COMP 482 – Human Computer Interaction

Assignment 3

System Implementation and Evaluation

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Introduction

The user interface designed here is based on the outline presented in Assignment 1. The interface is designed for the Amazing Game Console, a home entertainment device. The device is capable of playing disc based media, including games and Blu-Ray discs, as well as digital media purchased through the console interface. Additionally, it provides access to special third party applications for connection to other media sources such as Hulu and Netflix.

This report will outline the design rationale and discuss the results of the final interface implementation. This will include several screenshots, and a heuristic evaluation of the overall design. Source code is made available as a separate attachment. The code was developed using Visual Studio Community 2015 in C++, and also includes the Allegro library available at http://liballeg.org/. Please see the included ReadMe.txt file for specific instructions regarding the source code. Finally, a video presentation of the user interface is available on YouTube at (https://youtu.be/Ctf6YWa3dj4).

Design

The main idea behind the user interface design for the Amazing Game Console is to provide the user with easy access to the various functions that the system can provide. The interface should allow users to play purchased content in both physical and digital format. This includes games, movies, television and music. Additionally, third party companies can develop applications to provide access to specialized content available through their services. Therefore, as soon as the user powers on the console, the first screen provides easy navigation to these specific areas.
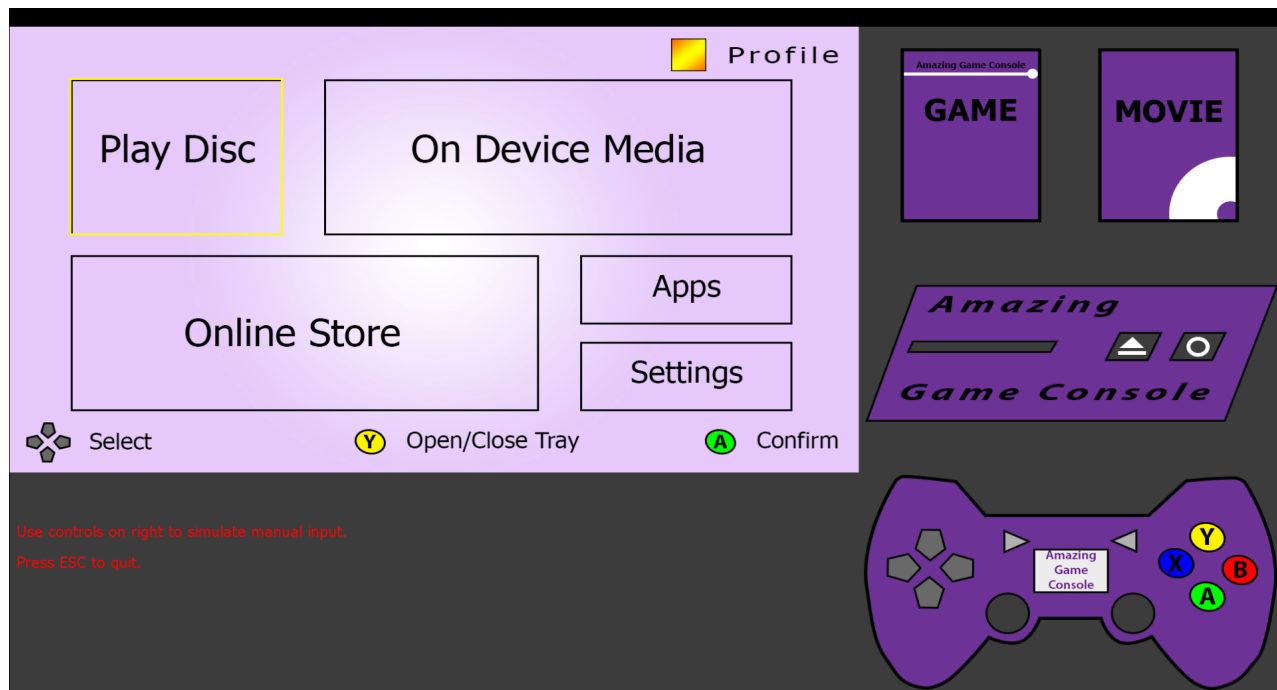

Figure1: First screen after powering on the console

In Figure1, the user user is presented with several options when first powering on the device. The user can play a disc inserted into the console, access media stored on the device, go to the online store to purchase additional media content, access 3rd party applications, and adjust settings, all from the main menu. The input device for the console is the controller located in the bottom right-hand corner of Figure 1. This is a much more limited input than they typical keyboard and mouse available with most computing devices. Menu navigation is done with the directional buttons. Other buttons

provide specialized contextual input. In this case, the user can confirm their highlighted selection with the 'A' button, and open or close the console disc tray by using the 'Y' button (in addition to the physical console button). Figure2 demonstrates this ability.
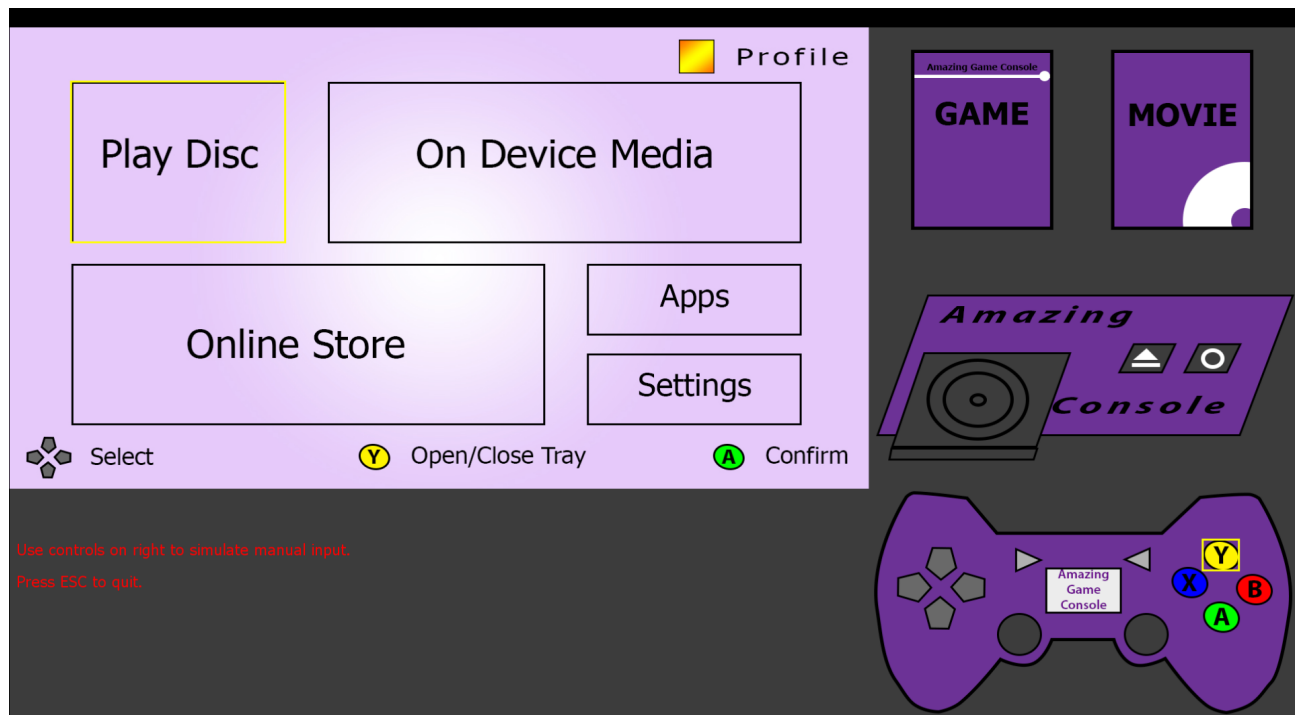

Figure2: Opening the console disc tray with the 'Y' button

Because of the lack of input options, these types of contextual inputs are necessary so that specialized functions can be made easily available. However, if too much specialization is used, the user will have difficulty in determining which input is required to perform the needed actions. Therefore, the 'A' and 'B' buttons typically perform consistent actions across different screens, confirming and canceling actions respectively. Furthermore, the directional buttons are almost exclusively used for navigation through the interface. Meanwhile, the 'X' and 'Y' buttons provide contextual input depending on the screen presented. This is demonstrated in Figure3 below.
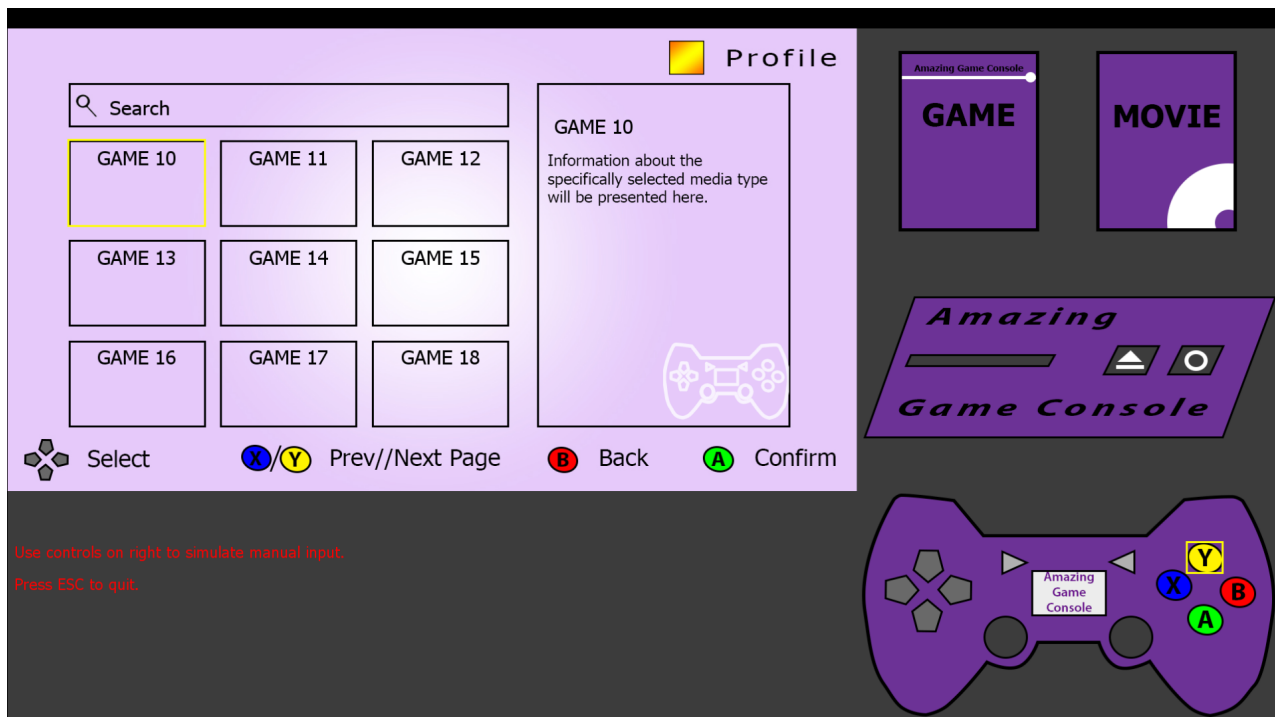
Figure3: Controller buttons provide both consistent and specialized input

Nevertheless, there are still some very difficult inputs to accomplish using only the controller input. The most obvious of these is text input. Without a proper keyboard, text is difficult to enter. However, using some of the same button consistency allows for some shortcuts. Common actions such as deleting characters or completing input can be abstracted to the specialized buttons. This can make text input easier and more accessible to users, as seen in the keyboard screen presented in Figure4 on the following page. Text input in this manner is still laborious, as letters can only be input one at a time, and the next letter to input may not be nearby, requiring time-consuming navigation. This is aided by presenting a standard QWERTY keyboard layout that most users are familiar with through their other computing devices. However, this area of the interface is a top candidate for improvement through an inspired interface design.

The theme of consistency was a major driver in other areas of the design. In addition to the

Figure4: The keyboard screen for text input

button consistency mentioned above, individual screens were designed to provide a uniform look and feel. Each screen uses yellow highlights to indicate the current menu position for input. Additionally, similar screens are used for differing functions. For example, when the user attempts to access content already available on the console, a listing screen is presented. Figure3 shows a list of the available games on the console. This same screen is used when attempting to purchase content from the online store available in the interface. Figure5 presents the available movies for purchase through the store. The same search function and presentation of individual items is used. The yellow highlighting can be seen throughout all screens as seen in the various screen captures presented throughout this report. The main problem with this consistent presentation is that it can be difficult for the user to distinguish which area of the interface they are currently using. There are no distinguishing features between the screens for media on the device and for media available from the store. Display of this information could help improve the design. However, there is a distinction between the type of media presented. Each listing screen presents an icon in the information portion of the screen to indicate the current type

of media available. This is a large transparent icon located over the information area that is easily

distinguishable by the user. This icon is also used in the detailed information screen presented in

Figure6.

Figure6: A semi-transparent icon identifies the type of media being browsed

As mentioned above, the ease of navigation was a major theme driving the design. To this end,

Figure8: The payment details screen has many menu options

each menu screen presents a relatively small number of options to choose from, with the notable exception of the payment information screen presented in Figure8 below. This design choice allows the user to quickly scan the screen to get to the areas they intend to use. However, the navigation of various menus through the directional pad is more limited than a touch or mouse-based interface. This presents some difficulty in the navigation. Users may encounter some unexpected results when trying to navigate, because it is not always clear where the next navigation choice will take them. For example, the keyboard interface in Figure4 has offsetting rows of keys, and a single space key at the bottom. If the user is currently on the spacebar, where should the up or down button take them? In this case, pushing up goes to the 'B' key, whereas pushing down goes to the '5' key. These are both in the middle of their respective rows. There is no clear way to present this information.

This problem is also present in some of the menu screens. The main screen presented in Figure1 is an example. Pushing up or down takes the user to largest menu item in each row ("On Device Media" and "Online Store"). Again, this is not made clear in the interface and may not be intuitive to the user. This can get very complicated when there are more menu options, such as the details screen in Figure8. Nevertheless, the many of the menus are designed as they are out of necessity, as with the large amount of information required in Figure8. In some cases they are also designed for emphasis, as with the main screen if Figure1. In this case, the more prominent options emphasize common functions for the user so they are easily identified.

The biggest drawback of the interface presented here cannot be seen in any screenshot. The lack of sound use in the interface design is a flaw in the design. The interface is highly visual, and works well in many visual contexts. There are bright colours and layouts, and many things are visually clear. However, a hallmark of good design is the use of alternate modes of communication to the user. This allows the user to process information better and more quickly. The use of sound to aid this

design could have improved the interface in a number of ways. One example would be a small sound that plays whenever the user navigates through the menus using the directional buttons. The sound could accompany the movement of the menu highlight to indicate that the system registered the button press. This is most useful in screens with a dense amount of information, or small menu items. The user may not see smaller highlight change in these screen types, so the sound would help them confirm they have made a navigational movement.

Furthermore, another use of sound that would be of great use is when the user presses the 'A' button to confirm a highlighted selection. This is a very common user action in this interface. While this action often results in a screen change, the use of sound can help the user distinguish the direction of movement through the screen hierarchy. For example, if the user pressed the 'B' button by mistake, it will often take them to the previous screen. If there were sounds to distinguish between the different navigational types, the user would be made more aware of their navigational progress. These are only two examples of how good use of sound can aid in the design of the user interface, but the inclusion of sound can aid in many more ways.

Fortunately, the design of the console system itself provides an additional mode of feedback to the user. The use of the controller is highly tactile, and button pushes can provoke a significant haptic feedback for the user. This mitigates the lack of sound somewhat, but it does not make up for this lack of inclusion. Unfortunately, this haptic feedback cannot be simulated in the interface prototype presented here. The prototype is designed to be used on a computer, so the tactile feedback is quite different than what would be used for the console.

Evaluation

The discussion of these issues brings us to the heuristic evaluation used to evaluate the user interface. As indicated in the outline for this assignment, the evaluation was conducted based on the recommendations of the paper by Chew and Whiteside. Heuristic evaluations were conducted by a total of three individuals and the aggregate results were used to improve the overall evaluation. The first evaluation was conducted by the interface developer, while the remaining two were overseen by the same developer, but using different subjects. However, in this role, the developer simply provided instructions along with a list of heuristic guidelines and aided experimenters if they ran into trouble or asked questions. The developer did not aid in finding any of the interface issues.

The set of heuristics used to evaluate the design are Nielsen's 10 principles as outlined below:

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

Users were asked to indicate the interface problem in writing and provide a severity score according to the following scale:

- 1 – Cosmetic problem only
- 2 – Minor usability problem only
- 3 – Major usability problem
- 4 – Usability catastrophe

The developer used the average mean of the scores rounded to the nearest decimal place to determine the overall severity.

Due to the nature of this particular user interface, there are some unique issues to consider during the evaluation. As mentioned above, the interface is designed for use on a gaming console. However, the prototype has been designed for use on a standard PC. Therefore, there were some issues reported by users that had to do with the interface simulation used, and did not apply to the system for its intended usage. These issues were not included in the final evaluations and their severity scores were disregarded.

The following table presents the results of the heuristic evaluations, categorized by heuristic:

Heuristic	Reported Issue	Severity
1. Visibility of system status	No way to know if browsing through device or store content on listings screen	4
	No on screen indication if the console tray is open or closed	2
	No screen indication if a disc is in the console	2
	No screen indication of what type of disc is in the console	3
2. Match between system and the real world	The term "On Device Media" on the main screen is unclear	2
	Some of the special keyboard characters are missing (ie. @ ! ( ) etc.)	1
	Navigational movement on some menus does not go where expected	2
	There is an extra slash between the terms 'Prev' and 'Next' on the listings screen	1
	The use of the term 'Prev' to indicate previous may be unclear	1
	The term 'Confirm' may not clearly indicate exactly what the button input is intended to do	3
	The keyboard term 'enter' goes to the next line in a text editor, but inputs the text and closes the screen in this interface	2
	The icon to indicate apps in some screens is not entirely clear	1
	There is a lack of information presented about the media	3
3. User control and freedom	Only way to get back to main screen from deep in the hierarchy is via several button presses	2
	Correcting text input is difficult because no cursor is available	2
	Can be difficult to tell on some screens where a directional button push will navigate to	2

Heuristic	Reported Issue	Severity
4. Consistency and standards	The X and Y buttons have different functions on different pages	2
	On the initial purchase screen, the navigation menus do not move the menu highlight (as it does in all other screens)	1
	When navigating, the opposite button press will not always move the highlight to the previous point	2
5. Error prevention	No issues reported	
6. Recognition rather than recall	No indication of which screen is previous when navigating back.	1
	User must remember if and what type of disc they may have inserted	3
7. Flexibility and efficiency of use	No way to customize any settings	4
8. Aesthetic and minimalist design	The use of yellow highlights doesn't fit with the colour palette	1
	The purchase details screen is quite cluttered with information	2
9. Help users recognize, diagnose, and recover from errors	There is no information about what fields are missing when using the purchase details screen	3
	There is no error checking on the various input fields in the purchase details screen	4
	The search function is not fully functional (ie. it does not provide similar suggestions if the user may have misspelled or doesn't know the full information)	4
10. Help and documentation	There is no type of help or documentation at this time.	4

The results indicate that there are some major issues to consider in moving to the next phase of interface development. Several functions need to be more fully realized, as well as the development of help and documentation for users. Additionally more information needs to be supplied, especially about the relationship of the disc media and the console. Additionally, there can be improvements made to the purchase details screen to help make things clearer for the user. Other problems were minor or cosmetic and are not a high priority.

Conclusion

Overall, the interface presented here should be effective for the intended tasks users will have when interacting with the device, despite some of the drawbacks mentioned above. Menus are, in general, easily and consistently navigated, and each screen is presented in a consistent manner. This consistency extends to the input types the user is able to accomplish. Many of the user tasks outlined from Assignment 1 involve the playback of media. These options are can be quickly reached in most cases. The most frequent options are presented at the moment the system is powered on, and the user has shortcuts available to use in some cases with simple button presses on the controller. However, more could be done to increase the user satisfaction when using the system, such as the use of sound, or a more intuitive method of text input. Fortunately, the user may not need to input text very often, and the haptic feedback inherent in the device can somewhat help make up for the sound issues. But we must be careful in some of these assumptions, as the interface does not simulate this touch interaction. The physical properties of the system cannot be duplicated through the mouse and keyboard input used to render this prototype. These are important considerations to take into account, so further testing is needed with the actual device to prove the functionality of the system.