iCITY – an adaptive social mobile guide
for cultural events

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Abstract. In this paper we present iCITY, an ongoing project, aimed to be a social adaptive mobile guide that exploits Semantic Web technologies in a Web 2.0 vision in order to provide cultural events of the city of Torino. The main goal of the iCITY project is to show i) how navigation and information retrieval in ubiquitous environment may be improved using Web 2.0 principles, in particular by means of social tagging; ii) the advantages of social networks and users' collective knowledge for providing accurate and trustworthy information.

1   Introduction

Nowadays, web paradigm is evolving from a "desktop-metaphor" to "mobile computing", and from there to "ubiquitous computing" [5].
The research on intelligent systems has recognized that *adaptation* is an appropriate way to achieve ubiquitous goals [3],[4],[9] by designing systems that are "no longer static stand-alone applications, but dynamic integrative environments that configure themselves according to the individual needs of the user, the context of use, and the platform requirements" [10].
   In this paper we present the underlying ideas of iCITY[1], an adaptive social mobile guide that exploits Semantic Web technologies in a Web 2.0 [8] vision in order to provide personalized information about cultural events of the city of Torino. The main goal of the iCITY project is to show i) how navigation and information retrieval in ubiquitous environment may be improved using Web 2.0 principles, in particular by means of social tagging; ii) the advantages of social networks and users' collective knowledge for providing accurate and trustworthy information. In Section 2 we describe iCITY and we compare it to UbiquiTO [1], a system we developed in the past, showing how the main limitations of UbiquiTO have been overcame in iCITY. In Section 3 we briefly present a sketch of the iCITY architecture, and in Section 4 we

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[1] The entire name of the project is Digital Semantic Assistant / iCITY. The Department of Computer Science of Turin, the City of Turin and CSP - ICT innovation contribute to it.

conclude the paper providing next steps in the project and future directions of the research.

2 Main features and advantages of iCITY

As introduced above, iCITY can be seen as an evolution[2] of UbiquiTO [1], a mobile adaptive guide that provides personalized location-based tourist information about the city of Turin. UbiquiTO integrates different forms of adaptation: to the device (web access via Desktop, Laptop, PDA, smartphone); to the user (personalized interaction); to the context of interaction, in particular to the user location.
The main limitations of UbiquiTO are consequences of a centralized production of content (top-down approach). Therefore, i) the content organization and categorization is fixed since it is decided by the designers. Therefore, users could experience some difficulties in retrieving information, since the designer's mental model could not match the user's mental model; ii) the content insertion is a time consuming operation, and sometimes the content may be out of date; iii) there is no possibility for users to actively take part in the process of content production; iv) the modalities of navigation are predefined, even if personalized (e.g. items ordering).
   The design of iCITY aims at overcoming some of these limitations. It is a social mobile guide, web-based, accessible both via desktop and mobile devices, providing information about the events that occur in the city of Turin in a personalized and adaptive way. The content conveyed by iCITY are collected in RSS format[3] from *TorinoCultura*[4], a web portal managed by the municipality of Torino for informing citizens about cultural ongoing events in the city. iCITY adapts content, presentation, and navigation structures to the specific users needs, differently from *TorinoCultura* that provides the same content for all the users. Another difference with respect to *TorinoCultura* (and to UbiquiTO, as above explained) is that in iCITY the user is actively involved in the process of content creation. She may add i) *events* and details on events not provided by *TorinoCultura* RSSs, as well as comments and assessments on events; ii) *tags*, which are keywords, labels, category names used to represent a concept that a user may associate to a specific event according with the associations in her mind [6]. In this way, the system turns out to be collaborative in a community and social network perspective. The content created by the users enriches the system knowledge, according to Web 2.0 paradigm (where the user is active not only in the fruition of contents but also in their production), and it can be seen as a metaphor of the concept of *peer production*. "Peer production" is a term coined by Yochai Benkler to describe a "new model of economic production (…) in which the creative energy of

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2 For a different evolution of the same project, see [5]

3 RSS is a XML format used for the distribution and diffusion on different channels (syndication) of list of links, titles, and summary of news (http://www.rssboard.org). Notice that, in this way, the source of information could be easily integrated with other RSS sources delivering events information in the same format. Moreover, this approach could be extended to other domains by changing the part of the knowledge base that manages the relationship with the RSS source.

4 http://www.torinocultura.it/

large numbers of people is coordinated (…) into large, meaningful projects, largely without traditional hierarchical organization or financial compensation"[5].

The opportunity offered by the idea of *peer production* applied in iCITY seems to fit quite well, since the content is partially provided by the system in a top-down approach (official content from RSS) and partially provided by users themselves in a bottom-up approach (events and tags from user).

On the one hand, the possibility for users to add contents i) lets to define a "space" where users can collaboratively partake in the creation of content, and ii) offers users to receive more complete and updated list of events. Moreover, it allows to define folskonomies representing the users' categorization of the domain. These folksonomies are exploited to enrich or modify the domain ontology used by the system to represent the cultural events of Torino. On the other hand, iCITY lets the content accessible in a more user- centered way, by making users navigate not only through the traditional category paths, but also by means of the tags added by other users. In this way they are not compelled to navigate following a fixed categorization of top-down organized contents. A more flexible modality of navigation represents an advantage especially in ubiquitous contexts, where the attention and the availability of time is strongly influenced by the contextual conditions.

Furthermore, iCITY has been conceived with particular care to a usable and intuitive fruition of contents; particular attention has been devoted to the design of the user interface for mobile devices by adapting the structure and the content to the user, and following the recent Mobile Web Best Practices[6]. To simplify users cognitive effort in the mobile interaction, not only a more intuitive navigation through tags is made possible, but we introduced web map navigation as well. UbiquiTO also offers a web map to users, but only to provide their current location by clicking on it. In iCITY, instead, the digital map-making assumes a fundamental role in representing the recommended events, since it provides the user with a clear and immediate visualization of their location in relation with her position.

3 Architecture

Fig.1 illustrates a brief sketch of the architecture of the system with an explanation of the most relevant involved modules.

Dialog manager: it manages the interaction between the user and the system and forwards the data to the involved modules.
Content insertion manager **(C.I.M.)***:* it supports the user in the insertion of content, simplifying some operations on the basis of context features and suggesting tags, on the basis of user features; then it stores these data in the database, through the DB Manager.
Recommender: it provides personalized recommendations about cultural events starting from data stored in the data base and regarding the current position of the user and her estimated preferences.

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[5] http://en.wikipedia.org/wiki/Peer_production
[6] http://www.w3.org/TR/mobile-bp/

Context module: it gathers information about space-time context and device, making them available for the adaptation of content, presentation and modalities of interaction.

Presentation adapter: it adapts the user interface according to the user characteristics, preferences and current device.
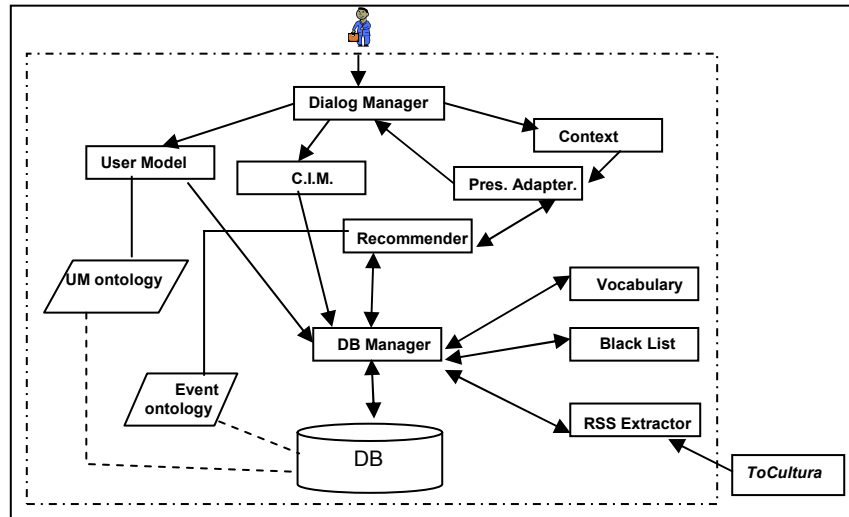

Fig.1. The architecture of iCITY

User modeling module: it creates and updates the user model. In detail, the *initialization sub-module* makes inferences starting from the user registration data and it initializes the model; the *behaviour- tracking sub-module* observes the interaction of the user with the system (e.g. content insertion, content search, bookmarking, etc.), learns from it (e.g. cultural interests and knowledge, involvement level, trust in the system, similarities with other users) and updates the model; the *tagging sub-module* analyzes the tagging activity of the user to update the user model (e.g. personal tags, similarities with other users tag-based).

RSS extractor: it extracts information about events form the RSS feeds of *TorinoCultura*[7].

User model ontology: it is partially derived by concepts from FOAF[8] and UbisWorld[9]

Event ontology: it is defined starting from RSS feeds.

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[7] http://www.comune.torino.it/torss/index.shtml

[8] http://xmlns.com/foaf/0.1/#sec-foafvocab

[9] http://www.u2m.org/UbisWorld/

5 Conclusion and future work

iCITY exploits Semantic Web and Web 2.0 paradigm in order to provide personalized information about cultural events of the city of Torino.

The paper presented the basic ideas of the design of iCITY, with a special focus on how navigation and information provision may be improved using users' collective knowledge.

At the moment we have implemented the modules regarding the RSS extractor and the Content Insertion Manager, namely the components for tagging and peer production, next steps will be the definition of user modeling and context modules.

As future work, we are going to explore the chance of using social networks for providing accurate and trustworthy information. In particular, we are working on the definition of a community of user with similar features in order to i) provide recommendations of content and navigation in a collaborative filtering perspective (since more information on a user can be achieved analyzing the behaviour of similar users), and ii) create a network of users that can communicate on ongoing events of the city. We are investigating the trust mechanism in a social network in order to evaluate the information provided by the user.

At the same time, we are enriching the content provided by *TorinoCultura* RSS with other Web resources available as RSS feeds.

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