Tetherless World Mobile Wine Agent: An Application for Semantics on Mobile Devices*

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ABSTRACT

The Tetherless World Mobile Wine Agent integrates semantics, geolocation, and social networking on a low-power, mobile platform to provide a unique food and wine recommender system. It provides a robust user interface that allows users to describe a wealth of information about foods and wines as OWL classes and instances and it allows users to share these descriptions with their friends via custom URIs. This demonstration will examine how the user interface simplifies generating RDF data, how location services such as GPS can simplify reasoning (reducing the ABox due to context-sensitive information), and how users of the Mobile Wine Agent can utilize social networking tools such as Facebook and Twitter to share content with others over the World Wide Web.

1. INTRODUCTION

The primary goal of the Semantic Web is to redefine how we store, access, and think about data [1]. In this spirit, the Tetherless World Mobile Wine Agent uses semantic technologies and the growing social semantic web to make context-aware wine and food pairings. The Mobile Wine Agent grows out of projects at Rensselaer [3] and Stanford [2] and extends the ontologies provided as part of the W3C's OWL 1.0 Guide [4]. This Mobile Wine Agent enhances those offerings by (1) using a mobile phone platform and (2) leveraging social web technologies to enable sharing of semantic data generated by users. In this demonstration, we will discuss how we leverage the integrated technologies to deliver a robust, social application with a Semantic Web infrastructure.

2. SMART USER INTERFACES

The Mobile Wine Agent has an onboard RDFS reasoner which also understands OWL `Restrictions`[1] and `intersectionOf`. The primary purpose of this reasoner is to act as a querying system for the user interface[2]. When the user wants to request a recommendation, the interface queries for the possible properties which can apply to the object being created and presents them to the user.

Once a user selects to apply a property, the interface displays a number of choices for assigning values to that property. First, a specific value can be picked for the property. In the event that the property is a `FunctionalProperty` or there is a `maxCardinality` restriction of 1 on the property, only one value is allowed for the property by the interface. Otherwise, it displays a list from which the user can pick the appropriate values for the property. Alternatively, if the range of the property is `Class`, the user can choose to specify that the property should accept a `unionOf` class. On the other hand, if the range of the property is not `Class`, the user can choose to specify a `oneOf` class or create a `someValuesFrom` restriction using a named class.

The user interface then takes all of the specifications given by the user and generates either a `Class` which is an `intersectionOf` a set of restrictions which would match such an instance in a reasoner or it generates a instance with the property/value pairs assigned. These descriptions are passed as RDF/XML to the server as part of commands.

3. LOCATION AWARENESS

Almost every mobile phone manufacturer produces handsets which have built-in GPS capabilities. The Mobile Wine Agent takes advantage of these features to determine the user's current location to display a map of nearby restaurants with RDF versions of their menus[3] (see Fig. 1). We currently provide a few restaurant menus in RDF and are working on a desktop agent which makes it easier to generate the appropriate RDF. The user can select an option that loads a restaurant's menu and wine list into the wine agent. Once the menu and wine list are loaded, users can select individual instances instead of describing them by hand. This allows the application to consider only the individuals contained within as suggestions given recommendations. This results in a context-aware response which enhances the user's interaction with the application. In order to enrich the data set, restaurants can include in their RDF pairings between particular dishes and wines they offer, further extending the agent's ABox. This location-based extensibility,

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[1]All typeset names are in the OWL namespace unless otherwise specified.

[2]A demo of the interface can be found online at http://wineagent.tw.rpi.edu/media.php

[3]At this time, restaurants must register their menus with the agent before they will appear.

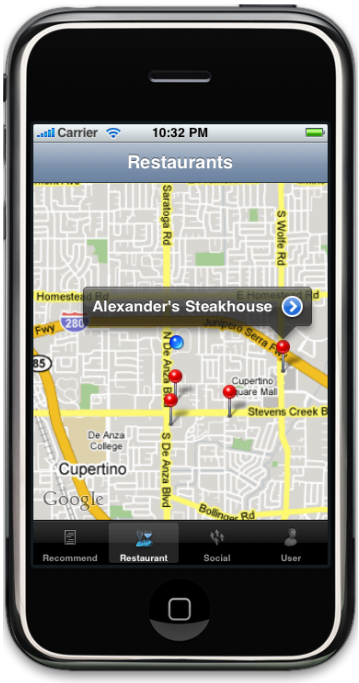

Figure 1: The Mobile Wine Agent can use GPS coordinates to display nearby restaurants which provide their menus as RDF instance data.

which would have been extremely difficult in the old Wine Agent, is simple to use on a mobile platform.

4. SOCIAL INTEGRATION

The Mobile Wine Agent supports direct interaction with two popular social media: Facebook and Twitter. Facebook users can view their friends' recommendations and have the agent prioritize them. They can use friend lists or events to organize with whom they interact and share preferences. This allows event organizers to import preferences of attending individuals who opt to share their preference data. This data can be used to make group recommendations for events. In addition, the Mobile Wine Agent provides templates so that users can record the foods or wines they consume as part of the Facebook news feed.

Similarly, the agent is capable of posting information to a Twitter stream if the user so prefers. Wines, dishes, recommendations, and restaurants all have a "Post to Twitter" button which the user can activate. The Mobile Wine Agent provides a text box for the user to enter a message and pre-populates it with the URI of the resource he or she is commenting on. This allows users to share their experiences with others over existing social web infrastructure while engaging Semantic Web frameworks.

The agent records certain user actions. For example, if a user requests a recommendation from a friend, the agent will store a triple representing this request. Further triples are added if the user likes or dislikes this pairing. Similar events also occur for wines, dishes, and restaurants. The result is an interaction graph in RDF which other services can access via HTTP.

In order to facilitate communication using media unaware of the Semantic Web, each resource is assigned a URI which uses a custom scheme associated with the Wine Agent. A capable browser, with an appropriate wine agent (e.g., the Mobile Wine Agent on iPhone) installed, will cause the agent to load the resource. For other clients, an XSLT stylesheet is supplied along with the RDF to render the data as HTML. This allows individuals to post links to foods, wines, recommendations, and restaurants on any web page so that other users can click those links to access the resources.

5. CONCLUSIONS

Mobile platforms provide a variety of different tools for creating rich user experiences and since phones themselves are part of the fabric of society, it is important to integrate with and extend these capabilities. The Mobile Wine Agent utilizes mobile phone features, such as GPS, as well as outside resources, such as Facebook and Twitter, to allow users to interact and share their dining experiences. Since the wine agent is built on top of Semantic Web technologies, it can also rely on external resources to expand its knowledge base and play a more dynamic role by letting the user import data from elsewhere on the web. The culmination of these three vital components is a tool which anyone without experience in the Semantic Web can use to create and share open data with the rest of the world.

6. FUTURE WORK

The next step to expanding the capabilities of the Mobile Wine Agent is to develop a full OWL reasoner for the iPhone platform. This will allow the agent to perform all the necessary reasoning locally or distribute the reasoning between client and server. This will also enable the agent to reason about a group of individuals by having devices talk to one another about their owners' preferences and choices for food or wine. Using a communication medium like Bluetooth, clients will be able to communicate data to one another and work together to reason over the data set with the goal of choosing the most appropriate wines given restaurant data, recommendations, and individual user preferences limiting foods, wines, and recommendations.

In order to encourage the creation of content, a desktop tool is being developed for business proprietors to generate RDF instance data using an interface technique similar to the one used on the Mobile Wine Agent. With this, restauranteurs and vintners will be able to generate information about their products quickly and have it available online for the Wine Agent or users to seek out.

7. REFERENCES

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