Situation-aware Task-based Service Recommendation

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Abstract

In this demo, we introduce a task-based mobile service recommendation system that is able to propose the most appropriate task-list to a user in a given situation by using situational reasoning.

1 Task-based service recommendation

In everydays life people are dealing with various kinds of tasks and problems. We have developed a task-oriented service navigation system [1] that supports the user in finding appropriate services. This includes even services the user might not have been aware of before. This is possible through making use of a rich task ontology representing common sense about typical complex tasks. The architecture of this initial service navigation system is illustrated in Fig.1.

The usage of the basic task navigator is as follows. After specifying a task-oriented query such as “Go to theme park” a list of tasks that match that query is sent to the mobile device. Now the most appropriate task can be selected and in turn the corresponding detailed task-model is shown to the user. In a final step, associated services can be invoked by establishing an Internet connection to invoke actual i-mode services.

In this demonstration we present an extended task navigator that takes the users situation into account and thereby avoids the necessity to input an initial task query. Situations are computed by applying ontology-based logical reasoning to the available context data such as time, location and people in proximity [2]. The extended system achieves improved usability, especially for non-expert users, who are not willing to input queries.

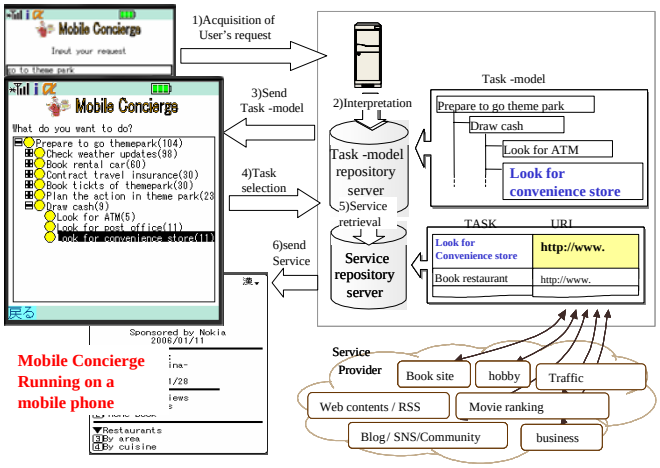

Fig.1 Architecture of task based service navigation system

2 Situation-aware task recommendation

To express complex user contexts we have defined a set of context ontologies expressed using W3C’s Web Ontology Language (OWL). The single component ontologies are integrated by a situation ontology that defines a top-level concept “Situation”. This concept is refined by a set of concepts such as “Private” and “Business” that are defined by referring to concept and relations defined in the other component ontologies. Situational reasoning is realized using a Description Logics reasoning engine that classifies concrete individual situations w.r.t. the situation ontology. Let us consider the following situation. On a Sunday morning A is together with his wife B at the Tokyo station. First, each piece of context information such as the location ("station"), time ("Sunday morning"), and companions (his wife "B") is represented in terms of vocabulary formulized by the context ontologies. This requires mapping given quantitative data to qualitative representations (e.g. mapping a timestamp such as “2006-01-29T02:00:00.000Z“ to an individual in the ontology representing “Sunday morning”). The qualitative representations are enriched by the world-knowledge formulized in the component ontologies and combined to an individual in the situation ontology for classification purpose. In our example, the situation of A is classified as "Private", since he is located at a public place (as “Station” is defined a subconcept of “Public_place”) during leisure hours (as “sunday_morning” is classified as “Leisure_time”) accompanied by relatives only (as B is the wife of A and “wife” is a subrelation of “relative”).

Finally, to be able to recommend an appropriate task-list corresponding to the user's actual situation, tasks are categorized according to the high-level context concepts given by the ontologies such as “Situation” and ”Place”. On request the task engine returns a filtered task list that results from matching the inferred user situation with the task-specific categories.

3 Brief demo explanation

The cell phone used in the demonstration is equipped with a Felica contact-less RFID[3] tag that is accessible via a standard Java interface and enables a two-way communication with Sony’s Felica Reader-Writer devices as shown in Fig. 2(a). For our demo we assume that a

Felica Reader-Writer is installed near the gate at Tokyo station (like the mobile Suica system that is currently deployed by Sony and NTT DoCoMo for JR East[4]) and that it delivers location information to the mobile phone via its Felica tag whenever the user puts it close to the Reader-Writer device as shown in Fig. 2(b).

The scenario of our demonstration is as follows. Dawson Campbell, the main character, and his colleague Fiona Davidson are at Tokyo station one afternoon taking the train to another facility of their company located outside the city. At first, Dawson Campbell passes the gate at Tokyo station as shown in Fig. 2(b). The task-list associated with the location concept “Station” appears on Dawson's cell phone and includes the entries "Prepare to ride a train", "Buy souvenirs", "Meet someone at the station" etc. as shown in Fig. 2(c). While displaying the task-list, Dawson's phone connects to the situational reasoning engine and updates Dawson's location to “Tokyo station“. No task-list is shown on Fiona's cell phone at this moment.

Few seconds later, Fiona Davidson passes the same gate at Tokyo station (Fig. 2(d)). Fiona's phone connects to the situation reasoning server and uploads Fiona's new location ("Tokyo station"). In turn, the situation reasoner infers that Dawson Campbell and Fiona Davidson are both located at Tokyo station, traveling together. The situation reasoning engine refers to the situation ontology, and then finds that the relation between Dawson Campbell and Fiona Davidson is colleague. Dawson's situation is reasoned based on time ("afternoon"), place ("station") and relation ("colleague"). In this case, the reasoned situation becomes BUSINESS and this judgment is then passed to both Dawson's and Fiona's cell phone and service navigation server. Both Dawson and Fiona's cell phone shows the reasoned results as shown in Fig.2(e). Service Navigation server acquires the task-list that is determined from both reasoned situation ("Business") and the place ("station"), and then sends the acquired task-list to both Dawson's and Fiona's cell phone (Fig.2(f)).

The second demo scenario is as follows. Dawson Campbell and his father in law Mark Buchanan are at Tokyo station during an afternoon to go somewhere by train. In this case, the inferred situation is "Private", and corresponding task-lists appear on both Dawson's and Mark's cell phone.

The key point of these scenarios is that the delivered task-lists are tailored to the different user situations, "Business" or "Private", even if both place and time are the same, station in this case.

Demo requirements: LAN access point, either wireless or wired LAN is OK.

References

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[2] M. Luther et al.: Situational reasoning – a practical OWL use case. In Proc. of the 7th Int. Symposium on Autonomous Decentralized Systems (ISADS'05), 2005.

[3] http://www.nttdocomo.co.jp/english/p_s/i/felica/index.html

[4] http://www.jreast.co.jp/suica/

(a) Gat at Tokyo station

(b) Dawson passing the gate

(c) Dawson's phone displaying the task-list suited for station

(d) Fiona passing the gate

(e) Both phones displaying the inferred situation BUSINESS

(f) Both phones displaying the task-list associated with the situation BUSINESS

Fig.2 Demo Sequence