

ContextWatcher – Connecting to Places, People and the World

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Abstract

We present our latest efforts in bringing semantic technologies to a mobile application called ContextWatcherⁱ. ContextWatcher automatically collects context information centered on places you visit and people you meet. Gathered data is semantically enriched through probabilistic and ontology-based reasoning to be shared with others in a networked context management framework.

1. Introduction

Sharing personal moments with your family, friends or even an entire community through online services has become increasingly popular. However, many of these services, such as personal Weblogs (aka Blogs), still require a considerable amount of manual work in selecting and editing the content to be made available online.

In this paper, we present ContextWatcher, a semantic-based application that allows the mobile user to easily collect personal context information and semantic annotations in daily life, to share it with others through different applications, including Weblogs. ContextWatcher (CW) has been developed within the IST project MobiLifeⁱⁱ and builds on the MobiLife Context Management Framework (CMF) [1], which aims at the management of distributed contextual data. The MobiLife CMF has been designed and implemented as a network of interconnected Context Providers (CPs) in an architecture that enables the transformation of quantitative context information into qualitative statements about a user's given situation. We extended our early prototype [2] by tightly integrating probabilistic and ontology-based reasoning mechanisms. The resulting situational reasoning mechanism combines a set of context ontologies, differentiated social relationships as well as the interpretation of temporal data together with an efficient spatial clustering algorithm.

2. The ContextWatcher client

With its tab-based navigation, the ContextWatcher application offers an intuitive and user-friendly interface, which makes it easy to share your life as you live it. As depicted in Figure 1, each tab represents a certain type of personal context. The activity tab, for example, lists the user's recent situations based on cluster learning and situational reasoning. The buddy tab shows all distributed context information from the user's buddies, including their current location, their latest picture or nearby buddies. Similarly, social relationships can be managed, photos can be taken or points of interest can be received, right from the client application. As a result, ContextWatcher helps keeping in touch with relatives and friends in multiple ways. Context-tagged pictures on Flickrⁱⁱⁱ, buddies visualized in Google Earth^{iv} as well as automatic daily blog summaries on Blogger^v, which cover all personal events throughout the day.

3. Context enrichment and reasoning

Context enrichment is the process of gathering data from various sources and the subsequent extraction of qualitative knowledge. In ContextWatcher, this process of knowledge deduction is based on semantic descriptions, formulated using OWL-DL and enables the actual reasoning on social, temporal and spatial aspects.

2.1 Learning important places

We use probabilistic clustering techniques to automatically detect a user's frequently visited locations (cf. Figure 2). To this end, different types of location (geo and beacon based), the time of the day and the day of the week [5] are considered. In case of missing information, gradually less specific layers of information are taken into account. When a new cluster has been detected, the user can assign a tag specifying this location. For the average CW user, the most com-



Figure 1: The ContextWatcher client

monly tagged clusters are “home” and “office”, followed closely by places of friends and family. Whenever a user is in one of his favorite places, this information is communicated to all approved buddies and displayed within the buddy list. Additionally, buddies can also be grouped based on their situation, e.g., making it easy to address all buddies who are currently at a soccer stadium in order to send them an SMS.

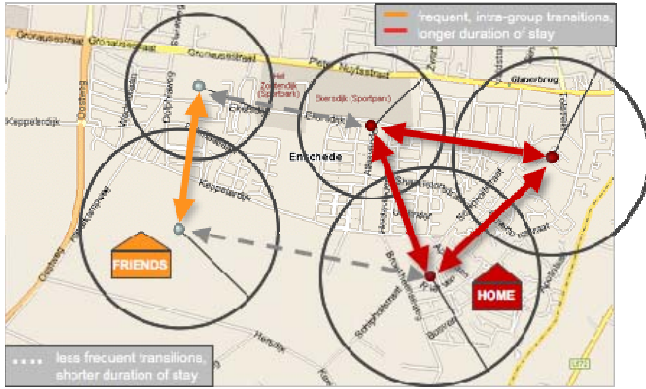


Figure 2: Location clustering

2.2 Tagging and linking

Tagging is a way of assigning names or short descriptions to digital content and allows you to add a certain meaning to objects. The ContextWatcher does not only assign user-defined tags to the taken pictures, but, in addition, automatically assigns all available pieces of context information present at that time. Apart from geotags, this includes nearby buddies, information on time as well as the current weather. However, without mapping those tags to the underlying ontology, this information is of no avail for context reasoning. Concerning this matter, the CMF anticipates the automatic linking of context fragments to well-defined concepts of the appropriate ontology. Due to the fact that certain types of context information, e.g. learned location clusters, must be assigned by the user himself, the ContextWatcher also provides a quick and easy way of adding ontology references right from the client application.

2.3 Social relationships

The social connection between users primarily enables a more fine-grained service composition as well as distribution. Managing personal context information also means having to differentiate, for instance, between highly trusted parties like family members on the one hand, and rather loose contacts like business partners. Based on the relationships' specifications, the social reasoning [2] aims at complementing the social network and helps to interpret different context scenarios.

2.4 Ontology-based reasoning

Ontology-based reasoning in ContextWatcher is based on a set of OWL DL ontologies that provide axiomatic descriptions of a context vocabulary. A classification process is used to determine the user's current situation [5]. For exam-

ple, a business meeting situation is derived in case all attendees are colleagues (a transitive relation), it takes place during office hours and is further located at the office.

4. Related work

Reacting to the immense popularity of sharing personal content online, Yahoo Research recently introduced ZoneTag^{vi}, a mobile application that allows users to upload snapshots to their online picture service Flickr. Similarly to the ContextWatcher, geotags (usually based on cell tower) are automatically assigned to each picture to simplify browsing through a web-based library. However, these tags lack the underlying semantic descriptions, a major prerequisite for facilitating the use of ontology-based reasoning.

Another related project, introduced by the University of Helsinki, is called the ContextPhone [6]. Based on this prototyping platform for a context aware mobile environment, two applications, ContextContacts and ContextMedia, have been implemented. Both applications are tightly integrated with the standard phone applications and facilitate the sharing of digital media (e.g. photos via Flickr), cell-based location information as well as presence information about the user's interaction with the phone. However, no learning or reasoning is applied to further enhance context data.

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5. References

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ⁱ <<http://portals.telin.nl/contextwatcher/>>

ⁱⁱ <<http://www.ist-mobilife.org/>>

ⁱⁱⁱ <<http://www.flickr.com/photos/tags/contextwatcher> >

^{iv} <<http://earth.google.com>>

^v <<http://mwag770.blogspot.com/>>

^{vi} <<http://research.yahoo.com/zonetag>>