

Collect&Drop: A Technique for Physical Mobile Interaction

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Abstract

The proposed demonstration presents Collect&Drop, a new technique for Physical Mobile Interaction with the real world, its objects and associated information. Collect&Drop is integrated with the PERCI framework to interact with Web Services through the interaction with real world objects. By supporting Physical Mobile Interaction techniques such as Touching or Pointing, the framework tries to make mobile service interaction more intuitive and shift its focus from mobile devices to augmented physical objects. The demonstration will put a focus on the mobile Collect&Drop-client and complimentary posters for mobile ticketing that are augmented with NFC-tags and visual markers.

1. Introduction

During the last years, *Physical Mobile Interaction* [5] emerged as a new paradigm for mobile interaction with people, places and things in the real world. As such, it benefits from the dissemination of enabling technologies such as RFID [7], NFC (Near Field Communication) [2], Bluetooth or visual markers [4]. They enable the tagging of everyday objects with additional information that link them with web pages or services. Complementary, mobile phones increasingly have available the technologies to collect this information from physical objects, process it and use it for different applications. Physical Mobile Interaction eases the constrained interaction with mobile phones and partially replaces it with the more intuitive interaction with physical objects. Instead of browsing nested menus, users can simply touch or point at the things they want to interact with. Consequently, different techniques for Physical Mobile Interaction, such as *Touching*, *Pointing* or *Scanning* (see [5]) have been developed on top of enabling technologies in order to make their usage more familiar and convenient.

The proposed demonstration will present *Collect&Drop*, a new technique for Physical Mobile Interaction that focuses on the interaction with information acquired from the real world and its objects. The demonstration showcases a use case for mobile ticketing. It consists of smart posters as well as the mobile Collect&Drop client that uses NFC and visual marker recognition to collect information from them in order to use it for the interaction with associated services. Both mobile client and posters serve as a front-end for the PERCI framework that takes advantage of Physical Mobile Interaction to facilitate mobile interaction with Web Services [1]. The framework was developed in the PERCI project (PERvasive ServiCe Interaction) [3], a collaboration between the University of Munich and NTT DoCoMo Euro-Labs. This demonstration is based on previous work on the framework and will show the latest improvements of the prototype.

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The next section will provide a more detailed overview of the proposed contribution while section 3 will specify details for the setup of the demonstration.

2. The Concept of Collect&Drop

Collect&Drop is a new interaction technique for collecting and using information that is acquired through mobile interaction with physical objects. It builds upon an earlier client front-end for the PERCI framework (see [3]) but improves it in several ways.

The first mobile PERCI client was used to retrieve information from smart posters for the immediate invocation of services which imposed a certain order of interaction. First, the users had to select an *action-tag* that specified the URL of a service and the type of parameters that were needed for its invocation. After that, the users would interact with *parameter-tags* that provided the actual parameter-values (e.g. the specific title of a movie or a specific timeslot). The matching between required parameter-types and parameter-values was accomplished using a generic typing-scheme that is applied throughout the PERCI framework. Every piece of information that conforms to this scheme can be used with services in the framework and either identify them or serve as a parameter for their invocation.

Collect&Drop works in a different, less rigid and more intuitive way. It is more modular than the old approach and provides more freedom during the interaction process, as it does not urge users to invoke services immediately. Instead of imposing a certain order of interaction, it allows users to arbitrarily collect information from any tag, either parameter- or action-tag – as long as they follow the typing-scheme of the PERCI framework. The collected tags and their information are not used for the immediate execution of a service, but are stored in different Collections. A Collection is an information-container specifying the URL of the service and the types of parameters that are needed for its invocation. Based on the typing-scheme, Collect&Drop automatically manages the matching of information items from tags with suitable Collections. In order to invoke a service, a user only has to open a Collection, select the correct parameters from the possible alternatives and initiate the invocation.

This flexible approach to information management provides the means for more sophisticated Physical Mobile Interaction techniques beyond Touching, Pointing or Scanning. Collect&Drop makes it possible to reuse the same information item with several collections – and thus services - that need a parameter of its specific type. For example, an information item that specifies the location of a cinema can be used with a cinema service as well as with a transportation service that suggests the appropriate ticket for getting there. Collect&Drop also increases the interoperability between different smart objects, as *Cross-Object-Interaction* makes it possible to invoke a service discovered on one physical object with parameter information acquired from another object.

A scenario for mobile ticketing with smart posters presents Collect&Drop in more detail: The first poster offers different options for buying movie tickets (see Figure 1a). Users can select among different values for movie title, cinema, number of persons and timeslot. The second poster implements a simplified way to buy tickets for a public transportation system (see Figure 1b). Instead of having to understand a complicated ticketing system, inexperienced users only have to select options for the stations they want to start their journey from, their destination, the number of passengers as well as the duration of the journey in order to have appropriate tickets suggested.



Figure 1: Posters for movie ticketing (a) and transportation ticketing (b)

Each option on the posters is augmented with a numeric identifier, a NFC tag and a visual marker. They contain or reference the information that is represented by the option, e.g. the name of a movie, the number of tickets or different stations. The mobile Collect&Drop client supports the Physical Mobile Interaction techniques Touching (using NFC, see Figure 2a), Pointing (using the recognition of visual markers, see Figure 2b) and Direct Input of numeric identifiers (see Figure 2c) for which a user simply types a numeric identifier into a form.

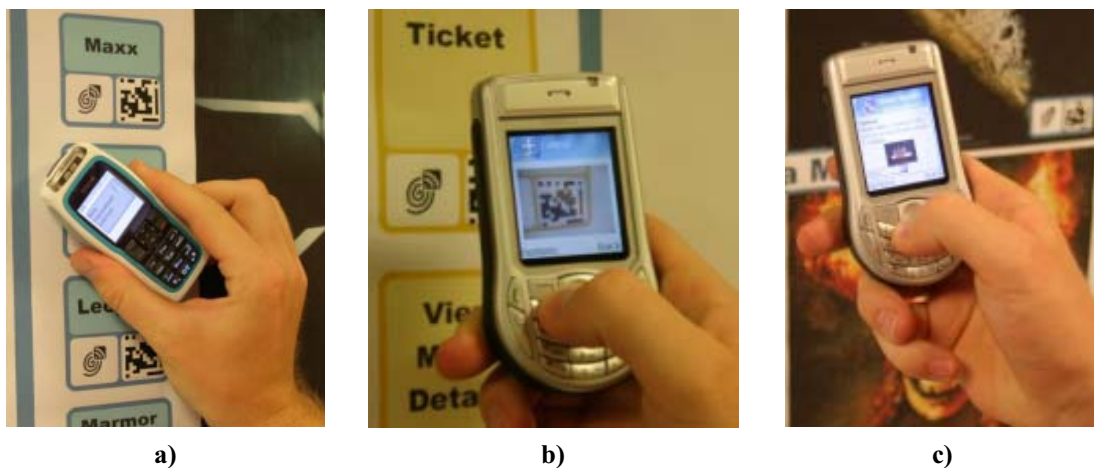


Figure 2: Physical Mobile Interaction techniques Touching (a), Pointing (b) and Direct Input (c)

Users interact with the posters, selecting different options with their mobile devices in an arbitrary order using the supported interaction techniques. The information that is collected from the tags contains the URLs to associated services and/or parameter-values for their invocation. The transportation-poster implements the old separation of action-tags and parameter-tags which puts the URL for the ticketing service on a dedicated tag. This approach requires the additional interaction step of selecting the action-tag explicitly. However, this separation is useful in case an object is associated with several services that can be used with the parameter-tags from the same

object. For example, the movie-poster could provide several services for ticketing, renting DVDs or buying merchandise. For the presented use-case, the movie-poster implements the new concept of *Hybrid Tags* that combine multiple information items and put service-URL and parameter-information on the same physical tag. As a result, the poster only provides parameter-tags and the user can save the interaction with a dedicated action-tag, as the service-URL is implicitly collected during the interaction with every other tag.

The Collect&Drop prototype is a good example of how Physical Mobile Interaction shifts the focus of mobile interaction from the device to the real world and its objects. Features and options from mobile application menus are pushed off the device and mapped to tags on objects which act as physical interfaces. This helps to circumvent usability constraints of mobile devices regarding e.g. input, output or overall usability.

3. Setup of Demonstration

The setup of the proposed demonstration will consist of 2 prototype posters for mobile ticketing that will show the interaction technique Collect&Drop including Touching (using NFC), Pointing (using visual markers) and Direct Input of data, Hybrid Tags as well as Cross-Object Interaction. The augmented posters and suitable mobile phones (e.g. Nokia 6131 NFC) will be provided in order to show how Collect&Drop works.

For the setup of the demo, a vertical space of approximately 2 by 2 meters will be required for putting up the posters. Visitors will be able to use the Collect&Drop client to interact with the posters and their services. They will also be able to see how the PERCI-framework provides different interfaces for different clients, e.g. an HTML web browser, based on the same abstract interface description.

It has to be mentioned that the PERCI framework and earlier versions of its front-end have been demonstrated at previous conferences. However, since the whole framework is constantly evolved, the proposed demonstration of Collect&Drop comprises the latest versions of the mobile client application and the posters and will showcase the latest features of the system.

4. References

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