closely related with the School of Electrical and Computer Engineering, of the NTUA. Its aim is to support research and development in all different areas of telecommunications and computer systems. The Multimedia Communications and Web Technologies (MC&WT) Research Team has been established within the Computer Network Laboratory of the NTUA, in order to undertake educational and research activities in the specific fields of multimedia communications and the Internet, and WWW-related technologies, with applications in areas such as e-learning, e-culture, e-commerce, e-government etc. Some of the recent research activities of the MC&WT team include the following projects

ADAMANT, IST-2001-3911 «Airport Decision And MAnagement NeTwork» (http://adamant.elec.qmul.ac.uk/), with the aim of providing an intelligent, personalized, location-based information and decision support system for travelers and airport services.

AVATON «Volcanic Arc of the Aegean: New Technological Orientations and Cultural Landscapes» aiming at the provisioning of ubiquitous, personalized, location-based multimedia services for tourists within the area of the Aegean Volcano Arch.

E-Museum «Development of an Innovative Platform for the Electronic guidance inside museums and exhibitions», aiming at the design and development of a reusable platform supporting electronic guidance and other advanced services inside museums and exhibitions.

Athens Information Technology (AIT) (http://www.ait.edu.gr): It is a private educational and research institute founded by INTRACOM S.A, the largest IT/Telecom Industry in Southeastern Europe. AIT's mission is to establish a center of excellence for research and education and to foster the development of top-level competitive information and communication technology professionals.

The *Autonomic and Grid Computing* research group of the AIT aspires to achieve pervasive, human- centered, high-performance computing through a combination of user, network and systems technologies. Some of the recent research activities of this group include:

CHIL (Computers in the Human Interaction Loop), FP6-506909: aiming at realizing computer services that are delivered to humans in an implicit, indirect and unobtrusive way.

BReATH - Broadband e-Services and Access for the Home, FP6-SSA-015893: for stimulating and supporting the transfer of know-how and best practices in planning and delivering broadband e-services to the EU New Member States and Associated Candidate Countries.

ELeGI (European Learning GRID Infrastructure), FP6-002205, a semantic Grid for human learning based on ubiquitous, collaborative, experiential-based and

contextualized learning through the design, implementation and validation of the Learning Grid.

Finally, ***Archetypon*** (http://www.archetypon.gr/) is the project's industrial partner with huge experience on middleware technologies, multimedia and e-government solutions. Some of the research activities of Arhetypon include participation in IST-Ontologging (Corporate Ontology Modelling and Management System) and ONTOGOV (Ontology-enabled e-Gov Service Configuration) projects.

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