

Semantic-Based Query Processing on Moving Objects: Position Paper*

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Abstract

In this position paper, we introduce our current research on semantic-based query processing on moving objects. Our goal is to contribute to bridging the areas of Moving Object Databases, the Semantic Web, and mobile Peer-to-Peer systems. Thus, we aim at building a generic solution to process continuous location-dependent requests in highly-dynamic distributed and mobile environments. The solution should not make any assumption regarding the network infrastructure available (e.g., 3G or ad-hoc), the types of moving objects (e.g., static users, moving persons, or drivers in vehicles), or the availability of any centralized knowledge repository (e.g., a well-know data schema vs. distributed and fragmented metadata). In this context, we will apply semantic techniques to represent the meaning of the queries and data and obtain a flexible solution. We plan to study the benefits of the proposal in different use case scenarios.

1 Introduction

Advances in wireless networks and mobile devices have motivated an intensive research effort in mobile data services. Within the field of mobile computing, *Location-Based Services (LBS)*, have attracted a great interest. Moreover, progress in the so-called *Semantic Web*, including applications that consider spatial and temporal dimensions and the vision of the *Geospatial Semantic Web*, enable the development of more intelligent LBS.

A key element to achieve these intelligent LBS is the exploitation of semantic techniques that have been popularized in the areas of the Semantic Web and Knowledge Representation. Thus, the use of ontologies for knowledge representation (encoded in languages such as *OWL*) and the emergence of the *Web of Data / Linked Open Data* open up new opportunities to link LBS and semantics

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and develop LBS that *understand* the user requests and *know* how to behave in unexpected situations. Indeed, linking LBS and semantics can provide interesting benefits [1]: flexible querying, management of semantic locations and trajectories, interoperability among different LBS and providers, protection of personal location information, and reasoning in complex and dynamic contexts.

We aim at developing a generic software architecture to manage continuous location-dependent requests in mobile environments by exploiting semantic information. It is interesting to mention that there already exist systems to process continuous location-dependent queries [2, 3], but they do not manage knowledge about the types of moving objects and their features and assume that the users will formulate precise queries based on a predefined database schema. Besides, they usually make certain assumptions about the network infrastructure or about the behavior of the moving objects. We plan to study the use of the proposed architecture in different scenarios, not only involving classical queries submitted by mobile users but also environment monitoring tasks performed in *Vehicular Ad Hoc Networks (VANETs)*, multimedia mobile data management (e.g., to dynamically select devices that can provide images/videos of interest), and emergency management (e.g., vehicles near an accident cooperating to retrieve and communicate useful information to the emergency vehicles).

2 Interest of this Work in Relation to MOVE

The COST Action MOVE (*Knowledge Discovery from Moving Objects*) “aims to build a network for collaboration that leads to the improvement of ICT methods for knowledge extraction from massive amounts of data about moving objects”. Our ongoing work, presented in this position paper, is related to the field of *Moving Object Databases*, that we intend to bring to a highly distributed and heterogeneous environment and enrich with semantic techniques. We plan to present the challenges that we face and our current ongoing research directions. So, we believe that this topic could be of interest to the participants in the Delft meeting and could foster interesting collaborations.

References

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