

# Authoring Support for Mobile Interaction with the Real World

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## **Abstract**

*Mobile phones have been established as devices for the interaction with objects from the everyday world, such as posters, advertisements or points of interest. However, the usage of physical mobile applications is often still restricted by fixed content and behavior, whose authoring usually requires a considerable coding effort. This paper presents an approach to an authoring tool that separates the creative process of authoring content and behavior for mobile applications from its technical deployment. The tool supports non-technical users in the creation of content and behavior for the mobile guiding application MOPS that associates its content with points of interest in the real world through Physical Mobile Interaction.*

## **1. Introduction and Motivation**

The establishment of mobile phones as ubiquitous computing platforms over the last years has leveraged the development and usage of Physical Mobile Interaction. This mobile interaction paradigm benefits from the dissemination of technologies such as RFID, NFC, Bluetooth or visual markers that allow the augmentation of everyday objects from the real world and their association with additional information. Mobile phones increasingly have available the technologies to extract this information from physical objects in order to use it for different applications (see [2]). Physical Mobile Interaction is gaining in popularity as it eases the constrained interaction with mobile phones and partially replaces it with the more intuitive interaction with physical objects.

So far, applications for mobile interaction with the real world mostly comprise closed and proprietary systems that are hard to extend. They usually have a very narrow scope of application and come with a fixed content, respectively can only interact with a limited set of objects and provide appropriate information or services for them. In addition there is rarely support for changing mobile applications' content or behavior, respectively the way they interact with physical objects. Extending such closed applications usually requires a considerable coding and deployment effort, which clearly marks an inhibition threshold, especially for application developers with little or no technical experience in the mobile domain.

This paper addresses these issues and presents an approach to supporting content and interaction authoring for physical mobile applications. As an example, this paper presents an authoring tool that facilitates the definition of content and behavior for a mobile point-of-interest application.

The next chapter deals with related work concerning authoring support for mobile applications. Chapter 3 introduces MOPS – an application for the mobile interaction with physical points of interest. Chapter 4 outlines the requirements and the design of an authoring tool that allows non-technical users to create content and to define behavior for this application. Chapter 5 concludes this paper.

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## 2. Related Work

The Semapedia project [8] uses visual Semacode markers [7] to connect physical objects with appropriate articles from Wikipedia [10]. The markers can be attached to everyday objects (e.g. posters or points-of-interest) and used as physical hyperlinks. Semacode readers on mobile phones can extract encoded Wikipedia-URL from photographed Semacode markers and open the corresponding Wikipedia page in a browser. The system allows authoring on a simple, but effective level as all content is provided through editable Wikipedia pages and both the Semapedia and Semacode websites allow the simple creation of visual markers.

The Mobile Bristol Application Development Framework [5] comprises a framework and development tools that enable the rapid authoring of mediascapes – media-oriented, context-sensitive, mobile applications. The framework allows non-technical domain specialists with no programming skills to specify how mobile devices should behave in predefined context. Developers use a desktop authoring tool to produce an application script which defines this context-dependent behavior and which can be downloaded to mobile devices and used by appropriate applications.

iCap [3] is a system for the quick prototyping and visual design of context-aware applications. It does not require its users to write any code and allows abstracted control over sensor systems and application behavior. For that purpose, iCap provides a graphical interface for the definition of rule-based systems that supports the prototyping of 3 common types of context-aware behavior: simple if-then rules, relationship-based actions and environment personalization. After the definition of application elements and rules, entire rule sets can be either simulated or connected to context sensing infrastructure.

## 3. Mops – a Physical Mobile Information Application

MOPS (MOBILE Petuelpark System) is a mobile guiding application that is inspired by similar applications like the Cyberguide [1] and which provides its users with information about exhibits in the Petuelpark in Munich, Germany through Physical Mobile Interaction (see [6]). The objects in the park were augmented with information signs showing a number identifier and a visual marker. Users can acquire information about exhibits by taking pictures of their visual markers, typing their number identifiers (see Figure 1a) or by entering a certain area around each exhibit which is determined by an external GPS-device. Upon interaction, the application displays the names of selected exhibits, a picture, textual information and an audio file (see Figure 1b).



Figure 1: The MOPS (a,b) and MOPS++ (c,d) guiding applications (from [6])

MOPS++ (MOBILE Point of Interest System) is an enhancement of the original MOPS application and focuses on indoor exhibition environments (see [6]). The application consists of several posters presenting the names of exhibits, their pictures and textual information in English and German. These posters are augmented with RFID tags, visual codes and number identifiers.

#### **4. Developing an Authoring Tool for Physical Mobile Interaction**

The authoring process for the MOPS mobile guiding application comprises the assembly of its media content – text, pictures, audio – the definition of the application’s behavior – which action to execute upon which interaction - and their integration with the source code of the application. In order to facilitate the last step, MOPS uses a XML-description of different points of interest including the events of Physical Mobile Interaction that trigger their presentation – e.g. GPS-coordinates or number identifiers from visual markers and RFID-tags. At runtime, MOPS automatically parses this XML-blueprint and presents the appropriate information.

The goal of the MOPS authoring tool is to facilitate the design and modeling of points of interest, the assembly of appropriate media files, the assignment of Physical Mobile Interaction trigger events and the automatic generation of the XML-descriptions. At the end, the tool outputs the XML-description, media files and physical markers (e.g. number identifiers or visual markers) whose deployment (e.g. writing a number identifier on a RFID-tag) can be left to a developer with more technical skills.

The focus of the authoring tool clearly lies on usability for non-technical users like museum curators that can use it for modeling their real exhibits as virtual points of interest and assemble them into a mobile guided tour whose participants can physically interact with exhibits while on the move. In the process, the authoring tool separates the creators of content from technical developers and serves as an interface that allows both of them to use their expertise in an efficient and distributed way.

The MOPS authoring tool is implemented as a website in order to be accessible from anywhere without technical requirements beyond a web browser. Instead of having to install a standalone authoring application, users can easily surf the website and use its tools with their local media files – pictures, sounds, texts – to create application content. The website’s basic layout is similar to regular websites and designed to accommodate users that are familiar with web-browsing.

The functionalities of the tool are divided into 5 main categories for creating media content (images and audio files), defining different languages that are supported by the MOPS application, specifying points of interest and assembling them into tours. Each category starts with an overview of objects – images, sounds, languages, points of interest and tours – that have already been created with the system (see Figure 2a). From these overviews, objects can be deleted, added or edited on the next level of the site’s hierarchy. For creating new objects, users follow a step-by-step process that guides them through the creation of all attributes for a new object. Users can skip non-mandatory steps and complete them later. For editing existing objects, users are provided with an overview of all attributes of a selected object that can be edited on demand (see Figure 2b). This layout is the same for all categories in order to provide a consistent interface.

The creation and editing of points of interest also includes the definition of trigger events for Physical Mobile Interaction which define the behavior of the application. The tool supports simple number input, RFID-tags, visual markers and location based selection of points of interest through the vicinity to predefined GPS-coordinates. Users of the tool simply provide their own number identifiers for the interaction through number input, identification through RFID-tags and the encryption of these identifiers in visual codes that are automatically created using a script from the visual codes website [9]. GPS-coordinates for points of interest can be provided by specifying the

location of a point of interest in a Google Maps [4] window. These definitions of trigger events will later be used by the MOPS application to provide users with the appropriate content when physically interacting with exhibits in the real world.

Finally, application developers assemble multiple points of interest into tours. From all the content and behavior that has been collected for the points of interest in a tour, the tool automatically generates the XML-description for the MOPS application as well as leaflets containing names, descriptions, number identifiers and visual codes for different points of interest that can be attached to objects in the real world.

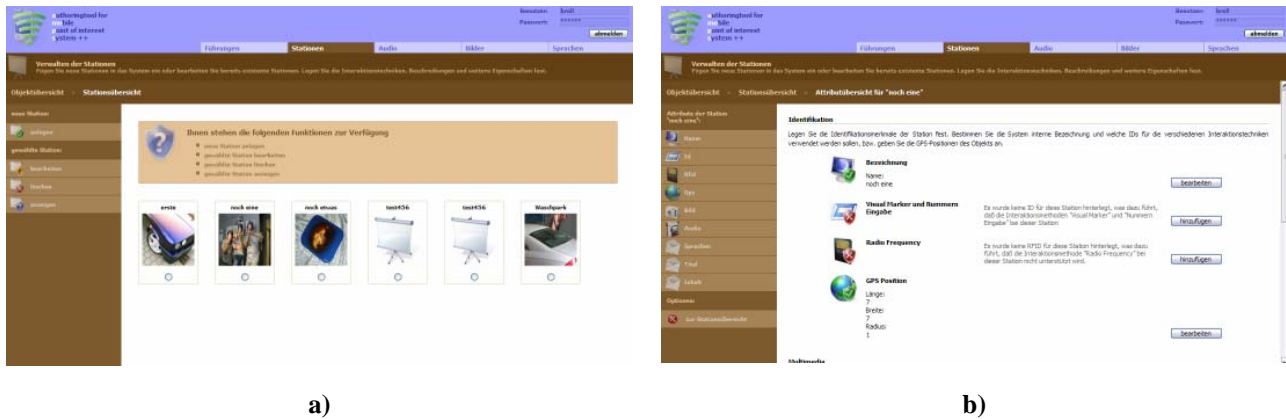


Figure 2: Screenshots of the authoring tool; object overview (a) and object details (b)

## 5. Conclusion and Outlook

This paper presented an authoring tool for physical mobile applications. While still in development, it is planned to evaluate its usability in the context of an existing mobile guiding application. Currently the authoring tool is limited to such applications but bears the potential for future extension to other physical mobile applications. Since the tool does not yet make the elaborate step of deploying the XML-descriptions and media files with the source code of mobile applications, we consider facilitating this process, e.g. through automatic updates over the Internet.

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