PROJECTS AND HOMEWORK

Students are required to deepen a topic among those introduced during the class hours. Exceptionally, after agreement with Prof. Schreiber, students can propose a topic from other related courses, which will be presented by researchers in a special lecture.

The work can be made individually or in groups of max. two students. It can be constituted by either the development of a small project (effort about 50 participant*hours) or a survey report (10 – 15 pages more or less) and a public presentation in front of the class, as part of the course hours, with a schedule that will be defined at due time.

Bibliographical references and suggestions for starting the research can be found in the bibliography page.

Some example topics:

- DATABASES IN CONTROL SYSTEMS (SURVEY)
- DSMS ARCHITECTURES AND SYSTEMS (SURVEY)
- ALGEBRIC OPERATORS DEFINITION AND IMPLEMENTATION IN DSMS (SURVEY)
- CROWD-SYSTEMS AND SOCIAL NETWORKS AS DATA SENSORS (PROJECT)

Finally a recent research collaboration has been proposed with the University of Naples in which a number of thesis and projects can be assigned as follows:

Possible Thesis and projects within DATABENC-CASH - A Context-Aware System for cultural Heritage applications

Cultural Heritage represents in Italy a resource of inestimable value. This value gains more and more importance when embedded into the digital ecosystem of a Smart City, where several aspects must be considered: logistics, economy, tourism, entertainment and so on.

This project, developed within DATABENC (www.databenc.it) - a High Technology District for Cultural Heritage Management recently funded by Regione Campania - aims at designing and developing a system (CASH) based on a Service Oriented Architecture providing a set of context-aware applications for assisting users (e.g. tourists, citizens, etc.) in the exploration and management of Single Smart Spaces $S^3$ (e.g. indoor museum, archeological site, historical archive, etc.).
Track 1 - Modeling the Context

1. Extensional Context and Context Evolution Description using CEG
   - **Description:** Study of the formalisms and methodologies for describing the Context Evolution driven by services or generic events, and of the application of the Context Evolution Graph (CEG) for modeling the evolution among context instances in a single smart space; Mapping the generated context instances in the RDF format.
   - **Required Skills:** Object Oriented Programming (JAVA), SOA e BPEL, UML, Relation Databases and SQL, XML/RDF.

Track 2 - Sensor Data Management

1. Data mining and reasoning techniques for event detection in a single smart space
   - **Description:** Definition of data mining and reasoning techniques for event detection on the gathered data from a single smart space captured by PerLa and integration of such techniques in PerLa system for an automatic event detection.
   - **Required Skills:** Object Oriented Programming (JAVA, C++), Sensor Programming (C), Relation Databases and SQL, XML/RDF.

2. Extension of PerLa functionalities
   - **Description:** Definition of a social network as a PerLa sensor network; Management of context and conflicts in PerLa; definition of hierarchical computing techniques in PerLa.
   - **Required Skills:** Object Oriented Programming (JAVA, C++), Sensor Programming (C), Relation Databases and SQL, XML/RDF.

Track 3 - Knowledge Management, Platform and Services

1. Design the Knowledge Base of a single smart space
   - **Description:** Design of a Knowledge Base based on the LOD paradigm and of data ingestion mechanisms to store context information and events; Definition of indexing techniques for big data based on intensional information and semantic methodologies.
   - **Required Skills:** Object Oriented Programming (JAVA, C++), Relation Databases and SQL, NoSQL Technologies, XML/RDF.

2. Definition user profiling and recommendation techniques
   - **Description:** Definition of user profiling and recommendation techniques to support automatic data and services tailoring in a single smart space.
   - **Required Skills:** Object Oriented Programming (JAVA, C++), Relation Databases and SQL, XML/RDF.

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