Ph.D. topic 2014

Combining Data Driven & Knowledge Driven Techniques for the Context Awareness in Ambient Assistive Livings

Supervisor

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Presentation of the Ph.D. topic

Knowledge driven approaches make it easy to leverage the important domain knowledge and common sense inherent to understanding people's behavior. It also performs better than other techniques in situations where a very coarse granularity of situational data is available. Moreover, it does not require any learning dataset before an operational system can be deployed in a given environment with specific characteristics. This observations have defined the direction of our work, relying on semantic rule-based systems, until now.

However, using a purely rule-based and knowledge driven approach has limitations as well. Since this approach relies on the availability of structured and formalized data and prior knowledge, it does not let information emerge from frequently observed patterns implicitly present in the data. We believe that this could be compensated by combining data driven techniques to semantic reasoning. It would indeed make a powerful coupling of rule-based techniques capturing domain knowledge, expert knowledge and common sense; and statistical techniques extracting patterns from data itself in a less "human bound" manner, which would perhaps be more scalable. A data driven approach would also enable more long term observations of the behaviors without having to make the semantic model used more complex and augment the size of the ontology processed. Hence, shifts in the residents' lifestyle could be observed and translated into health assessment markers.

Expected deliverables

We have observed during early investigations an interesting parallel between the limitations of data driven approaches and the advantages of knowledge driven approaches, and vice-versa. Hence, we strongly believe that combining them would probably improve the performance of context-aware systems. The doctoral thesis proposed addresses the design, implementation and validation of mechanisms for combining both techniques. It should introduce new paradigms for the real-time interchange of data and/or results between semantic and statistical reasoning techniques, as well as for the arbitration of heterogeneous reasoning results.

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Keywords

Ambient Assisted Living, Smart Home, Web Services, REST, Javascript, Semantic Web.

Applicant profile

- Master Degree or Engineer Student (last year of studies).
- Skills in programming, REST, Javascript, server-side applications.
- Familiarity with one or more of the following is appreciable: AWS, Heroku, node.js.
- Strong motivation towards this challenging project.
- Open to work with both French and Singaporean scientists
- Availability for starting second semester of 2014.

Gratification: Compliant to French Regulation on Ph.D. students (Contrat doctoral)

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