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Abstract

The document describes the first version of the prototypes for the three ICE-CREAM applications. These applications are a real-time sports application, an infotainment enhanced video application and an enhanced video application based on fictional content.
This deliverable combines the deliverables D11 and D12, which otherwise would have had a significant amount of overlap.

Keyword list

User interfaces, application prototypes, end user tools

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1 INTRODUCTION

In “D7 – Evaluation results of interactive design concepts and applications scenarios” the designs for the three ICE-CREAM applications have been presented.

These applications are:

1. Real time sports event

In this application a football match is enhanced with commentary or annotations of the player actions and additional hot and cold statistics.

2. Travel Application, Enhanced Video (non-fiction content)

This application enhances a travel video with specific information about the various attractions presented in the video and other travel related information, which is either part of the broadcast or retrieved from the Internet.

3. Deep Sea, Enhanced Video (fictional content)

In this third application a video is enhanced with fictional content, which uses 3D graphics and animation to enhance the users viewing experience. The application also interacts with the user environment to create an immersive experience.

The evaluation results of these application concepts in D7 were used as a blueprint to build the first version of the three application prototypes. These prototypes are described in the present deliverable.

The original intention was to cover the user interfaces and interaction tools in D11 (WP1) and the application prototypes themselves in D12 (WP3). While the focus of one deliverable would have been on the user view of the applications, whereas the other would have focused more on the workings of the applications themselves, there would be a significant amount of duplication in these two documents. To avoid this, both deliverables were merged into the current deliverable.

2 Application Prototypes

2.1 Application 1: Real time sports event

2.1.1 Application concept

During a football match, the user (the TV viewer) is be able to access different features and statistics of the event taking place through an interactive application on his TV set. Everything the user accesses during the match is produced during the live broadcast (with a few seconds of delay).

There are two distinct applications: A production application that creates live content for the end-user, located on the site where the event is taking place, and the end-user application, which is in the set-top box.

2.1.2 Functionality

The data accessible by the user is divided into 2 categories: cold statistics and live information.

Cold Statistics:

The user is able to access classic statistics, independently of what is happening on the match: Results of previous tournaments, team positions in the current tournament, players name, age....

Live Information:

The user is able to have a brief summary (list of free kicks, fouls etc..) of what happened during the match so far.

On some interesting actions, he is able to get a video replay of the selected sequence (picture in picture).He is also able to view a video of a computer generated 3D scene of the action for some of these scenes.

2.1.3 User interface

To get all these features, the user will navigate through a simple menu on the set top box:

Tournament Results -> Select Team-> Select Player
or
List of actions-> Selection of an action-> Play video

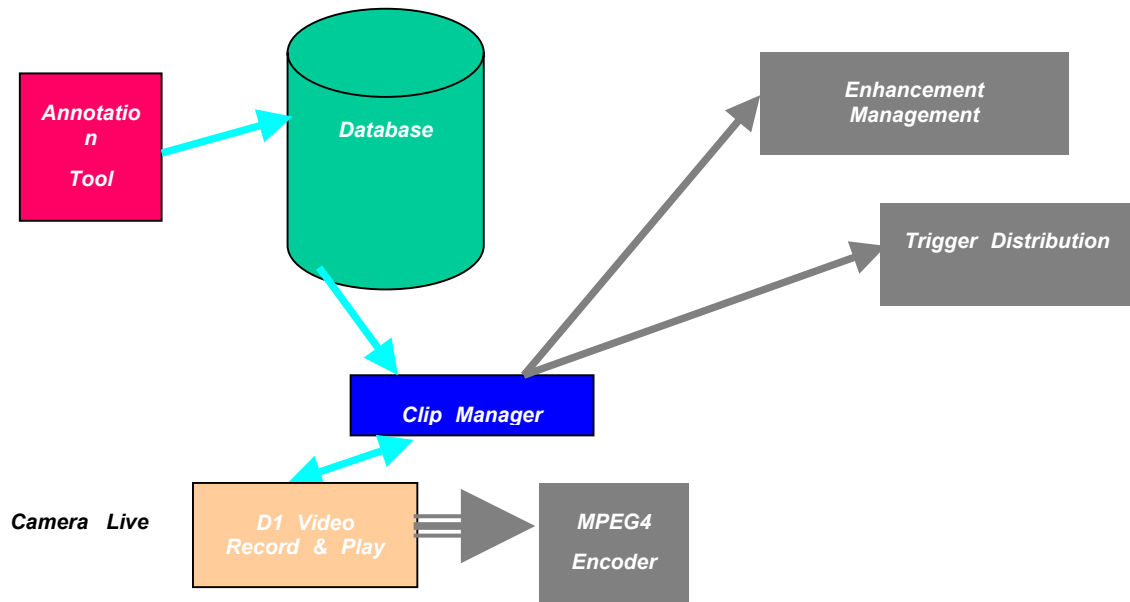
2.1.4 Interaction tools

The user will be able to access all those features with a simple remote control, like any other interactive TV application.

2.1.5 Application description

2.1.5.1 Production application

An operator logs what happens in the match and this information goes into a database. A clip manager prepares the clip to be sent, and all the information concerning this clip.



Once this clip is ready it is sent either to an IP Server or in the carousel of the DVB Stream

2.1.5.2 End-User Application

This application is running on the set-top box. It is a classical menu based navigation, except that the menus change depending on the live action. On the events for which a video is available, a thumbnail (snapshot of the action) is used to inform the end-user.

2.2 Travel application – Enhanced Video (non-fiction content)

2.2.1 Application concept

The travel application supplies the television viewer with additional information that accompanies a city travel video. The enhancements available are a mix of informational items that are linked to specific events in the video and information about the travel destination that is provided independently of what happens in the video, although thematically connected.

Enhancements that are directly connected to events in the video are:

- Attraction information
- Quiz
- Bookmarks
- Short textual notifications

Enhancements that can be accessed independently of the video are:

- Thematic attractions
- SMS messages

The following subchapters describe the scope of these enhancements.

2.2.1.1 Attraction information

This provides additional information for a specific attraction shown in the video, for example a hotel, a theatre or a famous landmark. The information usually consists of a short description of the attraction and its history, an image of the attraction, a map showing its position as well as a list of details including opening hours, nearest subway station, opening hours, price range (where applicable).

2.2.1.2 Quiz

At specific points in the video various multiple choice questions pop up, allowing the user to test his knowledge of the attractions featured in the movie. It also causes the viewer to watch the programme more attentively, since the questions are usually related to topics mentioned in the video.

2.2.1.3 Bookmarks

Bookmarks allow the marking of points of interest. Bookmarks in the travel application have three distinct functions:

1) Broadcast bookmarks

These are bookmarks that are broadcasted with the video and automatically added to the a bookmark list. The main function of these is to provide the user with chapter markings and easy access to segments of the video for subsequent use of the set-top box as a PVR.

2) User video bookmarks

When the user presses a 'bookmark key', the current position in the video is marked. If the set-top box has PVR functionality, the user can later jump back to that point in the video and watch it again.

3) User content bookmarks

If the user presses a 'bookmark key' (see previous paragraph) and additional content for the current attraction is available, not only the video position is marked, but the interest of the user in this specific attraction is also stored and later available as part of the personalized city tour.

2.2.1.4 Short textual notifications

These are short messages that are presented, similar to SMS messages, while the video is shown and usually contain current event information, news and updates. .

2.2.1.5 Thematic attractions

In addition to the attraction information that is presented based on triggers in the video, there is similar information available for other attractions, which is sorted by themes. There are city tours available for fashion shoppers, for people who have only a very short time for sightseeing, people with historical interest, and so on. Each of these tours has a short teaser text and a list of attractions, which can be viewed individually or sequentially. The content for these attractions is similar to the attraction information (2.2.1.1), since it is based on the same information database.

A special feature of the city tour is the capability to allow users to build their own tour by bookmarking specific attractions. These bookmarked attractions can be attractions that were part of the predefined city tours or attractions that accompanied the video. These personalized tours will be the basis for the user specific information send to PDA in the next version of the application.

2.2.1.6 SMS Messages

Viewers can provide additional information for other users by sending an SMS message to a specific telephone number. These messages will be presented on screen in an area reserved for this purpose. In addition to SMS messages provided by users, this area can also be used to display short messages at specific points in the video.

2.2.2 User interface

Starting point for all user activities is the travel video presentation.



Figure 1: Travel video without enhancements

Once an additional service becomes available, an alert is displayed to the user.



Figure 2: Announcement of new service

The user can then call up the list of available services and start any desired service.



Figure 3: List of available services

There is also the option to pre-select services to be started automatically when they become available.

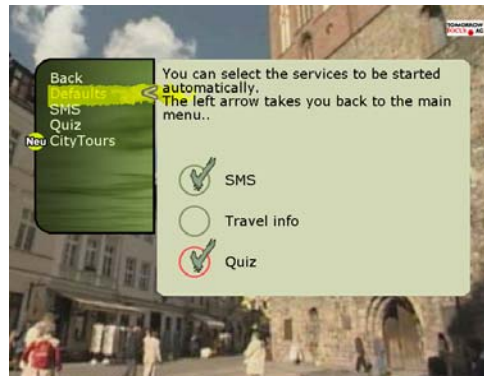


Figure 4: Pre-selection of auto-start services

SMS messages are displayed for a specific number of seconds and require no input from the user.



Figure 5: SMS message display

At appropriate points of time in the video, a quiz question pops up.

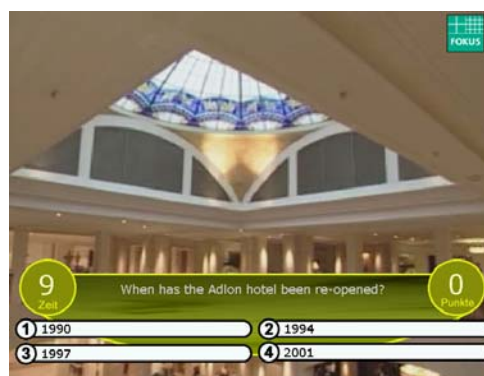


Figure 6: Quiz question

The user can select an answer by pressing one of the numeric buttons on the remote control.



Figure 7: Quiz question with user selected answer

Once the time runs out, the correct answer is shown.



Figure 8: Quiz question with user selected and correct answer

When additional information for an attraction becomes available, a menu is presented on the screen.



Figure 9: Additional attraction info menu

The user can now select specific information by the use of the four colour keys on the remote control, or, alternatively, the cursor keys.



Figure 10: Examples of additional attraction info

To use the bookmarking function, the user can press the bookmarking key at any point during the programme. To jump back to specific points in the video, the user can then choose the select bookmark service from the service menu and jump, if local storage is available, back to an earlier moment in the travel video.

The bookmarks here are a mix of provider supplied bookmarks, which are broadcasted with the video and denote specific chapters in the video, and user bookmarks, which are always presented as the previous chapter name and a time value, so that the user never has to enter any textual information.

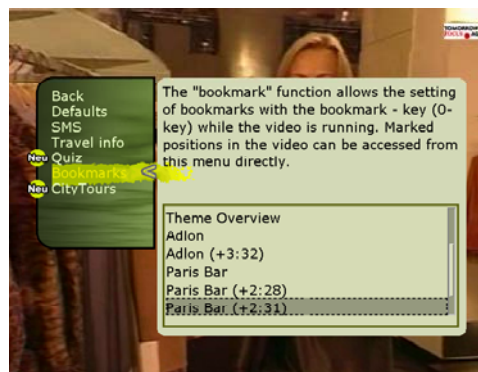


Figure 11: Bookmark menu

The final service presented here is the CityTours service, which is also selected from the service menu. For Berlin, there are currently three fixed city tours available in the application. Since the user had bookmarked the video at a point where information about the Brandenburg Gate was shown, there is also a 'Personal Tour' available, containing information about this attraction. If the user bookmarks additional attractions while following a city tour, these attractions will also be added to his personal tour, even if the attractions belong to different tours.



Figure 12: CityTours

Selecting a tour allows the user to access all the available information on all the attractions belonging to this tour. Navigation between attractions is done by the use of the cursor keys on the remote control, while shortcuts to specific elements of information for an attraction (e.g., the map) can be taken by using the colour keys.

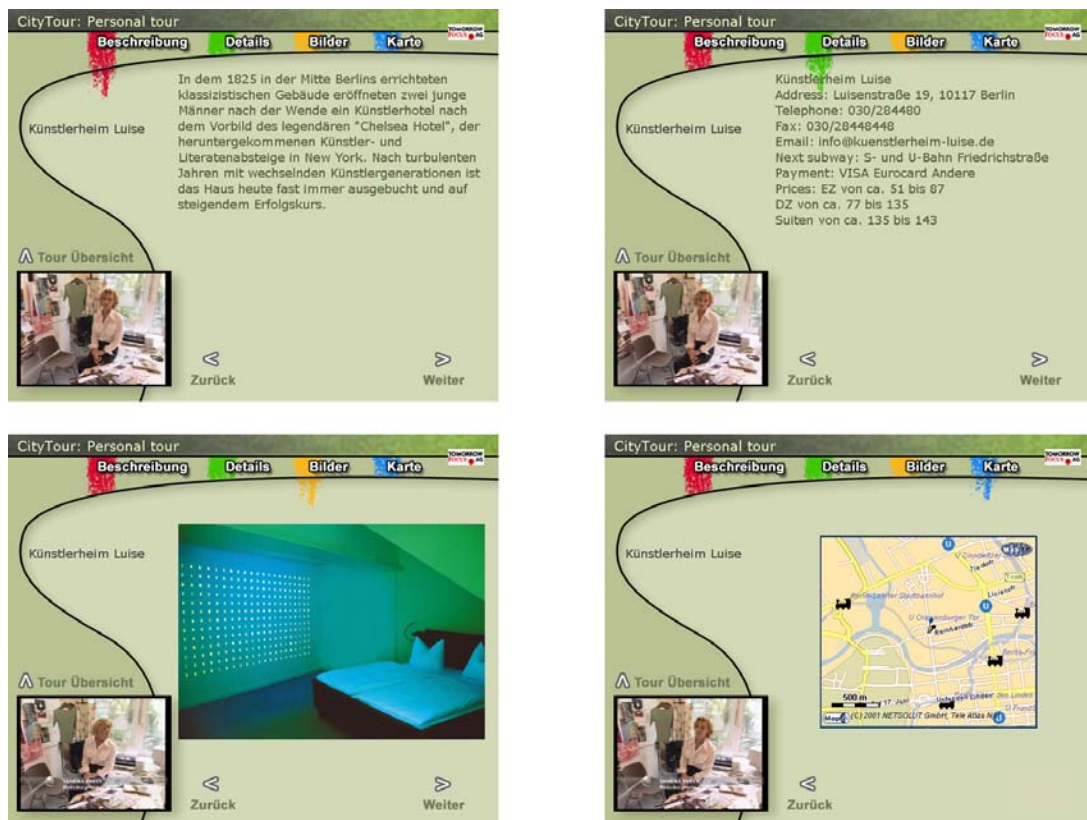


Figure 13: CityTours information for an attraction

2.2.3 Interaction tools

For the prototype version of the application, all interaction is performed with a standard remote control, using only the cursor, colour and numeric keys and a special menu key.

2.2.4 Application description

The first prototype is actually the second version of the application. The first version was a conceptual prototype with a fixed user interface using JMF (Java Media Framework) classes to present an MPEG-1 version of the travel video. The purpose of this first version was to study and demonstrate the basic functionality of the application and the user interface, without having to address the limitations of the intended presentation platform.

Besides showing the validity of the underlying application concept, the first version helped to identify a number of interesting issues, which were addressed in the current prototype and are described in 2.2.5 (Improvements to original design).

The current version of the application is running on a set-top box 'emulation' in a PC environment. While the classes used in the emulation are from an early 'not quite MHP' set-top box, the emulation allows the use of the application together with MPEG-2 video. By implementing a small number of 'adapter' classes the application will be easy to transfer to the actual MHP set-top box, once the development system becomes available.

Target platform for the application is an MHP set-top box with local storage (to allow video bookmarking) and an interaction channel (for SMS retrieval). While the application also functions on a 'plain vanilla' MHP set-top box, the functionality will be reduced.

2.2.5 Improvements to original design

While the first version was planned and implemented as a single application with fixed functionality, it became apparent that there were a number of functions used in the travel application, which were not specific to this application, but could be re-used for other applications.

This led to a classification of the application functionality in three different groups. The first is the core group, which contains those functions that would be required by all applications. This led to the core module, which provides the service information, service selection, property administration and video bookmarking functions. The second is the common group, which is a collection of additional modules that perform functions that are sufficiently generic to be also used in non-travel related applications. These modules are currently the message module, used for displaying SMS and other short text messages), the quiz module, used to present on-screen quizzes and the info module, which is used to present simple groups of textual and pictorial information as an enhancement to the running video programme.

The third group, the specific group, contains those modules which are too specific to the theme of the application to be likely to be of generic use and thus need to be developed separately for every application area. For the travel application, the CityTours module belongs to this group.

Dividing the functionality of the application into separate modules also had a distinct effect on the appearance of the user interface. Originally the interface was build directly into the prototype, with a fixed design. Since this design is unlikely to be adapted by other applications, using the same common modules, changes were required. For the

core group that meant using a fixed, but generic looking design, which wouldn't be overly fancy, but wouldn't clash with any application specific design for the other modules.

For the common modules that meant that the layout description was removed from the implementation and moved to a separate, easily editable layout description file. The purpose of this is to allow the easy modification of the appearance of, for example, quizzes, without the need to modify the quiz module itself, thus allowing the use of the module over a wide range of application areas.

An example of this is shown in Figure 14, which shows the same quiz question while using different layout description files. Figure 15 presents different layouts for the SMS notices.

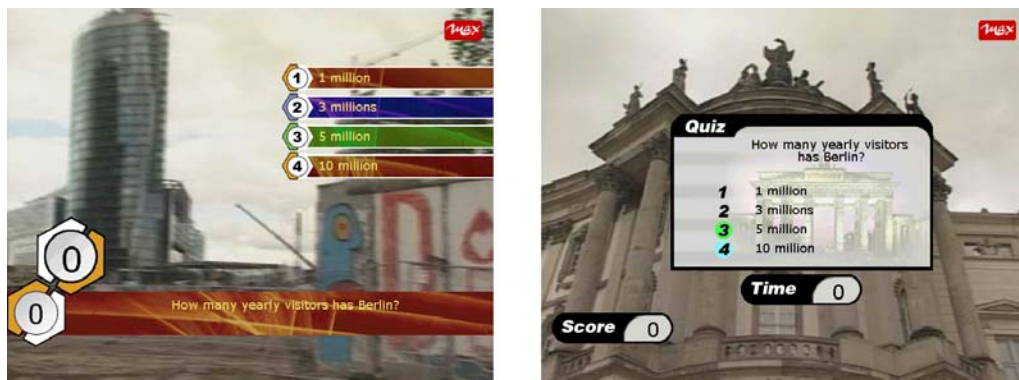


Figure 14: Same quiz question in different layouts



Figure 15: Two different SMS presentation layouts

For the application specific modules, the layout definition remains part of the module implementation, since it is unlikely that the special interaction needs of an application can be described in a sufficiently generic way to provide an layout template that can be used by other applications, without making the description format so complex that it becomes more cumbersome to use than a programming language.

To use the elements of the travel application for another application, the provider would implement those modules that are specific to his application area, add those to the core module and add any common modules deemed useful, while providing layout files for these modules, which make them match the design and layout of the application specific modules.

2.2.6 Further work

Beside various changes that are related to the content of the application (addition of programmes for other cities, additional types of content, additional travel videos, different language versions), there are two major areas that will be added for the next version of the prototype.

1. Ticket booking

The application will provide links from selected venues shown in the video presentation to a ticket booking system. This allows the user to purchase tickets for events that happen at that venue (and also for other venues). Technically this feature highlights the use of a backchannel and adds functionality that could not be achieved by a simple 'broadcast only' environment.

2. PDA integration

In the current version, all information is only available on the TV screen. While this is useful for information that is mainly relevant within the context of a specific TV presentation (e.g., actor biographies for a specific movie), it is problematic within the context of travel applications. If the user intends to travel to the city presented in the video, it is likely that some weeks pass before he travels to that destination, forcing the user to keep the video and the application on his set-top box, using up resources. The information presented during the broadcast might also be out of date by then. In addition, the user most likely wants to have the information, especially the map information, available during the trip itself. To facilitate this, the user will be able to make all the bookmarked information available on a PDA, together with live-links to dynamically changing information (e.g., event information), allowing the user to carry the information during travel and to be able to access current information about the attractions he is interested in (e.g., changed opening times or special events while he visits the city) . So overall, the PDA application will be an integrated interactive service containing personalised material from the ITV-service and 'stand alone' material specifically provided for mobile usage.

2.3 Deep Sea application – Enhanced Video (fiction content)

2.3.1 Application concept

This application is about enhancing a video broadcast with fictional content, where 3D-graphics and animation are used to realize the fictional effects. The focus of this application is on the application structure and the complexity of the interaction. In this application the content is presented in a non-linear fashion, in such a way that multiple users can watch different facets of the story depending on their different interests. The advantages of such an approach are that content can be re-used within the same program and that users with different interests (for example, a group of friends, the members of a family) can watch the program together at the same time, while each gets their personal flavour. Such programs can provide adventure, education and entertainment at the same time. The content of the story is about deep-sea nature.

2.3.2 Interaction tools

The DeepSea application is situated in a living room setting. The application has various interfacing devices, i.e., a handheld device, a toy, and some light fixtures. The interfacing devices carry corresponding media content and the user can interact with these devices.

1. *iPronto – the wireless home control panel*

The ever-increasing complexity of home theatre systems places correspondingly greater demands on centralized remote control systems. Responding to the challenge, Philips has now added the convergence-minded iPronto to the top end of its Pronto family of programmable remotes.

Implementing ProSyst's OSGi-certified service delivery platform, mBedded Server, the iPronto provides consumers with a versatile solution to control home theatre as well as the increasing number of electronic home automation products. The iPronto includes USB connectivity and an MMC/SD card slot for future applications and accessories. Among others, the iPronto features other built-in components that enhance the entertainment experience, like a built-in microphone and stereo speakers that will allow users to listen to MP3s from the Internet through future software upgrades and for future applications such as voice recognition and telephony. Implementing ProSyst's open, modular and scalable service delivery platform, the iPronto has an always-on Internet connection by which new features and software can be sent to the unit on the request.

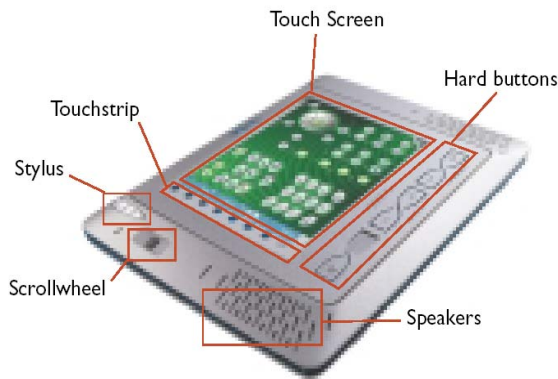


Figure 16. iPronto

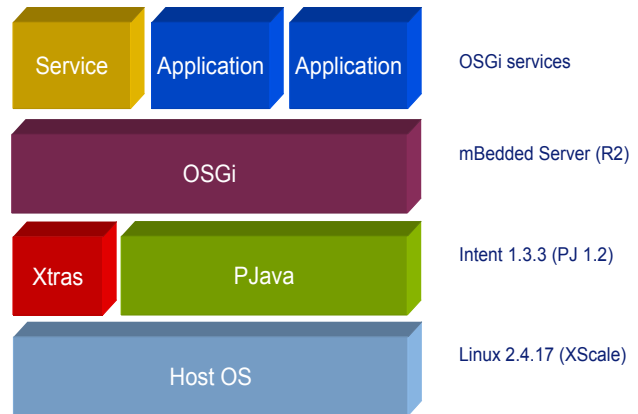


Figure 17. iPronto Architecture

In DeepSea application, an iPronto is used to present timed graphical user interfaces that are changing during the show, depending on the story modes and plots.

A presentation server parses the hierarchy and properties of the graphical user interfaces that are scripted in simple XML-style documents, renders the interfaces, handles user interaction, and calls the messaging mechanisms. The interface presentation (described in the XML file) and the application logic are separated from each other. The interface presentation server can serve different graphic interfaces and user interactions during the time and for a variety of applications.

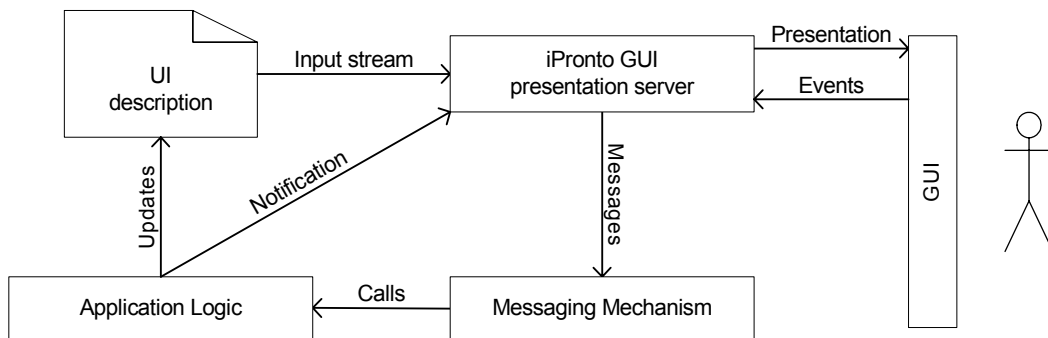


Figure 18. iPronto GUI presentation server

2. Tony – the robotic toy

The robotic toy, namely Tony, is assembled using the LEGO Mindstorms Robotics Invention System (RIS), and programmed in Java. The Java program is running on a small Java Virtual Machine LeJOS. A LeJOS program can use some standard Java libraries, such as `java.lang`, `java.io`, and `java.util`. It has libraries for control of motors, sensors, LCD and Buttons.

Tony's sensors:

- Two touch sensors on the shoulders generate events indicating whether left or right shoulder or arm has been pressed or released.

- A light sensor between two eyes monitors whether the eyes are covered or no longer covered.
- An infrared sensor receives messages from other devices.

Tony's actuators:

- A small lamp on the head indicates the level of attention.
- A motor behind the neck to drive the head movements. In order to get precise control of the head movements, a rotation sensor is connected to the motor to measure the rotation angle and the number of rounds.
- Two motors drive left and right wheels respectively so that Tony can move forwards or backwards, and make turns.
- A speaker in the RCX can play ascending and descending tunes, which indicates respectively an annoyed mood or a happy one.
- The infrared transmitter sends messages to other devices

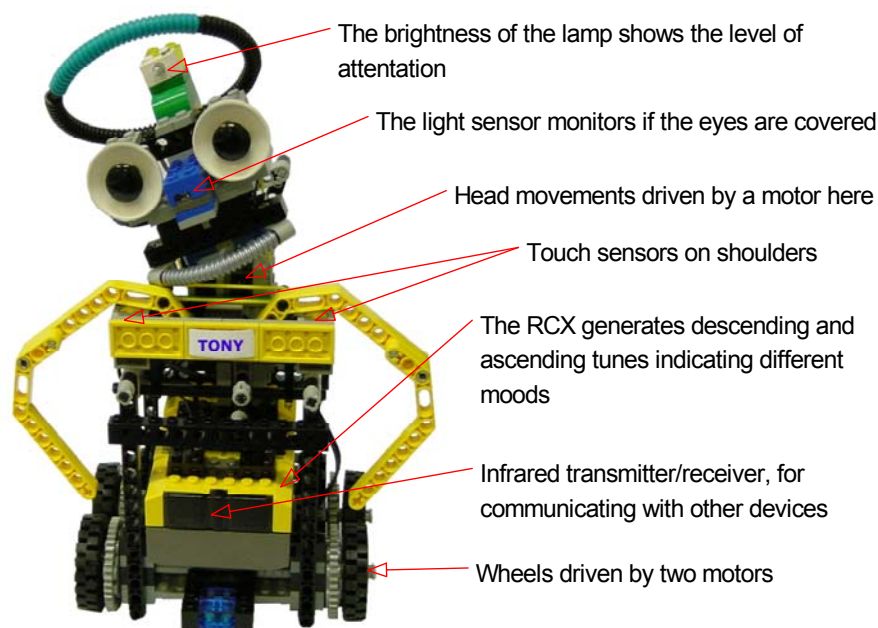


Figure 19. Tony

With these sensors and actuators, Tony can perform four different behaviours: it can be at sleep, relaxed, in attention, and tired. The following table shows how Tony will execute different behaviours and possible interactions during a performance.

Tony's behaviours and possible interactons

	Behaviour	Sleeping	Relaxed	In Attention	Tired
Performance	Light	Off	Dim	Flashing for a while, then bright	Dim
	Sound	Quiet	Quiet	Ascending tunes then quiet	Quiet
	Movement	Head leans, then at rest	Head leans, then at rest	Head upright, body forth and back once, then at rest	Head leans, then at rest
if touched	Sound	Descending tunes	Ascending tunes	Beep	Descending tunes
	Movement	_____	Moving away	_____	_____
	Messages sent out	_____	_____	Which sensor is touched	_____
if eyes are covered	Sound	_____	Ascending tunes	Descending tunes	Descending tunes
	Movement	_____	Moving away	Moving away	_____
	Messages sent out	_____	_____	Eyes are covered or no longer covered	_____

Tony is presented to the DeepSea show as an interfacing device, and as a companion for the user. It watches the show together with the user, and performs some requests from the show, i.e. renders some robotic behaviour. The users may interact with robot and thus interact with the show by pressing one of its touch sensors or covering the eyes.

3. Lighting fixtures

The lighting fixtures in the living room are driven by effects (events) in the 3D movie and vice versa. Lighting effect presentations are very powerful in terms of connecting the virtual world with the reality in a natural way. This can be enhanced if the user interaction with the lights affects also the illumination of the 3D virtual world, that is, not only the lighting in the users' environment can be driven by the 3D movie, but also the lighting of the 3D virtual world or objects can be changed accordingly when the users adjust the brightness of the lights in the reality.

2.3.3 Application description

To experiment with the distribution and presentation effects in relation to the content of the DeepSea show, we need to work with different environment settings and compare the effects to draw conclusions. This requires a flexible architecture enabling us to easily add, remove and modify the interactive devices. Briefly, all the presentation servers (the 3D Movie player, the lighting controller, the robotic toy controller, and the handhelds) need to be able to be controlled not only locally on the hosting computer, but also elsewhere via a network connection.

These presentation servers are independent, and only to be connected to clients via certain network protocols. In the current experiment settings, the only client is a presentation scheduler. The presentation servers respond immediately to the query commands to report local time for synchronization. Guided by a script, the scheduler sends action commands to control the presentations of the 3D movie, the lighting effects, the robotic behaviour and the handhelds interface. The scheduler also listens to the events of the presentation and the user interaction from presentation servers, and if necessary, translates these events to action commands and sends them to other presentation servers. The schema shows in the following figure.

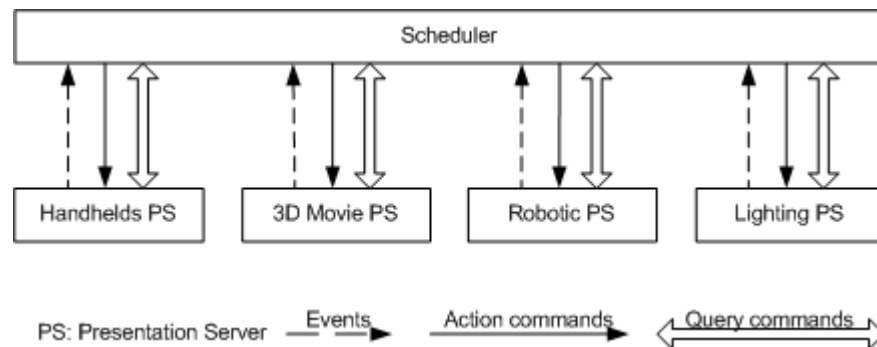


Figure 20: Presentation server architecture

A scripting language (ITML, Interactive Theatre Mark-up Language) and the scheduler (the ITML player) have been designed and implemented. ITML is an XML based language, which makes use of the SMIL timing module to schedule the presentation, combining with a distributed interface management module. The ITML scheduler coordinates the presentation servers as follows.

Immediate response to the query commands from the scheduler to report the local time of the presentation server for synchronization. Action commands are sent to the presentation servers with a timestamp, telling the presentation when to trigger the action.

The presentation servers listen to the action commands. The action commands can be,

- Scheduling commands at the presentation level, such as creating, starting and stopping a presentation,
- Control commands at the content level, such as changing the view points of a 3D scene, adding and removing an object from the content, and modifying the attributes of an object.

The presentation servers notifies the scheduler with events, such as,

- Error messages when an action has failed,
- Presentation events to notify the update of the presentation state,
- User interaction events that are possibly interesting to other presentations on other devices, for example a button has been pressed on the handheld device, the robotic toy is hidden from the environment, the lights are switched off,

- Content events that may affect other presentations. For example when a ghost shows up in the scene, an event can be sent to the scheduler in order to let the robot act scared.

The scheduler reacts to the events from the presentation servers and schedules the further actions for related presentation servers, according to the semantics of the ITML script.

2.3.4 Improvements to original design

1. Interactive lighting effects are added to the demonstrator, that is, not only the lighting of the user's environment is influenced by the show, but the change of the lighting will also influence the illumination of the virtual world presented in the 3D movie.
2. The robotic toy can be used as a control device; in addition, a 3D model of a virtual robot is developed in correspondence to the physical robot to build stronger narrative relations between the real and the virtual.

2.3.5 Further work

Fine-tuning of the ITML parser and the scheduler is needed. ITML is aiming at not only the distributed scheduling mechanism and engine, but also an abstract description of the desired environment for the presentation. The desired environment is not tied to any specific configurations, but still could be mapped into different user environments. For the later purpose, a mapping engine is to be developed.

3 Conclusions

The application prototypes have been developed according to the plans laid out earlier in the project. While some improvements have been made, based on the results of the evaluation of the design concepts and the application scenarios, the underlying concept of the three applications remains unchanged. The application highlight the use of new services and platforms and demonstrate the integration of different technologies to provide new types of interactivity for the end users, while opening new avenues for service and content providers.

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