

Hidden Guardian

DESIGN DOCUMENT

Team 9

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Revised: 2/27/18

Version 1

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List of figures/tables/symbols/definitions

Not applicable

1 Introduction

1.1 ACKNOWLEDGEMENT

Professor Swamy Ponpandi provided technical support and shall be acknowledged for assisting Team 9 in the development of Hidden Guardian. Similarly, Professor Zambreno and the SE, CPR E and EE departments provided financial support in the creation of this product.

1.2 PROBLEM AND PROJECT STATEMENT

Kid's lives today involve online interactions more than ever. Their interactions with strangers invoke the risk of sharing unwanted personal information, password theft, receiving viruses, being cyberbullied and more. However, currently there is no practical parental monitoring system to keep track of these unwanted videogame interactions.

Our solution is Hidden Guardian. Hidden Guardian is a combination of a speaker/microphone for a gaming console. It will connect to the gaming console as well as the Hidden Guardian's mobile app. Through the mobile app the parent user will be able to input keywords, such as meet, phone number, address and will be notified if they are used in chats. The app will also provide live streams of the child's chats and specific clips of chats with those keywords. Hidden Guardian will only be able to be enabled or disabled by the parent.

Overall, our goal is to provide a system for parents that can monitor their children so that parents can have peace of mind that their kids videogame interactions are safe. Our output for this project will be an app for the console, a mobile app and a bluetooth speaker.

1.3 OPERATIONAL ENVIRONMENT

The typical operating environment of Hidden Guardian is a household setting. Given that houses are typically well climate controlled the hardware component won't be subject to

any extreme conditions. It will however be handled frequently and should be at least somewhat robust in order to withstand moderate impacts.

1.4 INTENDED USERS AND USES

The intended user for this project will be for 2 targets, parents and their children. The children will be able to use to bluetooth speaker for their gaming uses or listening to music. The speaker will provide immersive gaming experience by providing high quality audio. The device will also have a mic to enable children communicate with other players online to improve gameplay.

Parents will be using it as a device to monitor their children activities. By using the mic on board, the device will record all conversations made by the kid when the device is turned on. Parents will be able to access logs of recordings using the app and find keywords of the recording such as phone numbers, address, to help improve the safety of their children.

1.5 ASSUMPTIONS AND LIMITATIONS

Assumptions:

- We don't have to worry about privacy laws, only the Xbox TOS.
- The maximum number of tracked voices will be 8 at a time.
- At the end of development, this product will not be commercially ready to consume
- The maximum amount of hours/week of data we will store is 15. This is the assumption because 9 is the average per child, so we will store the upper limit of this data point.

Limitations:

- We will only be able to cover one language, that being english.
- The amount of audio data that can be stored in the local object.
- Running a background application on Xbox One is limited to 128 MB.
- Following Xbox guidelines can be restricting
 - User's ability to exit out of a background application
 - Ability to access text chat logs

1.6 EXPECTED END PRODUCT AND DELIVERABLES

Console App

The console app will be a data logging application for the xbox one console. Parents will be able to set up the app to record their child's audio and text chat conversations over xbox live. Access to the app will be restricted so that only the parent account can enable or disable it. The app itself will have low performance requirements so that the child does not notice any differences before and after the installation of the app.

Smartphone App

The smartphone app will allow users to review and search through the data collected by the console app. It will have a user friendly interface and provide a variety of tools for filtering through the stored data. These tools include things like being able to search for keywords or users and having all relevant conversations pop up. For the prototype at the end of the first design cycle we expect to have a placeholder for audio information while after the second design cycle you will be able to access the audio data exactly.

Database code

The database will be a simple database with tables for all the retrieved data. This will be set up so that the mobile application can easily interact with all of our collected data.

Hardware

A wireless speaker and microphone that allow a user to communicate with a gaming console. The speaker will have a set of controls for changing different channels of volume (e.g. game volume, chat volume). The speaker will run on a rechargeable battery and may be rechargeable via a usb cord. Connection between the speaker and the console will be set up in such a way that the user must have the speaker to use our software.

2. Specifications and Analysis

2.1 PROPOSED DESIGN

Our proposed design is to create an application on an XBox One X that gathers chat and party audio chat, converts it from speech to text and sends the text data to a database. The data in the database can then be pulled and sent to a mobile app where the parent will monitor video game usage.

Functional Requirements: The device will have the function to record conversations done by the kids and double as bluetooth speaker with wifi connection capabilities. Basic features of the

speaker will be bluetooth connectivity, a volume button, a mute button, game volume, a power button and powered by a battery which is rechargeable. The speaker will send information in a non-standard way such that to work with our program you have to have our speaker. The main feature of the device would be hidden from the kids which is the ability to record conversations. Other feature will be an app the will enable parents to access the the conversations and chat logs from multiple platforms and find key words and phrases with a parental lock on the app so the kids do not remove the app accidentally or purposely.

Non Functional Requirements: Our focus on nonfunctional requirements include efficiency/speed, interoperability, usability, security and scalability. Our main user is parents who could be of ages 25-50 and will have varying technological understanding. A requirement that is of utmost priority is to make the mobile application easy to understand and use. We also will focus on speed and efficiency with our applications, so that data is being sent at appropriate time intervals, there is not a slow buffer time or cached incorrect data. Our product needs to be interoperable so that the purchase of a speaker contains a code to access the console application which can smoothly connect to a database which connects to a mobile app all synced together. We will also need to have interoperability between the speaker and the Xbox One Console via bluetooth. Security is an important requirement so that we are making sure the text data is only viewable by the parent and their username/password data is protected. We also need to make sure that our product is scalable so for future potential production it can be extended to iOS apps, web applications, PS4's and other gaming systems. In order to complete this we will have to focus on having excellent documentations, commenting and making sure our code is modular and easy to understand and pass on.

Current Project Status: So far in our design we have thoroughly researched how to set up an android mobile application and how it will connect to the database. We've also researched how the console application will connect to the database. We have researched what kind of hardware we will be using for the wireless speaker requirement. We realize we will have issues with this as Xbox has their own wireless system so we cannot connect it to bluetooth. We have all downloaded visual studios which is the platform we will be using to write the console application in C++ code. We have purchased an Xbox One X and a development license as well as set up our development mode, connected it to our visual studios and tested very simple applications. Besides this work, we have done many iterations of project plans, considered how to overcome our licensing roadblocks and have been in contact with our client and adviser to make sure we are on the right track.

For standards relating to privacy and security of data we will meet general standards of encryption of data being sent to and from the database and applications. However, before this product is able to go into production it will need a firewall system and further more intensive privacy and security implementations that will be handled by our client.

2.2 DESIGN ANALYSIS

So far we have done research into the feasibility of our initial design. In our research we encountered two major issues with our initial design. These issues were that the audio data from a week of online chatting would be excessively large for a phone application, and that the xbox does not natively support bluetooth communication. To get around the data size issue we modified our plan to convert the audio data into text before storage, significantly reducing the

amount of data. The data needs to be converted to text further in the process later anyways so this solution presents very few drawbacks. Our plan to get around the issue with the wireless speaker is to implement a second hardware module that will connect to the controller that will communicate with the speaker via bluetooth. This second hardware module will connect to the 3.5mm audio jack on the controller that is used for headsets. The controller module has the added benefit of being a convenient location to implement easy to reach buttons as well as a more convenient place for a microphone. A downside of having to use the audio jack is that commands can't be sent to the console to affect the volume or mute settings in software. This could be solved by using the expansion port on the controller but that presents its own challenges as that port is proprietary and it would be extremely difficult to develop a prototype for.

3 Testing and Implementation

3.1 INTERFACE SPECIFICATIONS

The hardware interface will have the xbox sending the text and sound files via wifi to our database for storage and cross reference.

3.2 HARDWARE AND SOFTWARE

Hardware

Bluetooth Module

- used to transmit signal to the audio to the speaker and receive mic signal.

3.5mm stereo jack

- To send the audio or mic signal to the bluetooth module to interface with the bluetooth speaker or headset.

Software

SQL database

- store location info and speech to text files along with who said it

Xbox application

- send voice recording to database

Android app

- view and analyze messages, update keywords to be listening to, receive notifications for flagged keywords and users, etc...

3.3 FUNCTIONAL TESTING

Examples include unit, integration, system, acceptance testing

- Testing whether speaker can receive a bluetooth signal and amplify it based on the volume setting
- Test whether the controller extension can pair with the speaker via bluetooth
- Test transmitting an audio signal to the speaker through the controller extension
- Test receiving microphone data to the controller extension
- Manually sending a message on the console will be read into the application
- Test dumping all data on app into database
- Unit tests on database server to make sure querying works
- Testing specific set of keyword system using unit tests

3.4 NON-FUNCTIONAL TESTING

Testing for performance, security, usability, compatibility

- Will test the best location to put the speaker and the switches.
- Controller extension fits in the space between controller handles
- Will test our login feature to guarantee security with unit tests
- Will test compatibility between database and both applications
- Usability will be tested by making sure that the app fully runs in the background
- Will do stress tests to make sure the console application can send a continuous stream of data

3.5 PROCESS

Due to the phase we are in of our timeline we have not tested yet. We are still working on basic proof of concepts in our three areas - hardware, mobile app and console app. However, we will soon be able to test our console application with the Xbox One X Development Test Mode. Similarly, within the next few weeks with progress on our mobile application we will be able to write jUnit tests and test our mobile application. For GUI testing we will need to have manual tests that we can consistently check off because for Java Application automated testing applications tend to be too expensive (based on prior research).

Once our project begins development we will have figures, images, examples and a much more thorough description of our testing process for every deliverable we will provide.

3.6 RESULTS

We failed to realize the xbox has no bluetooth transmitter so we realized we will need to construct hardware ourselves to account for that. We also failed to realize difficulty of developing on two separate consoles with one of them having to get take a while to get a license, so we decided on the Xbox One console. We've had successes in learning about speech to text capability with Xbox and have created an intro "Hello World" app so we have had success using Xbox One Development Mode.

We've learned some of our limitations such as XBox One's background app restricting us to 128 MB. We've learned that we will have some roadblocks in accessing game data such as chat in order for us to convert it from speech to text and send it to our database, but we are constantly trying to find workarounds.

We've had failures and successes with implementing but not much with testing as right now we are finishing our research phase and starting to do baseline developing.

4 Closing Material

4.1 CONCLUSION

Our goal of this project is to have a platform to monitor children when they are playing games so they would not disclose any information that would jeopardize their safety. Other than that we have tested a dummy program on the xbox one. Our plan is to have a background app in the console that can tap into the chat history and store them at a database. This is the best solution because we can get better quality of audio rather than starting from scratch.

4.2 REFERENCES

Not applicable.

4.3 APPENDICES

Not applicable.