

# Service Navigation System Enhanced by Place- and Task-based Categorization

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## Abstract

We have developed a task-based service navigation system to guide the user to appropriate services that will help the user perform real world activities. In this paper, we propose a place-based and general-task-based service navigation system that offers enhanced usability. We compare our General-task and Place-based methods to Google and Yahoo mobile portal engines. The results show that our methods are effective from the viewpoints of the speed to find the goal site and the variety of services, found respectively.

## 1 Introduction

People face various kinds of problems in the real world. We have developed a user task-oriented service navigation system[1] that navigates the user to appropriate services even if user does not know that the service exists in advance by designating the most appropriate task from task-model. The concept of the service navigation system is illustrated in Fig.1. A user uses the service navigation system as follows. At first, the user inputs a task-oriented query such as "Go to theme park", and then a list of tasks matched to the query is retrieved and sent to the mobile device. The user selects the most appropriate task, and the task-model of the selected task is shown to the user. The user can access the service by using the Internet connection function provided by the mobile handset (Fig.1). In this paper, we enhance this system so as to improve its usability for non-expert users, who are not willing to input queries. To omit the query acquisition process, task categorization is the most important task to be resolved.

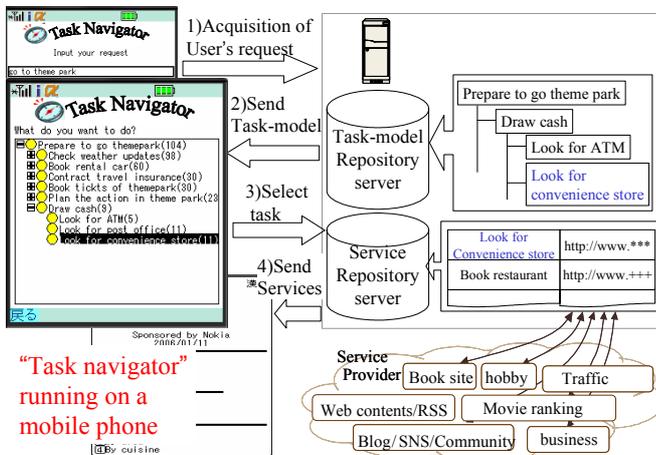


Fig.1 Architecture of task based service navigation system



Fig.2 View of place based (left) and general-task based (center) service navigation system and task-model navigated from both type of service navigation (right)

## 2 Place-based and General-task-based Service Navigation System

We first describe the property of the task. Task, which is a real world problem solving action, depends highly on the real world domains such as place and object. Actually, task consists of a domain dependent part and a domain independent part, which are mostly represented by nouns and verbs, respectively. We call the domain independent part general task. For example, the task "Watch movie at theater" has place domain "theater" and object domain "movie" and general task "watch".

Based on the above discussion, we propose two approaches to categorizing tasks. One is to categorize the task according to its domain, which we restrict to place. The other way is to categorize the task according to its general task. We call service navigation based on these two categorization approaches the Place-based and General-task-based service navigation system.

A view of Place-based service navigation is shown in Fig.2(left). Place domain has two meanings; place related to planning the task and place related to executing the task. Accordingly, we set two kinds of place categories: category of current place and category of destination place. At first, the user is asked to select the place from the place list. The appropriate task-list of selected place is then shown to the user. Finally, the user can reach the task-model by selecting the task, "Watch movie" in this case, from the task list (Fig.2(right)).

A view of General-task-based service navigation is shown in Fig.2(center). There are two list boxes: the general task selection box and the domain selection box. To construct both lists, we separate the task into the general task part and the domain part. We put the set of the separated general tasks into the general task list box and put the set of the separate domains corresponding to each general task into the domain list box of the corresponding general task. To use this menu, the user first chooses the appropriate general-task from the general-task list box,

and then the domain list corresponding to the selected general-task is shown in the domain list box. The user can reach the task-model by choosing both general-task and domain.

### 3 Evaluation of Service Navigation

We evaluated three types of service navigation systems, Place, General task, and existing query based service navigation systems by comparing them to Yahoo portal site[2] and Google[3]. We set two evaluation criteria: 1) how fast user can find the site that satisfies the designated purpose and 2) the range of sites that satisfy the designated purpose. To evaluate criteria 1), we set the problem as follows: You are in a department store looking for a bottle of wine as a gift to your friend on his birthday. Please find a mobile site that provides a description of wines and recommendations. To evaluate criteria 2), we set the problem as follows: You are at the station and have just missed your train. You must wait for a few hours. Please find as many sites as possible that provide recommendations on how to spend your time until the next train. We posed these two problems to 40 subjects.

The results for criteria 1) are shown in Fig.3. As you can see from this figure, General-task-based service navigation is the fastest of the five methods. This is because, in case of Google, the results include sites such as user's diary or blogs, which are not directly related to the purpose. In case of Yahoo, the top page contains several vague category names which confused the subjects such as "gourmet", "hobby", and "shopping". In the case of Place navigation, the user's purpose, finding a wine site, is not directly related to the user's current place and the user is confused about how to find the site from the top page. In case of query navigation, the subjects took some time to input the query.

The results for criteria 2) are shown in Fig.4. This figure shows the category of sites found by the subjects for all methods. The number in the table represents the sum of the sites found with each method. In this test, all subjects first used Google. If the subject did not find the service in Google but could find it using one of the other methods, it can be said that subjects could find the sites that were unknown to the subjects in advance of this test. The sites that were not found in Google (number is 0) but that were found in Place method or General task method (number more than 2) are highlighted in yellow; they include sites such as "rambling", "theme park", "castle", "temple", and "nail salon". As you can see from this figure, almost 1/3rd of the site categories are colored yellow. In the case of Yahoo, most of site categories colored yellow are 0. This result shows that Place-based service navigation allowed the subjects to effectively find various kinds of sites for the purpose of killing time.

To summarize the above evaluation, if the user has the clear purpose, i.e. find a site that discusses wines, General-task-based service navigation is the most appropriate method. If the user has a vague aim and no

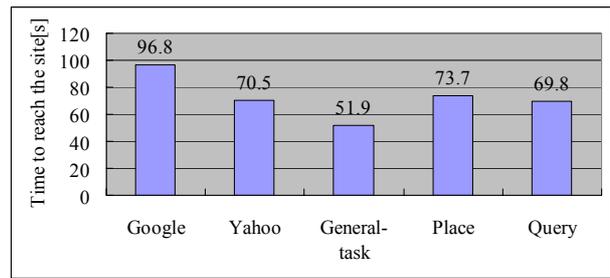


Fig.3 Comparison of time to reach the goal site

Kinds of site	Place	Query	General-task	Google	Yahoo
Have a meal	17	17	22	11	4
Go to cafe	16	10	15	6	16
Check tourist guide	13	3	0	11	21
Go to museum	12	3	8	2	5
Watch movie	4	4	7	6	4
Go to department store	2	5	3	6	2
Go rambling	5	0	12	0	1
Go to hot spring	0	5	0	4	8
Karaoke	0	5	3	7	1
Buy souvenirs	6	3	1	4	0
Go to themepark	4	4	1	0	3
Go to aquarium/zoo	2	1	0	1	7
Use facilities of station	4	1	6	0	0
Go to castle	2	0	8	0	0
Go to temple	3	0	7	0	0
See nearby map	3	5	0	0	2
Check evnet info. (festival or fireworks)	4	0	3	0	1
Check game download site	0	1	0	5	1
Go to Manga-café(Café you can read various comics)	0	0	0	5	1
Go to nail salon	3	1	1	0	0
Develop film	1	0	4	0	0
Go to bookstore	0	0	1	3	1
Check interesting site (fortunetelling)	0	0	0	2	3
Go to pachinko	2	0	1	1	0
Check news site	0	0	2	1	0
Get a massage	0	2	0	1	0
Go to music store	0	0	0	1	1
Get transit information	2	0	0	0	0
Go to game center	0	0	0	2	0

Fig.4 Kinds of site subjects found during evaluation test

clear purpose, i.e. find the service useful to killing time, Place-based service navigation works well.

As the next step to creating a comprehensive service navigation system, we must consider the service recommendation service. To realize this service, we must deal with two main issues; recognition of the user's task or problem faced in the real world and system personalization by learning the usage pattern of the service navigation system.

### References

[1] T. Naganuma and S. Kurakake: Task Knowledge Based Retrieval for Service Relevant to Mobile User's Activity, 4th international semantic web conference, Y.Gil et al. (Eds.): ISWC 2005, LNCS 3729,pp.959-973, 2005.  
 [2]<http://www.yahoo.co.jp>  
 [3]<http://www.google.co.jp/imode>