



Ticket Reservation System for the Millennium Forum

BSc (Hons) Computing with Human Resource Management

Intelligent MultiMedia Module: COM556M2

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1 Introduction

The following report will outline the development of an automated Ticket Reservation System for the Millennium Forum which will incorporate features in order to aid the process for visually impaired users. This application has been designed for customers to reserve theatre tickets for various shows.

1.1 Aims and Objectives

The main aim and objective of this system is to design and implement a speech driven reservation system for show listings.

This application should allow customers to:

- 1) View show listings;
- 2) Select show;
- 3) View show description;
- 4) Check availability;
- 5) Reserve Tickets.

The information for the show description will be stored in a database that can be accessed using spoken dialogue.

1.2 Overview of Chapters

This subchapter will outline the seven chapters within this report which are the literature review, Requirements Analysis, Design, Implementation, Testing and Conclusion.

1.2.1 Chapter 2 - Literature Review/Background

This chapter will discuss the background research which was carried out within the relevant areas of the design. Traditional Multimedia and Intelligent Multimedia will also be outlined along with information on Visually Impaired Users. A sub section regarding Speech technologies will also be discussed with reference to the CSLU toolkit which is the software being used to implement the Ticket Reservation System for the Millennium Forum. Similar systems will also be discussed.

1.2.2 Chapter 3 – Requirements Analysis

This chapter will establish and discuss the requirements necessary for the Ticket Reservation System for the Millennium Forum. The user, system, functional, non-functional, software and hardware requirements will be identified.

1.2.3 Chapter 4 – Design

This chapter will outline the design process. This chapter involves implementing the requirements identified in chapter 3 into the actual design of the Ticket Reservation System for the Millennium Forum. A System architecture will also be included.

1.2.4 Chapter 5 – Implementation

This chapter will outline the implementation of the Reservation Ticket System for the Millennium Forum. As a database is required to store information on the shows, show times, show listings etc this will be detailed within this section.

1.2.5 Chapter 6 – Testing and Evaluation

This chapter will discuss the testing process which is employed for the Ticket Reservation System for the Millennium Forum. Each testing method which is used will be discussed along with the test results.

1.2.6 Chapter 7 - Conclusion

This chapter will provide a conclusion of the overall report and Ticket Reservation System for the Millennium Forum. A critical analysis will also be included in order to evaluate the project and future work which could be undertaken. Any problems which were encountered will also be outlined.

Chapter 2 Literature Review/Background

2.1 Introduction

This chapter will discuss the background research which was carried out within the relevant areas of the design. Traditional Multimedia and Intelligent Multimedia will also be outlined along with information on Visually Impaired Users. A section regarding Speech technologies will also be discussed with reference to the CSLU toolkit which is the software being used to implement a Ticket Reservation System for the Millennium Forum.

2.2 Traditional Multimedia

Traditional Multimedia consists of objects such as video and audio types.

Traditional multimedia middleware such as:

- DirectShow from Microsoft
- Apple's Quicktime

The above provides access only to multimedia devices directly connected to the same PC an application is running on. The network is supported as a source of data but the middleware cannot extend its control to other devices on the network. For example, it is impossible to transparently watch TV via the TV card in your colleague's PC, or control remote cameras attached to other PCs or directly to the network. (Lohse, Slusallek &Wambach 2001)

2.3 Intelligent Multimedia

Mc Kevitt (1997, p.1) notes "Intelligent Multimedia is a growing area which involves the computer processing of language and vision information and representing it in terms of its semantics". Semantics is identifying the study of meaning in communication. Intelligent Multimedia is a computer's ability to process and understand an input in text, speech, images etc and responding to it.

2.4 Visually Impaired Users

Visual Impairment is when individuals have reduced vision and therefore can find it difficult to view certain types of computer interfaces. Lehman (2007) notes "Many

people have some type of visual problem at some point in their lives. Some can no longer see objects far away. Others have problems reading small print". Therefore it is important to recognise the needs of visually impaired users.

2.5 CSLU Toolkit

"The CSLU Toolkit was created to provide the basic framework and tools for people to build, investigate and use interactive language systems. These systems incorporate leading-edge speech recognition, natural language understanding, speech synthesis and facial animation technologies. The toolkit provides a comprehensive, powerful and flexible environment for building interactive language systems that use these technologies, and for conducting research to improve them." CSLU Toolkit (2008).

The CSLU Toolkit development started in 1992 and it has progressed to meet different needs. Hoson (2008) has outlined the main goals of the CSLU Toolkit as:

- "easy to use";
- "powerful for research and development use";
- "systems that work in the real world";
- "incorporates research advances".

2.5.1 What is the CSLU Toolkit?

Figure 2.5.1 CSLU Toolkit (Hoson 2008)

As you can see from the above picture there are three main sections of the CSLU Toolkit. The first section is the 'Fundamental Components' which includes:

- Audio Tools;

- Display Tools:
- Speech Recognition;
- Speech Generation;
- Animated Faces.

The second section is the 'System Integration', at this point the components of the system are brought together and system functionality is ensured. The third section is the 'Technology Transfer', here the system ensures that the technology which has been developed can be accessed by a range of users. In figure 2.4.1 the users include High Schools, Universities, Researchers and the Industries.

2.5.2 CSLU Toolkit Core Technologies

Figure 2.4.2 CSLU Toolkit Core Technologies (Hoson 2008)

As you can see from the above picture the core technologies of the CSLU toolkit are:

- Facial Animation: used in order to show emotions.
- Text to Speech Synthetic voice: used to translate the text which is required to be spoken by the toolkit.
- Speech Recognition: used by the toolkit in order to understand the end user.

2.6 Speech Technologies

Speech technologies are used to make the system more acceptable and usable by its users. The first choice of speech technology which could be used is Clear Voice. Clear voice is the technology of noise cancellation for speech signals. This is used in call centres and helps block out background noise which could interfere with the system or responses given by the caller. As they will be new shows being added and deleted each week the use of clear voice would be effective in creating a new list of shows.

Once a user makes a purchase using the system they can set up an account which means that their details will be saved. One way of doing this securely is by using Biometric Voice Verification (Voice Key) which is a voice-based access control algorithm performing user authentication by voice password. In just 0.5 sec Voice Key will identify a user and define his/her access rights to information and services.

2.7 Theatre background

Theatre is the division of the performing arts that acts out stories in front of an audience using a mixture of speech, gesture, music, dance, sound and spectacle. Together with the narrative dialogue style, theatres also take the forms as opera, ballet, mime, kabuki, classical Indian dance, Chinese opera, mummers' plays, and pantomime.

2.8 Relevant Papers

This section outlines a number of relevant papers that have been reviewed, discussed and critically analysed in our Intelligent Multimedia module. These papers relate to areas such as language, vision and speech.

Week 2: "Computational Models for Integrating Linguistic and Visual Information: A Survey" Srihari (1995)

Computational Models for Integrating Linguistic and Visual Information, surveys research in developing computational models for integrating linguistic and visual information. It discusses the importance of linking language and vision in order for a system to exhibit intelligent behaviour. This paper includes an examination of existing computational models, computationally motivated theories of human cognition and major research issues, which arise in the task of integrating visual and linguistic information. This paper acknowledges that more research is required in developing an intelligent agent that has both language and perceptual abilities.

Week 4: "The Behaviour Expression Animation Toolkit (BEAT)" Cassell et al. (2001)

The Behaviour Expression Animation Toolkit (BEAT) allows animators to input typed text that they wish to be spoken by an animated human figure, and to obtain as output appropriate and synchronized nonverbal behaviours and synthesized speech in a form that can be sent to a number of different animation systems. The toolkit is extensible, so that new rules can be quickly added.

2.9 Human Computer Guidelines (HCI)

As the system which will be created is intended to be as user-friendly as possible, in the design of the system, HCI must take centre place in order to design and develop a system which will be as usable as possible and will meet the requirements of all its users. The system will be the creation of an automated ticket booking system for the Millennium Forum which will be fully automated. This means that in order for someone to book tickets for a show they will simply speak to the system and the system will do all the work for them. These will be discussed in more detail in chapter four.

When designing this system the team will take into consideration the following factors:

- People with speech problems
- People with Visual Impairment

2.10 Analysis of Similar Systems

In this section similar systems to the Ticket Reservation System for the Millennium Forum will be discussed.

Online Booking Systems:

An online booking system is a system on the internet where users can book products or services. Usually customers are required to fill out web-forms with details such as their name, address and telephone number and are also required to provide payment details such as credit/debit card details.

Online Availability Systems:

Online availability systems are systems on the internet where users can check the availability of a product or service. If the required product/service is available customers may be able to reserve it.

Both systems are similar to the system which is to be developed, as the two main requirements of the Ticket Reservation System for the Millennium Forum are to be able to check the availability of a show and to reserve a number of tickets.

Reservation system

Reservation systems are electronic systems that allow users to check the availability of a product or service and then if available allows the end user to reserve the product or service without payment. These types of systems can be used for reserving hotel rooms or reserving tables at a restaurant.

2.11 Conclusion

This chapter provided a background on the relevant areas for this project, detailing information on the different areas of Multimedia, the CSLU Toolkit, Speech Technologies, Theatre, Reservation Systems, Visual Impairment and the HCI Guidelines. Also included is a sub-chapter detailing the papers which were discussed in class which are relevant to this project. Chapter three will now discuss the Requirements Specification. An analysis of similar systems to the Ticket Reservation System have also been discussed, which has helped to identify useful elements that could be included in the design of the Ticket Reservation System.

Chapter 3 Requirements Specification

3.1 Introduction

The intention of the requirements analysis is to identify and evaluate the requirements for the proposed system and then design and develop the system that will address these. This chapter aims to recognise the user requirements, system requirements, functional and non-functional requirements for the 'Ticket Reservation System for the Millennium Forum'. Similar systems will also be evaluated to ensure the ticket reservation system will contain all the required functionality.

3.2 User Requirements

The target users for the Millennium Forum Reservation system is the current and potential customers and also visually impaired individuals so it is very important to make sure that it is designed and developed with their unique needs in mind.

The Millennium Forum Reservation system booking system will enable users to make a reservation for tickets which they can collect at reception before the show. According to Sommerville (2001) User requirements "should only specify the external behaviour of the system and should avoid, as far as possible design characteristics".

The user requirements are:

- 1) To provide a usable service for visually impaired customers;
- 2) To allow the reservation of tickets;

- 3) To allow customers to choose seating area of their choice.
- 4) To allow customers to choose a number of tickets;
- 5) To allow users to select the show of their choice.

The functional and non-functional requirements of the system will now be discussed.

3.4 Functional Requirements and Non Functional Requirements

Functional Requirements

Sommerville (2004) has identified functional requirements as “Statements of services the system should provide how the system should react to particular inputs and how the system should behave in particular situations. In some cases, the functional requirements may also explicitly state what the system should do”.

The main functional requirements for the Millennium Forum are as follows:

- The system must provide the user with information of all current shows
- The system must provide the user with information of up coming events/shows
- The system must allow users to book a quantity of tickets for a show on a specific time and date.
- The system must provide users with a booking confirmation

Non-functional Requirements

Sommerville (2004) has identified the non-functional requirements as “constraints on the services or functions offered by the system. They include timing constraints,

constraints on the development process and standards. Non-functional requirements often apply to the system as a whole”.

The main non-functional requirements for the Millennium Forum are as follows:

- Usability: the system will be fully operational and in working condition, along with providing a user friendly interface for visually impaired users.
- Speed: the system will allow customers to reserve tickets quickly.
- Security: the system will contain security features in the form of a username and password.
- Reliability: the system will have a high availability rate.
- Performance: the system will have a quick response rate.

3.5 System Requirements

This section details the system requirements for the Ticket Reservation System for the Millennium Forum. The minimal hardware and software requirements will now be outlined.

3.5.1 Hardware Requirements

The minimum hardware requirements for the Ticket Reservation System for the Millennium Forum are:

- A Computer;
- 512MB RAM;
- 100MB Hard Disk Space;
- 500 MHZ Processor;
- Sound Card;
- Microphone;

- Headset.

3.5.2 Software Requirements

The minimum software requirements for the Ticket Reservation System for the Millennium Forum are:

- Windows 97 or above;
- CSLU Toolkit;
- Microsoft Access;
- Macromedia Fireworks.

3.6 Methodology

The development of any software needs to be a precise plan of action. This plan can be also known as a process model. A process model is made up of the steps that are to be taken as the development of the software progresses. The following process models have been researched in order to decide which will be most appropriate for this project.

The Waterfall Model

This model is also known as the Linear Sequential Model, it suggests a systematic sequential approach to software development that begins at the system level and progresses through analysis, design, coding, testing and support (Burback, 1998)

The stages of the Waterfall model are shown in Figure 4.1

Figure 4.1 The Waterfall Method (Sommerville, 2001)

The Spiral Model

The spiral model is an evolutionary software process model that couples the iterative nature of prototyping with the controlled and systematic aspects of the linear sequential model. It provides the potential for rapid development of incremental versions of software. Using the spiral model, software is developed in a series of incremental releases. A spiral model is divided into a number of framework activities, also called task regions. There are usually between three and six regions (Pressman, 1997).

Figure 4.4 The Spiral Model (Wiley, 2002)

3.7 Rapid Application Development

Figure 4.3 Wysteria 2008

Maner (1997) identifies rapid application development as “a software development process that allows usable systems to be built in as little as 60-90 days, often with some compromises”.

3.8 Choice of Methodologies

After evaluating the methodologies we decided to use the RAD because this best suits our project requirements due to the short period of time we have to develop the application. It also has been decided that UML will be used to support the design methodology as this includes a wide collection of tools and allows the modelling of a system from many different views.

3.9 Conclusion

This chapter provided information on the requirement specification. The User, Functional, Non-Functional, Hardware and Software requirements were identified and will be the basis of the design for the implementation for this system. The methodology has also been outlined and the storyboards have been designed. Chapter four will involve implementing the requirements.

4 Design

4.1 Introduction

This chapter identifies how the requirements gathered in chapter three are implemented into the design of the system. The system architecture, the HCI guidelines and the storyboards for the system will be outlined.

4.2 System Architecture

Sommerville (2007) describes the first stage of the design process as the architectural design. Sommerville also states “the process of establishing a basic structural framework that identifies the major components of a system and the communications between these components”.

4.2.1 Application Architecture

Chitnis et al (2009) state that “the Use case diagram is used to identify the primary elements and processes that form the system. The primary elements are termed as "actors" and the processes are called "use cases." The Use case diagram shows which actors interact with each use case”.

A use case diagram has been developed in order to identify the processes that the system needs to carry out; it outlines the relationship between the different functions and can be seen in figure 4.1.

Figure 4.1 Use Case Diagram

4.3 HCI Guidelines

In designing the Ticket Reservation System Millennium Forum, the eight HCI guidelines outlined by Atakan (2006) have been taken into consideration to ensure that the system is suitable for all types of users needs including those who are

visually impaired. The important aspect of this software product is a well laid out and intuitive user interface also the spoken dialogue should be easily understood. Abbreviations and technical words should be avoided in order to avoid user misunderstanding and confusion.

Smith-Atakan (2006) outlines five of the best known design guidelines that can be applied for the design and creation of a suitable internet revision interface. If the interface is to be of a high standard in terms of HCI these must be applied to our system and will now be discussed:

- **Learnable:** Meaningful names and labels will be used so customer's actions can be quickly learned and therefore, memorised.
- **Predictable:** Customers will know what the system offers and what must be done to carry out the reservation of tickets as a simple approach to design will be taken.
- **Consistent:** The system will maintain consistency throughout in order to promote usability and learn-ability.
- **Flexible:** Flexibility enhances the communication between the customer and system interfaces. Interfaces will be flexible as this is good practice as it allows for the customer to operate the system on their own terms, for example, being able to resize screens or minimize and maximize windows.
- **Responsive:** the system will be responsive to the customers as the spoken dialogue will reinforce what the customer says. The customer will be kept informed what is being carried out.

4.4 Storyboards

Storyboards have been utilised in the design phase of Millennium Forum to provide an insight into how the user interfaces will appear. User Interfaces will be kept to a minimum as spoken dialogue will be used to help aid the experience of visual impaired users. (see appendix 9.2)

Mallon (1995) states that “a storyboard is an expression of everything that will be contained in the program -- what menu screens will look like, what pictures (still and moving) will be seen when and for how long, what audio and text will accompany the images, either synchronously or hyperlinked. Typically, storyboards may be written documents and off-the-shelf storyboard pads for TV and video formats, adaptable for multimedia, are available. For me, the storyboard expresses, in one way or another, everything that can be seen or heard or experienced by the end-user of the multimedia program. It's more than a test-of-concept model and just short of the final product specification document”.

There are significant advantages of using storyboards within our design, these advantages include:

- 1) It allows us to see how the system will look once implemented, therefore if the storyboard does not look good we have the ability to change this.
- 2) We will be able to spot errors.
- 3) The storyboards can be evaluated by the whole group.
- 4) Advanced planning can help produce a more usable interface.

4.5 Design Process Used (UML)

Unified Modelling Language is a graphical visualisation language. The UML standard defines many types of diagrams however for this project use case diagram will be used, this has been implemented using Rational Rose. Use Case diagrams allows us to easily view the communications between the different functions of the system as can be seen in figure 4.1

4.6 Interface Design

It is important for the design of the interface to be considered in order to produce a usable system for all users. A variety of users may use the system and those may

range from novice users to expert users, the system needs to be able to accommodate both, as previously stated one of the aims of this project is to develop a system that is usable by visually impaired users. Therefore a basic approach will be taken to the design of the interface and a minimum number of interfaces will be implemented.

4.7 Database Design and Connectivity

In order to for the system to be able to advise users of the available tickets, shows, shows descriptions and show times a database is required to store this information and to allow the system to retrieve this information when required. A Microsoft Access Database will be implemented and Open Database Connectivity (ODBC) will be incorporated in order to connect the database to the CSLU Toolkit, as this will allow the information to flow from the database to the system. Advantages of using a database have been outlined by Connolly and Beggs (2005) include:

- 1) Control of data redundancy;
- 2) Data consistency;
- 3) Improved security;
- 4) Data independence.

4.8 Conclusion

Now the design process has been outlined it will now be implemented in accordance with the human computer interaction guidelines this will be discussed in chapter 5.

Chapter 5 Implementation

Introduction

The purpose of this chapter is to present a step by step account of the implementation of the Ticket Reservation system for the Millennium Forum. According to Sommerville (2001; p45) throughout the implementation stage of the software development process “the software design is realised as a set of programs or program units”. This means that there are several ways to implement a system which includes unit, module and system implementation. For this project the database and system implementation will be discussed.

Database Implementation

The database for the ticket reservation system was implemented using Microsoft Access 2007. It was agreed upon by the group that it would be best to use Access as all the team has prior knowledge and experience using Microsoft Access 2007. Microsoft Access 2007 also allows the user to have two view points of the tables which include design view and database view. Implementing a database has allowed us to set validation rules ensuring invalid data cannot be entered, the properties allows us to set the criteria for the ticket reservation system, and allows us to incorporate usernames and passwords. Figure 5.1 shows a database table in the design view where we have been able to set the field size, in this instance it is eight characters long and the field has been identified as ‘required field’ therefore advising this field must be completed.

Figure 5.1: Access in the design view

Rapid Application Development (RAD)

There are many objects available in RAD which have been used in the implementation of the 'Ticket Reservation Booking System SLI'. Objects included in the implementation of this system are:

Start Object - The start object indicates the point where the dialog begins for the ticket reservation system. All RAD applications must begin with the start object.

Sub-dialogue – resembles a mini RAD canvas. Used to organise the application into smaller separate components and provides a much clearer and neater canvas. Sub-dialogues can be reused time and time again throughout the application. In relation to the 'Ticket Reservation Booking System SLI' this icon was used to take the user of the system to a sub screen which is where they can select their tickets and seats for the show. Figure 5.2 shows the process of booking tickets and seats for a show using Sub-dialogue. Figure 5.3 shows the process of what happens within the sub-dialogue objects associated with this application.

Media – The media object has two methods of operation which are 'Present Media' and 'Remove Media'. 'Present Media', presents images and clickable image maps on the screen, in relation to the ticket reservation booking system it presents the poster which outlines the current shows and information on the shows. 'Remove Media' removes the image that is presented on screen. 'Remove Media' is used within the system, it is auctioned six times in total for example it removes the seating plan which is present in each sub-dialogue associated with each show.

Goodbye – as with every RAD having to start with the start object, the same method rule applies with the end of any RAD application. The only way to finalise and end an application is by finishing with the goodbye object and so this has been implemented at the end of the ticket reservation system.

Figure 5.2: Use of Sub-dialogue objects in the ticket reservation booking system

Figure 5.3: An inside view of the sub-dialogue object

System Functionality

The main functionality of the ticket reservation system is to allow customers to reserve tickets for shows in the Millennium Forum, In order to perform this task successfully there are a number of steps that the customers need to undertake.

Customers need to be register to use the system; once customers are registered they will receive a username and password which is required to process reservations. For the purpose of this small prototype a number of usernames which are in the form of pin numbers were generated along with passwords.

In order for the system to verify if the username and password entered are correct the system connects to the database and retrieves the relevant information. In order to attach the database to the RAD the following steps were carried out:

1. The 'Tcl ODBC' extension package was downloaded and installed;
2. A Data Source Name (DSN) was created for the database;
3. The RAD canvas was linked to the database.

Figure 5.4 illustrates the code used in order to load the TclODBC and this outlines the Tcl code required in order to complete this task.

Figure 5.4: Action object check_db

Figure 5.4 also shows the code used in order to retrieve the password associated with each username which is registered to the system. This code simply checks the database to see if the username exists and if it does then it checks to see if the password entered by the customer is correct.

```
“set password [db "Select password from Users where Username = $user"]#”
```

Adding Speech functionality

The speech prompts that the ticket reservation system use are entered into the generic objects. This is done by double clicking on the generic object icon, and then the following screen is displayed.

Figure 5.5: RAD prompt screen

Under the Text To Speech (TTS) tab is where the prompt is entered and this is what is spoken to the customer when using the system.

RAD only recognises pre-defined words therefore the prompts entered must inform the customer what to say so that the application can run smoothly. In order to carry this out successfully the red ports have been populated with answers so that the customers responses can be judged according to pre-defined inputs that the system will expect. For example the spoken dialogue from the system to the customer may be “How many tickets would you likely to reserve, 1, 2, 3 or 4?” the customer then knows to reply with the number 1, 2, 3 or 4.

Figure 5.6 highlights the welcome object in the ticket reservation system. This is the first response the systems gets from the customer as the object asks the user if they would like to reserve tickets using the automated ticket reservation system for the Millennium Forum.

Figure 5.6: Welcome object with pre-defined responses

If the customer answers ‘yes’ the system will automatically direct them to the login sub-dialogue which is the left port. This allows the customer to continue using the system. If the customer had of answered ‘no’ the system travels to the goodbye icon which is the right port were the customer sees the end the application. If the customer answers a response that is not predefined and therefore not recognised by the system, for example ‘bananas’ the system will say that it does not understand and will repeat the question until the user says either ‘yes’ or ‘no’.

In order to set a response which the customer needs to say we simply double clicked the red port and then placed the required response. In relation to figure 5.6 the left

port has a response of 'yes' and the right port has a pre-defined answer of 'no'. Figure 5.7 highlights how the responses are applied to the port, for this illustration it outlines the response associated with the left port.

Figure 5.7: Setting a pre-defined response of 'Yes'

In order to set a response which will be recognised by the system the word that we wished the application to understand was entered into the 'Words' box and then the 'Update All' button was clicked in order to automatically update the 'Pronunciation' box. Once this was done the 'OK' button was clicked and this means that when the question is asked to the customer if the respond 'yes' it will continue onto the next step of the application.

Present/ Remove Media

The media object is used various times throughout the ticket reservation system to present visual aids and information to the user. The visual aids include the poster which highlights information about the shows. When the media button is right clicked it has two main options as previously discussed these are present media and remove media. If you select present media from the two options the following window will appear.

Figure 5.8: Present Media Window

Figure 5.8 shows the areas on the screen which includes window placement. The window placement area meant that we could choose a specific position on screen to place our media, for example we have place it in the centre of the screen, In total there are nine placements to choose from.

The image area allows users to incorporate images within the system and therefore enhancing the interfaces which customers view. The poster within the system was implemented in this way.

The image map features allowed us to edit an image with clickable sections which work like hyperlinks. Within the system users are presented with an interface with a image of the Millennium Forums seating plan. Using the special features allowed us to predefine clickable areas which customers can click in order to choose if they would like to sit in the upper or lower tier, as shown in figure 5.9. The outline in green shows where a customer can click in order to choose the seating area for the upper tier.

Figure 5.9: Image Map editing Window

Figure 5.10 illustrates the window which appears in order to remove the media related to the seating plan. Once a customer chooses the upper or lower tier the seating plan should disappear. This has been done by clicking 'removemedias'.

Figure 5.10: Remove media object choice window

There are no limits to number of sections which can be edited within image maps however due to the fact that this is only a small application it was agreed upon by the team that there should be two sections which are lower level tier and upper level tier, also incorporating a large number of options of a user to choose from may cause confusion.

Conclusion

This chapter began with the database implementation process and focused on the system functionalities support by images then the system designs. As the group feel a useful system which has met the outlined requirements in chapter three has been developed and implemented the testing process will now take place.

6 Testing

6.1 Introduction

The testing process of the Ticket Reservation System will now be discussed. It is crucial that any system which is developed is tested. Testing is the process of trying to find as many errors as possible so that they can then be resolved and the system can then be deemed usable.

6.2 What is testing?

Testing involves executing the implemented software using test data in the system, examining outputs and monitoring the operational behaviour to ensure the system works effectively. “Testing is a dynamic technique of verification and validation because it works with an executable representation of the system” (Sommerville, 2001).

6.3 Testing Techniques

There are a number of techniques of testing available. Some methods includes Unit testing, Integration Testing, System testing and Acceptance testing.

6.4 Unit Testing

Unit testing is the process of testing each individual module to check for any errors and to determine if they meet the requirements. This method incorporates white box testing techniques. All individual units of the systems were tested one error was identified which when a user selected the lower tier to be seated in, the upper tier was selected. This problem was resolved easily by developing a new image map.

6.4.2 Black Box Testing

Black box testing as the name suggests views the system as a ‘black box’ it is unconcerned with the internal working of the system. The behaviour of the system is determined by studying the inputs and then relates outputs (Sommerville, 2001.)

6.4.3 White Box Testing

White box testing also known as glass box testing, is a software test methodology at the module level where the test cases are derived from the internal structure of the

system. The user performing the tests will require a detailed knowledge of the working of the (Pressman, 2000).

6.7 System Testing

System testing checks that, when all the modules are integrated together, overall system functionality is achieved (Pressman, 1997). The main aim of the system testing is to discover any errors or bugs when the system is being put together.

Task	Expected Outcome	Actual Outcome
1) Reserve four tickets.	Tickets should be reserved.	Expected outcome was achieved.
2) Reserve ten tickets.	Tickets should not be reserved.	Expected outcome was achieved.
3) Whilst reserving tickets select lower tier.	Tier was selected correctly.	Expected outcome was achieved.

6.8 Integration Testing

Integration testing, also known as integration and testing (I&T), is a software development process which program units are combined and tested as groups in multiple ways. (Anon 2008) The integration testing process for the Online Ticket Reservation involved bringing together the different modules such as the software application and the database and performing checks and sample runs of the system. No errors or problems were identified in this process therefore it was successful.

Acceptance Testing

Sommerville (2001) notes “This is the final stage in the testing before the system is accepted for operational use”. The acceptance testing for the ticket reservation system was carried out in two phases, the first phase was the alpha testing and the second phase was the beta testing.

- Alpha testing: here the developer and client worked together in order to determine if the system was usable and therefore accepted. The result of the process was successful and the system was accepted.

- Beta testing: here the system was released to a number of sample customers, no errors or problems were reported and so the system passed this stage of the testing.

6.5 Conclusion

This chapter identified the testing processes which have been employed in order to ensure no errors existed in the application. The system has proven to be currently error free as any errors which were discovered were examined, retested until they were resolved. Therefore The Ticket Reservation System for the Millennium Forum has been deemed successful.

Chapter 7 Conclusion

Overall we believe that we have achieved our main aims and objectives. We believe a consistent approach was taken to the design and implementation of the system therefore allowing visually impaired users to use the system easily and successfully. Currently there are not many reservation or booking systems that visually impaired customers can use easily and so we feel this system would be beneficial not only for visually impaired users but all customers. To conclude we believe we have achieved all our requirements outlined in chapter three and therefore feel we have produced a successful system.

Chapter 8 Critical Analysis

From the testing it can be seen that the ticket reservation system meets requirements outlined in chapter three and therefore an effective and usable system has been developed and implemented.

The acceptance testing allowed sample customers to use the system and they it interesting to use and they enjoyed certain aspects of the system such as the spoken dialogue. Certain customers commented on the use of the different shows and that all they had to say to reserve a show was state the show number instead of the show title which made the system more user-friendly.

Others commented on the seating plan, many customers liked that they could select the seating area that best suited their needs. One example of this is that a mother with small children was processing a testing example of reserving show tickets, and found it satisfying that she would be able to choose the lower tier for seats so that hey could see the show.

The customers of the system commented how easy the system was to use; however, a few commented that at times they had to repeat their response as the system did not fully understand their original answer. This proved to have a rather negative impact on the systems customers as the process became frustrating and one user

commented that they would not like to use this system until it could understand people with different speech accents.

One additional negative aspect of the system is the prompts, a few customers felt that they may not be as clear as they could be as some prompts are long and others are short, therefore a user could get bored or distracted.

Good aspects of the system:

- 1) Simple process: the process is extremely simple and errors cannot be made easily by customers.
- 2) Usability for Visually Impaired Customers: the usability for visually impaired customers is quite high as the interfaces have been kept to a minimum and any interfaces that do appear are large and easily viewed.

Unfavourable aspects of the system:

- 1) Lengthy dialogue spoken to customers: customers may become distracted or tired having to listen carefully to a long spoken dialogue; shorter more frequent spoken dialogue would prove more effective.
- 2) Miss-understanding accents: as the software tool the CSLU Toolkit has been developed in the American environment it is sometimes difficult for it to understand Irish accents.

8.1 Future Work

Future developments which could be implemented within the ticket reservation system are:

- 1) Once a customer completes the process of reserving tickets they could be taken to another screen where the tickets can be printed or saved.
- 2) Security features could be implemented to a higher standard and then a payment feature could be incorporated. Therefore customers could reserve

and pre pay for their tickets if they wish. By incorporating this feature the Millennium Forum would be guaranteed to be paid for reserved ticket's.

- 3) Another feature which could be incorporated into the design of the ticket reservation system would be the ability for customers to choose actual seats. At the minute customers can chose the upper or lower tier, by allowing customers to chose and reserve actual seats could boost customer satisfaction. Also if the seat has already been reserved for a show it could display a red 'x' on the unavailable seats so customers know they cannot select these seats.

9 Appendices

As the system has been designed with the needs of visually impaired customers in mind, the number of interfaces that appear to customers have been kept to a minimum in order to enhance the service visually impaired customers experience. Below we have outlined the interfaces that do appear as part of the reservation process.

9.1 User Interfaces

Interface that appears with the description of the shows:

Interface that appears in order to choose seating area.

9.2 Story Boards

9.2.1 The log In Screen

9.2.2 The Show Page

9.2.3 The seating Page

Reference List

- 1) Anon, (2008) SoftwareTestingClub.com, 2009, "Is Integration A Phase?", <http://www.softwaretestingclub.com/forum/topics/is-integration-a-phases>
- 2) Chitnis, M; Tiwari, P; Anathamurphy, L (2009). *Creating Use Case Diagrams*. [online]. Available from: <http://www.developer.com/design/article.php/2109801>. [Accessed 15th April 2009].
- 3) CSLU Toolkit (2008). *Welcome*. [online]. Available from: <http://www.cslu.ogi.edu/toolkit~> [Accessed 29/10/2007].
- 3) Hoson, *J.P.* (2008). *The CSLU Toolkit: A Platform for Research and Development of Spoken Language Systems*. [online]. Available from: http://cslu.cse.ogi.edu/toolkit/Toolkit_slideshow.htm. [Accessed: 21st March 2009].
- 4) Lehman, S. (2007). *Visual Impairment*. [online] Available from: http://kidshealth.org/teen/diseases_conditions/sight/visual_impairment.html. [Accessed: 12th March 2009].
- 5) Manner, W. (1997). *Rapid Application Development*. [online]. Available from: <http://csweb.cs.bgsu.edu/maner/domains/RAD.htm>. [Accessed: 13th February 2009]
- 6) Paul mc kevitt, 2009. *Intelligent Multimedia*. University of Ulster. Magee. .
- 8) Pressman, R. (1997), *Software Engineering, A Practitioner's Approach*, Fourth Edition, Mc Graw Hill.
- 9) Pressman, R. (2000), *Software Engineering, A Practitioner's Approach*, sixth Edition, Mc Graw Hill.
- 10) Smith-Atakan, S (2006), *Human-Computer Interaction*, Thomson Learning.

11)) Sommerville, I., (2001), *Software Engineering*, 6th Edition, Pearson Education Ltd.

12) Sommerville, I., (2007), *Software Engineering*, 6th Edition, Pearson Education Ltd.

13) Sommerville, I. (2007). *Software Engineering*. 8th Edition. Essex: Addison-Wesley.

12) Wiley, 2002.,. *Encyclopedia of Software Engineering*, 2nd. Edition, 993-1005

14) Wysteria (2008). *Rapid Application Development*. [online] Available from: <http://wysterdesir.com/2008/09/28/using-rapid-application-development-for-your-software-project/>. [Accessed 21st March 2009].

15) Lohse, Slusallek &Wambach 2001