Physical Mobile Interaction with Dynamic Physical Objects

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ABSTRACT

The proposed demonstration offers the possibility to access and interact with (web) services through Physical Mobile Interaction (PMI) with tag-based dynamic physical objects such as papers. Our demonstration supports several direct manipulation gestures in the real world and deals with physical objects able to provide system feedback to the user during the course of the interaction.

1. MOTIVATION

Physical Mobile Interaction (PMI) facilitates the usage of mobile services through the interaction with augmented physical objects. This interaction paradigm benefits from the dissemination of technologies such as Near Field Communication (NFC). PMI basically uses mobile devices to extract information from augmented objects such as associated information and services.

However, user interactions with tagged objects are so far rather limited since only one gesture *(single selection)* is supported. Moreover, contrary to dynamic objects, static objects do not provide any feedback to user inputs. Dynamic physical objects such as papers are indeed able to display the projection of a service user interface.

The next section describes our demonstrator while section 3 specifies its setup.

2. DESCRIPTION

The proposed demonstrator bridges two important research topics; namely ubiquitous service access and direct manipulation. It represents an enhancement of the work done within the PERCI-project (PERvasive serviCe Interaction), a collaboration between the University of Munich and DoCoMo Euro-Labs.

Mobile HCI'07, September 9-12, 2007, Singapore.

Indeed, this demonstrator supports PMI with a tagged dynamic physical object –a paper- able to provide system feedback on user inputs. Moreover, this demonstrator supports complex interaction techniques such as direct manipulation gestures (namely *single selection, bounding box selection and path selection*) for selecting areas of interest.

Our demonstrator consists of an apparatus where a map service stored on a server and a tags matrix is placed behind a paper (see figure 1). Using a projector, this paper can then display a dynamic map. A mobile phone is used to interact with such a map, through PMI with the tagged paper.

The user selects items of interests on his mobile phone (e.g. shops, museums) (see figure 3a) and defines the interaction technique (see figure 3b) to select the area of interest on the map.

The service update is computed after user interaction and an updated UI is displayed on the paper (see figure 2) as well as on the mobile phone (see figure 3c). Such UI highlights the selected area by marking red the corresponding tags. Moreover it uses several logos to locate the items of interests.

During user studies, 90% of participants expressed their interest to use such a system. The same percentage of test users confirmed the usefulness of getting visual feedback on physical objects. Indeed, this actually reduces the cognitive workload due to the usual attention shift when one interacts with a physical object but still has however to look at the mobile device to get visual feedback.

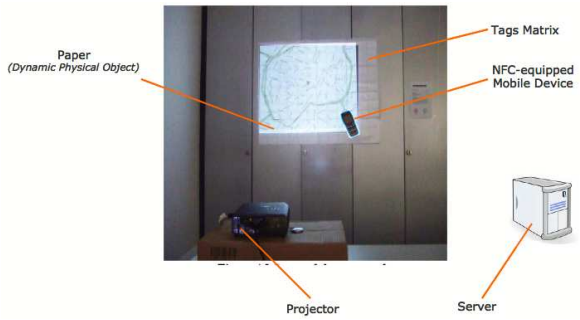

Figure 1: Apparatus

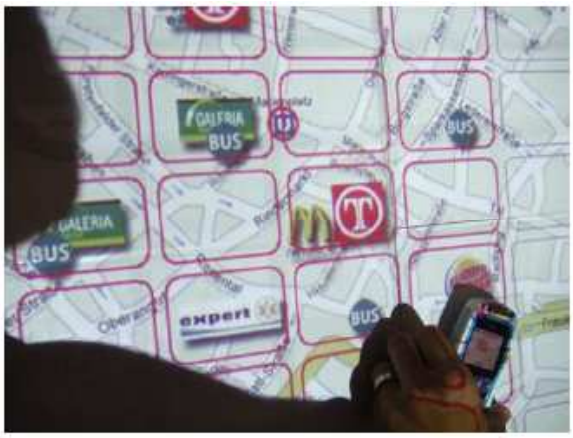

Figure 2: Bounding box selection

a) b) c)

Figure 3: Mobile user interfaces

3. SETUP

Our demonstration setup consists of a server for map service access, a projector connected to this server, a tags matrix placed on a paper and a suitable mobile phone (Nokia 3220) equipped with a NFC shell to support Physical Mobile Interaction. Such setup requires a vertical space of approximately 2 by 2 meters to hang the paper as well as a table of about 0,5 by 0,5 meters to put the projector.

4. REFERENCES

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