INTERACTIVE TELEVISION AND MAP-BASED PUBLIC PARTICIPATION

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ABSTRACT

Map-based public participation with the medium interactive television is a very young research area. The conclusion after an intensive search on the internet is that nobody has dealt with this research topic yet. With interactive television the viewer is able to make personal input or feedback that has an influence on what he/she sees and hears or is subjected to. This paper has the focus on the description of the medium interactive television, deals with its technical background and describes the Multimedia Home Platform (MHP). It further concentrates on the advantages and disadvantages of the usage of map-based public participatory applications with the medium interactive television. Interactive TV has the potential to become an important medium for some groups in our society, especially for the elderly and for visually impaired people. The second part of the paper deals with the ongoing project iiTV@home. iiTV@home focuses on the development of a map-based public participatory application for interactive television. Users can get informed about ongoing projects on the national and on the city level. Within the scope of the project S-Bahn Salzburg they receive the possibility to take part in a barometer of public opinion, where they are supposed to answer some questions concerning the building progress. Further we describe the user requirements analysis with the help of the Unified Modelling Language (UML), show and describe the first design of the prototype and deal with the design and the architecture of the system. At last an outlook on the user test is given.

INTRODUCTION

Online Map-based public participation, a research area which is still relatively new, deals with the use of maps for public participation in planning processes. It could be used as a tool for the inclusion of the whole public in decision-making processes. Their main intention is to involve the general public in decision making processes in order to arrive to transparent decisions for the public. Citizens are invoked to give their feedback at different stages of the planning process. Public participatory systems can be designed for different media such as for example the internet, touch-screens and also for interactive TV. The intensive search on the internet, documentations and research papers on existing map-based public participation

solutions for interactive television has not lead to any success. Therefore we concluded that nothing has been published in this area until now. Research in this field is in an initial stage.
This paper deals with the adoption of map-based public participatory systems with the medium interactive TV. The spatial data content focuses on the presentation of different planning projects on the national level and on the city level. Its potential benefit can be seen in bringing the participation process in the living room of the citizens. The users can get informed about these projects; they can use basic GIS (Geographic Information Systems) functionalities like zoom and pan and participate in a "barometer of public opinion" in one of the presented projects.
The paper provides a technical background to the medium interactive television and deals with the Mulimedia Home Platform (MHP). In chapter two it explains how interactive television applications can be used for map-based public participation. The second part of the paper deals with the application development in the project iiTV@home, the user requirements for the application, describes the first design prototype and the system design and architecture of the system. A conclusion and an outlook top the paper off.

1. TECHNICAL BACKGROUND ON INTERACTIVE TELEVISION

Interactive television includes a wide range of services and systems. This means that the viewer is able to make some personal input or feedback that has an influence on what he/she sees, hears or is subjected to. Interactive television has been developed in order to allow the viewers to interact with an advertisement, program, or service on their TV set with the adoption of a set-top box and its remote control. It is a person-to-person technique that allows two-way communication. Interactive television presents an opportunity to deliver information quickly and easily to the individual viewer. Various interactive television applications are changing the traditional consumer experience of television watching. The availability of interactive services changes the passive TV watching to a more active application usage *(Eronen L. 2003)*. The following sub-sections explain the different technical components of interactive television.

1.1 Multimedia Home Platform (MHP)

Up to now there has been no consensus on the format that can be used for interactive applications. This has led to fragmented markets, where consumers are not able to access all the services available to them with a single receiver system. As a result broadcasters have been forced to duplicate their application development work. This situation threatens to prevent the development of a thriving international market for interactive TV content. In response to this problem the Digital Video Broadcasting (DVB) Project has developed a specification for a new open standard platform for interactive TV and multimedia services, designed to address the requirements of both commercial and public sector broadcasters. DVB provides a global standard for the delivery of interactive TV *(Sivaraman G., Cesar P. et al. 2001)* called Multimedia Home Platform (MHP). This platform consists of a common Application Programming Interface (API) which allows for the creation and broadcast of interactive television applications that can run on any set-top box, integrated digital TV receiver, and Multimedia PC's. MHP has selected Java technology for its digital interactive Television-broadcasting standard. The primary goal of the MHP is to make the development of horizontal markets possible, and in such a way enable open competition between applications and different implementations of the MHP. MHP defines a whole set of technologies needed for the implementation of digital interactive multimedia services at

home. It includes the home terminal (set-top box, TV set or PC), its peripherals and the in-home digital network.

1.2 Application Areas of MHP

MHP basically aims at covering the following three application areas; enhanced broadcasting, interactive broadcasting, and Internet access. The Enhanced Broadcast Profile represents the baseline of the MHP and is for use in broadcast only systems where applications and data are delivered by the broadcast service but where there exists no return channel. The applications that are designed for this profile provide local interactivity with the user. The Interactive Broadcast profile is a superset of the Enhanced Broadcast Profile which adds support for a bidirectional data channel. It uses any of the return channel systems that are specified by DVB. This allows data to be returned to the broadcaster and enables applications to support e-commerce and tele-voting. The Internet Access Profile builds a superset of the Interactive Broadcast profile. It adds resident applications that provide access to the most common types of Internet service for example www, e-mail and usenet News (optional). The profile makes it possible to provide links between interactive TV applications and Internet services and vice-versa *(Newell J.C. 2002; Peng C. 2002)*. In our approach we used the Multimedia Home Platform for the implementation of a prototype interactive map-based public participation television application.

2. PROS AND CONS OF INTERACTIVE TELEVISION FOR MAP-BASED PUBLIC PARTICIPATION

According to the results of our internet research we came to the conclusion that interactive television has not been adopted and mentioned in relation to public participation processes in spatial planning until now. However, interactive television has a potential to become an important medium for some groups in our society by maintaining their independence and empowering them. Especially for elderly and visually impaired people interactive television could improve their quality of life in regard to public participation in spatial planning. These target groups are supposed to be familiar with the medium Television. Currently the users have the possibility for participation in traditional meetings with planners and politicians on a fixed place and by a fixed time. For the usage of the medium interactive television for public participation purposes advantages, but also disadvantages can be mentioned.

2.1 Advantages

The medium interactive television can offer new chances for a broader participation in public participatory processes as the participation possibility comes into the living room of the citizens. We mention the following advantages:

- Interactive television participation is not time-limited like open councils.
- With the adoption of the medium internet, groups, who are not able to attend public meetings like the elderly and some others, can participate.
- Television is a medium which is nearly in every household and therefore reaches nearly the whole public.
- Maps are no longer accessible only over the internet. They can also be accessed through interactive television.

2.2 Disadvantages

Currently the medium interactive television for map-based public participation is primarily limited by technical constraints and there are no experiences available yet. We mention the following disadvantages:

- The navigation in an interactive television application is different to the navigation with the computer mouse. Interactive television applications use a remote control which makes the navigation more difficult as the user has to use different buttons for navigation.
- The resolution on the television is not as good as on the computer screen. Therefore the appropriate application data have to be chosen in order to ensure good quality.

3. PROTOTYPE IMPLEMENTATION OF THE IITV@HOME APPLICATION

The project iiTV@home deals on the one hand with the development of an information portal for the Salzburger Nachrichten, a newspaper and on the other hand with the development of a public participatory application for the medium interactive television. iiTV@home follows after the project iTV Salzburg which was the first field test to interactive television in the digital wiring harness. The project executing organisation in iiTV@home is the Fachhochschule Salzburg GmbH, Studiengang Digitales Fernsehen (DTV). Further project partners are the ICT&S – Center of the Paris Lodron University of Salzburg, Salzburg AG, Salzburger Nachrichten, the faculty of Scientific Computing of the University of Salzburg and the ITG – Innovation and Technology transfer for Salzburg. The project lasts one year, from june 2005 to june 2006.
Currently Salzburg Research develops a software prototype for the Multimedia Home Platform which will inform and provide the possibility of participation for the users in planned projects for the country and the city of Salzburg. Geographic maps, which can be explored by basic GIS functionalities like zoom and pan, support the presentation of the projects.

3.1 Study cases / Description of the planned projects

The application aims at showing planned and current national and city planning projects. These projects include the new S-Bahn, the Unipark project in the city of Salzburg and the Tauerntunnel project. Currently the Salzburg S-Bahn project is Austria's biggest local traffic project. The user gets informed about the route's course, the progress of the station construction and they also have the possibility to participate in a barometer of public opinion via television. The subject of the urbanistic project Unipark is the reshaping of the Salzburger city district Nonntal. The application informs about this process, shows the master plan of the area and gives an insight into the architectural model of the new building of the university. The Tauerntunnel project is a traffic project and deals with the building of the second tunnel section of the Tauerntunnel. Information on the construction process is provided to the user.
Before we worked on the application prototype we executed a user requirements analysis. The next chapter describes the concept of user requirements analysis with the Unified Modelling language and deals with the requirements for our application.

3.2 User requirements analysis

As a first step we specified the user requirements which are a crucial element of the design process of any application. This was done with the help of the Unified Modelling language (UML). UML is the standard language for specifying, visualizing, constructing, and

documenting all the artefacts of a software system *(Bittner K. and Spence I. 2003)*. After Booch *(Booch G. 1994)* UML is a language and associated graphical notation for object-oriented analysis and design. According to the approach suggested in UML, the user requirements analysis consists of the identification of the different user groups, the development of user scenarios and the delineation of activity diagrams. In UML user scenarios describe the requirements of the potential customers in a relative simple way. They are characterisations of the users tasks executed in a certain context. User scenarios offer concrete representations of a user working with a product in order to achieve a particular goal. In the following we explain the different steps of the user requirements analysis performed within the iiTV@home project.

User group identification
As a first step we identified who the potential users will be. Therefore the different potential user groups had to be identified. The ICT&S, a partner in the project who is specialised on usability questions, found out that due to the results of the first field test, the main user group of the interactive television application will be elderly people who do not use the computer yet, but watch television.

User scenarios
User scenarios represent the requirements of the potential customers. Scenarios are characterisations of users and their tasks in a certain context. User scenarios offer concrete representations of a user working with a product in order to achieve a particular goal. We imitated user scenarios for the interactive television application. Two scenarios are presented in the paper.

Title	**Scenario 1**
Actor	Retiree, living in Golling (country of Salzburg)
Short description of the activity	Retiree, who wants to get information on the actual project status of the S-Bahn project
Application flow	1) The user selects the point "What do you mean?" and gets an access to the map-based public participation service. 2) The user selects the S-Bahn project with the remote control and gets the map extent where the whole net of the train is best viewable. 3) The user is especially interested in the station Hallein-Burgfried. He/she selects this station and receives then information on the progress of construction work for this station. On the map side he/she gets a detailed overview of the surroundings of the station (orthophotos, streets, etc.). 4) The user leaves the application.

Title	Scenario 2
Actor	Senior student, living in the city of Salzburg
Short description of the activity	Senior student who is interested in actual information on the Unipark project
Application flow	1) The user selects the point "What do you mean?" and gets an access to the map-based public participation service. 2) The user selects the Unipark project with the help of the remote control and gets the map extent where the master plan of the Unipark project is viewable. 3) The user also wants to get detailed map information of the Unipark area. Therefore he/she uses the zoom and pan functionalities. 4) The user reads the background information related to the Unipark project. 5) The user leaves the application.

Figure 2 provides a simplified state-diagram of our application. State diagrams are used to model the dynamic behaviour of a particular object or class of objects. After starting the application, an information-screen is presented to the user. This screen informs the user about the purposes of the application and the interactive television project, and gives information on the possible interaction with the map. If the user presses the OK-button on the remote control, a map of Salzburg is shown on the map screen. At that stage the user can make use of the navigation buttons (the arrow buttons and two of the colour buttons on the remote control) to zoom and pan the map. In this view the user can switch to the project-screen with the OK-button, which presents a list of projects in Salzburg. When the user chooses one of these projects, detailed information on this project is presented. Additionally, the S-Bahn project allows the user to participate using a survey, which can be accessed by one of the colour buttons.

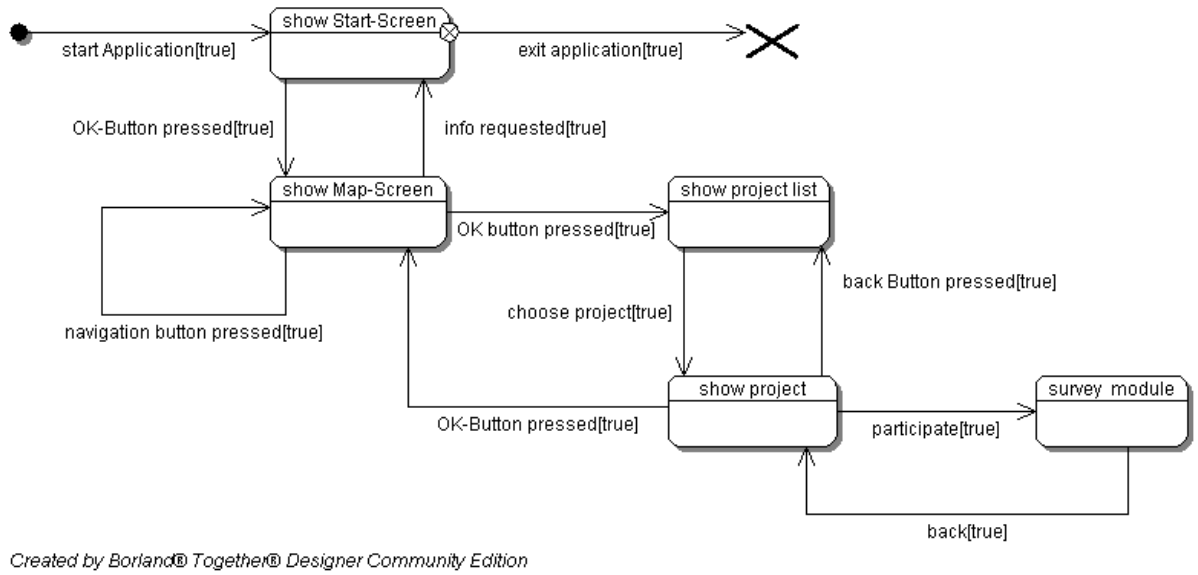

Figure 1: State-diagram of the public participatory interactive television application

3.3 User Interface Design

Based on the user requirements analysis of the application we started with the designing of the user interface of the projects. The following screenshots show how the application will look like. The most important issue in the user interface design phase was to develop an easy to use and also easy to navigate user interface. With interactive television the users have to handle a remote control instead of a computer mouse. A few buttons of the remote control fulfil certain predefined application functionalities. As the navigation is rather complicated only basic GIS functionalities will be available. The following figures give you an insight of the application design.

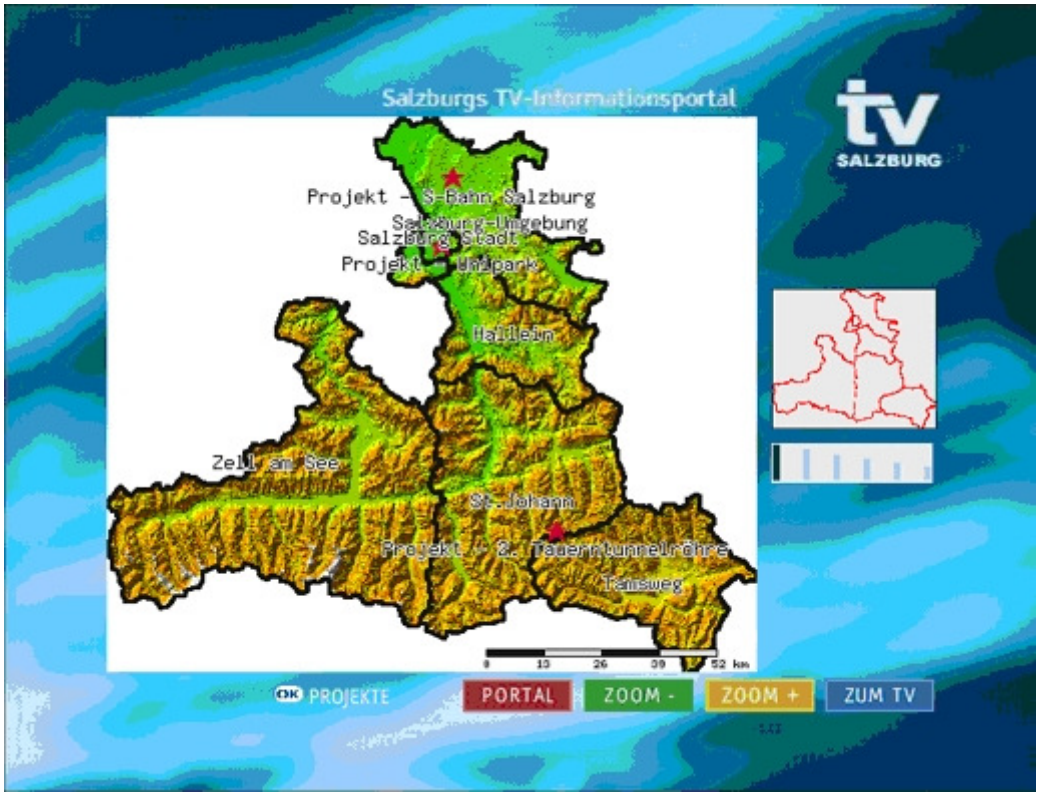

Figure 2: Overview mapping page of the interactive television application

Figure 2 presents the overview of the country of Salzburg with the districts and the projects that the application is going to deal with. The user can zoom in and zoom out the map. The map overview window helps you so that you do not loose the orientation.

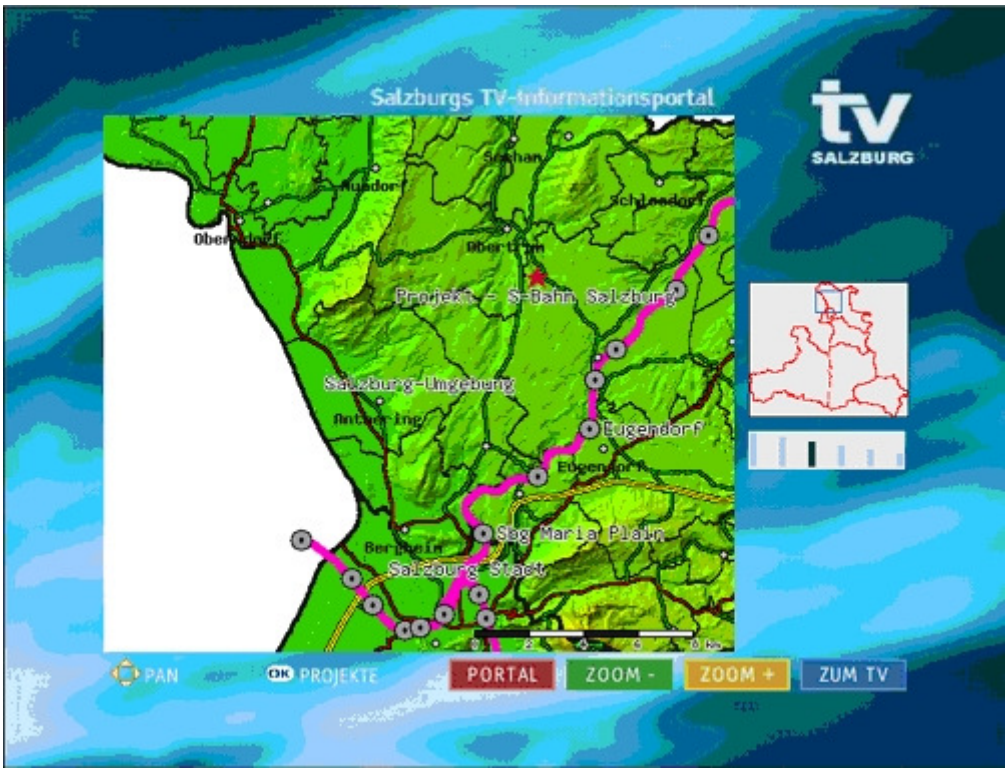

Figure 3: Project S-Bahn and overview window

Figure 3 shows a zoomed in extent to the Salzburger S-Bahn project with the track of the S-Bahn and the stations.

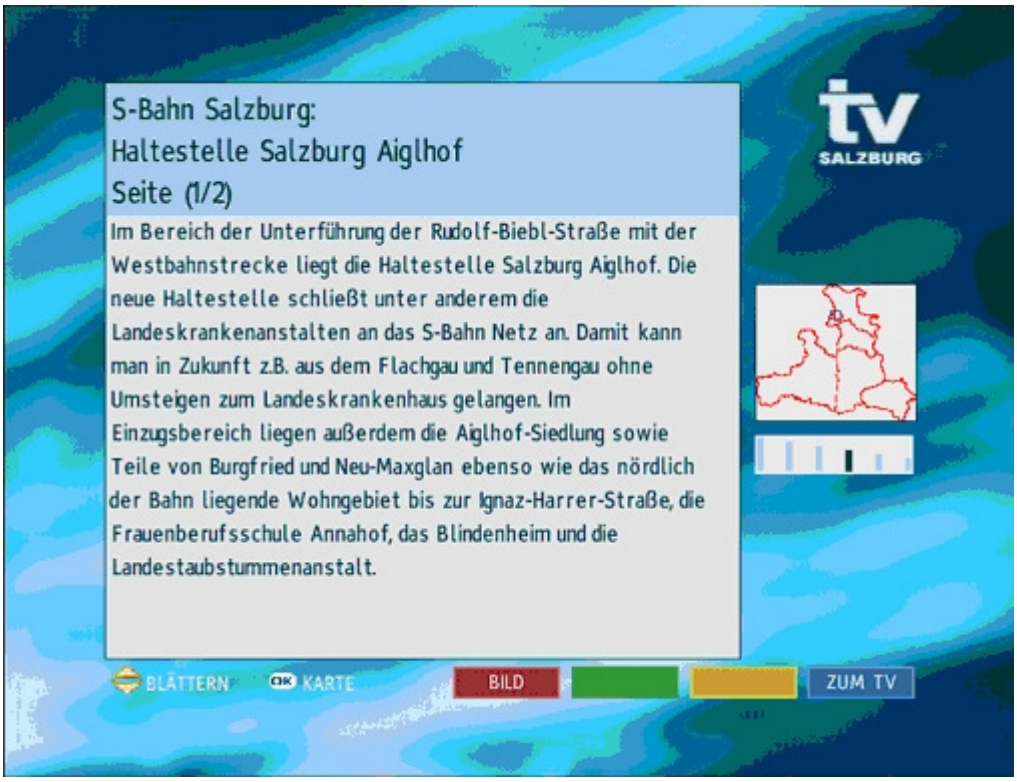

Figure 4: Text description of the S-Bahn station Salzburg Aiglhof

Figure 4 shows the textual description of the S-Bahn station Salzburg Aiglhof. If the user presses the OK button, he/she will return to the map window. The function “blättern” allows the user to move from one page to another.

The participation module which we want to implement for the S-Bahn project is not realized by now. We aim at developing a barometer of public opinion where we will ask the users about their opinion concerning the planned extension of the S-Bahn.

3.4. System Design and Architecture

Figure 1 shows a typical deployment of our current system. It consists of 3 main-components namely the DVB-H-Playout (i.e. the DVB-H infrastructure), the Set-Top-Box with our application, and the UMN-Mapserver, which provides project information and maps.

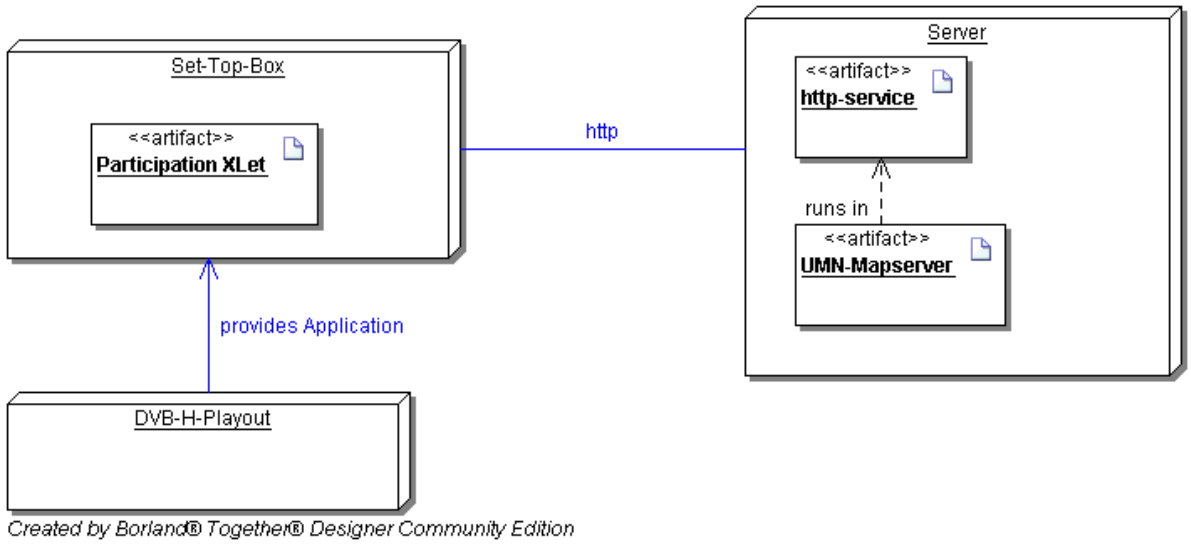

Figure 5: Deployment of the current system

The main objective of the MHP-application is to present the user a navigable map of Salzburg, and to provide information about current and planned projects in Salzburg, only using the limited interaction-capabilities of Set-top boxes, i.e. only arrow-buttons, OK and colour-buttons on the remote control. As described in *(Bernhaupt R. and Obrist M. 2005)*, the usability of an iTV-application is of utmost importance. To achieve this, we tried do:

- use buttons in our application consistently (e.g. left button is always back, consistent use of the colour buttons);
- use clearly visible colours;
- present the use of buttons in the status bar (bottom of the screen).

The map-part of the application lets you pan (using the arrow buttons on the remote control) and zoom (using two colour buttons) the map. Here a major difference to web-based systems can be recognized: using web-based (or desktop) GIS, the user navigates the map using a mouse, pans to a location with a mouse-click or zooms to an area defined with the mouse. However, with the remote control the navigation is organized in a very different way. We had

to limit the ability to zoom and pan the map to fixed steps, i.e. it is not possible to freely define a part of the map for viewing.
The OK-Button provides access to textual information about the mentioned projects in Salzburg, showing a menu to choose one project. After choosing a project, the application will provide an information-screen with content on the project. Additionally, the map shows the location of the project, which allows to explore this area and the surroundings of the project area. The OK-Button allows for switching between project- and map-view.
The maps that are used by this application are provided by a WMS-compliant Mapserver, namely the UMN mapserver *(http://mapserver.gis.umn.edu/index_html)*. The data were provided by Salzburg AG, energy provider of the country of Salzburg and from SAGIS, the Salzburger Geographic Information System. For our prototype, the information about the mentioned projects is provided by a simple webserver, which shows the information statically using textfiles. For a final solution we would propose a more adaptable approach, for example using servlet-technology in order to be able to provide dynamic information about the planned projects.

4. OUTLOOK

Around 40 test households will use, test and answer questions concerning the interactive television application a month long, starting at the beginning of March. According to the time plan the field test with the 40 test households will start at the beginning of March and will last a month. The users will get installed a set-top box in their house for the field test and they will also get detailed instructions on the usage of the application before the test is going to start. The user interaction within the scope of the iTV application will happen via the four arrow buttons, the confirmation buttons and the colour buttons on the TV remote control. The TV viewing distance is several metres and the resolution of the television screen is low.
Previous experiences with interactive TV applications gained by the Centre for Information and Communication Technologies & Society - ICT&S, University of Salzburg show that the users primarily look for entertainment, are laid-back and the engagement of the users is relatively low *(Bernhaupt R. and Obrist M. 2005)*. The first field test was performed with test households from the city of Salzburg and has not included a map-based participatory application.
As a first conclusion we can say that the interactive map-based public participation technology does not replace direct contact techniques. The technology needs to be well integrated in the whole planning process and should be seen as an endorsement to existing traditional public participation methods in planning.

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INTERNET REFERENCE:

http://mapserver.gis.umn.edu/index_html

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