

Hidden Guardian

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<https://sddec18-09.sd.ece.iastate.edu/>

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Client: Kelli Rout

Problem Statement

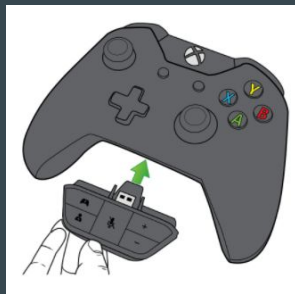
- Kid's lives today involve online interactions more than ever.



- Unwanted personal information, password theft, receiving viruses, being cyberbullied and more.
- No practical parental monitoring system

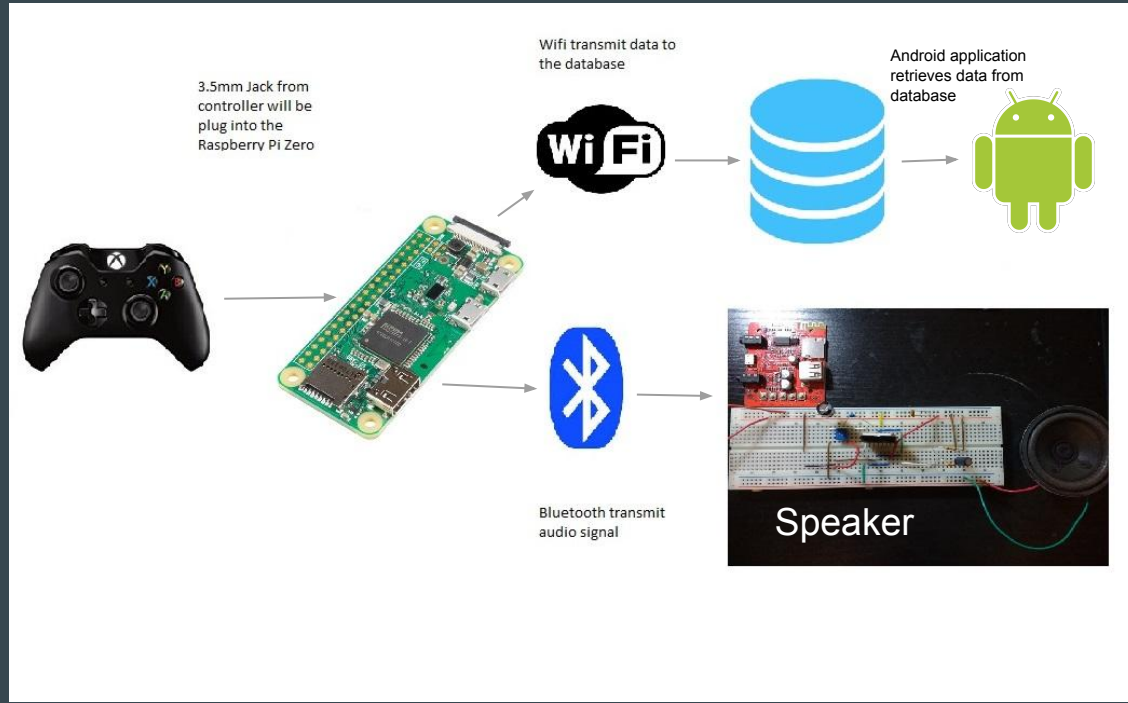
Hidden Guardian

- Combination of speaker, controller attachment, mobile application

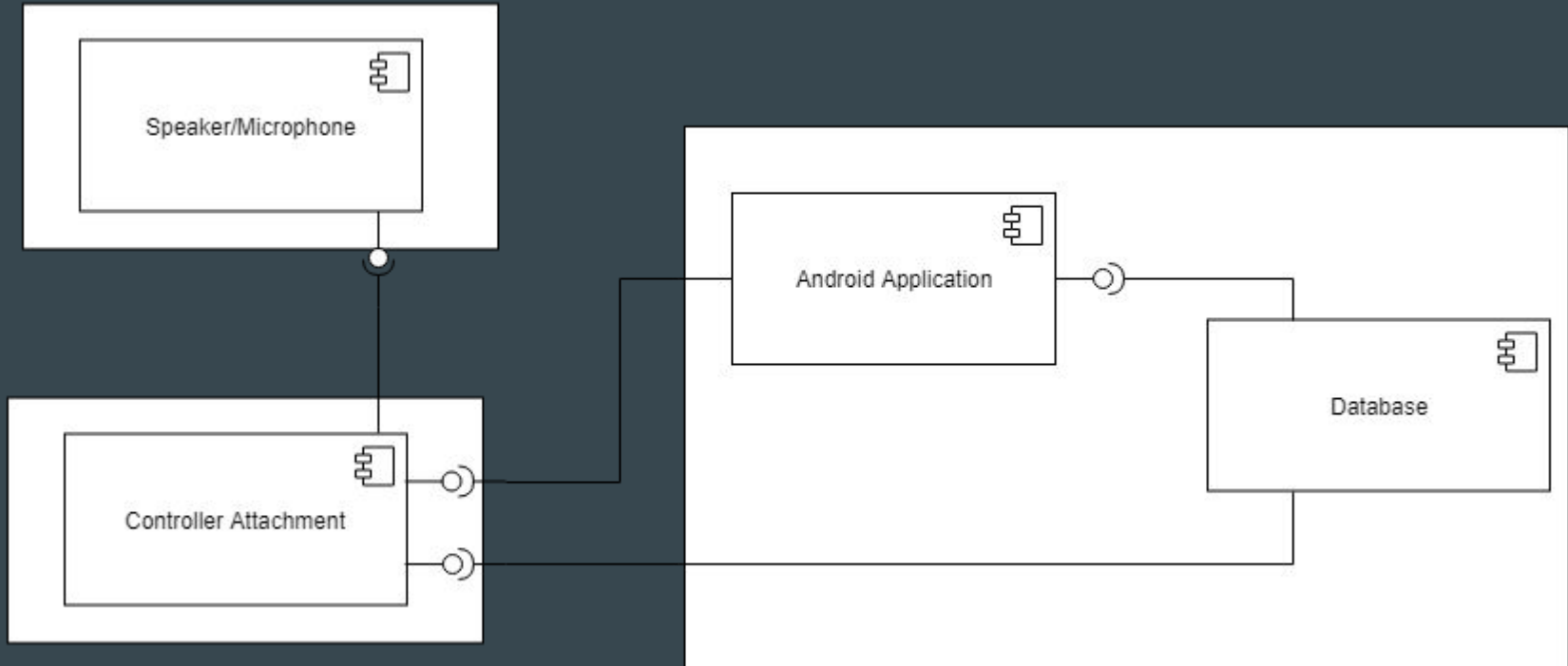


- Provide a way for parents to monitor effectively
 - Audio data
 - Comb through data using keywords

Conceptual Sketch



Block Diagram



How is Hidden Guardian Unique?

- No Xbox One compatible video game monitoring unit on the market
- Xbox Parental Settings can only monitor hours of usage and block certain games, but cannot record or flag keywords or live audio streams
- Xbox One currently does not support wireless headset, our device will be able to enable wireless connectivity.
- It is multi-functional

Operating Environment

- The expecting operating environment will be a household
- Expected size being approximately 2,700 sq. ft.



User Interface

- Expected users are parents with children ages 5-17 and children ages 5-17



Functional Requirements

- The device will be able to record the conversations of a user while gaming online
- The conversations will be stored on a database which can only be accessed by an account tied to the device
- The app will be able to query the database with user-specified keywords
- The speaker must be wireless and rechargeable
- The device must have a microphone and controls for both the speaker and microphone
- The parent will be able to use the speaker to relay the live conversations of a child using a headset

Nonfunctional Requirements

- The speaker and microphone should have audio quality comparable to other consumer devices
- The user interface of the app should be simple and easy to navigate
- The device attached to the controller should not make it difficult to hold the controller
- The speaker and microphone controls should be laid out intuitively

User Interfaces

Login Page - login, password, enter button, create account text/link

Create Account Page - login, password (with certain credentials listed), enter button

Main Page - Widgets based on gaming sessions that triggered keywords and list of the keywords, username info, help settings

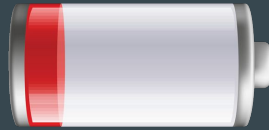
Specific Data Page - Lists text context of the keyword, audio context, full audio of that session

- **Blue text** -> Low Confidence, **Red Bolded Text** -> Keywords
- **Purple Bolded text** -> Low Confidence Keyword

Other - notifications when a keyword is triggered that takes you to the link of the “specific data page”

Technical Constraints and Considerations

- Target consumer is a parent with no technical background necessary
- The controller attachment will ideally have low power consumption to be able to power itself from the controller without drastically affecting charge-time



- The speaker battery life needs to be long enough to avoid running out of power in the middle of the user's gaming session

Potential Risk and Mitigation

- Muffled voices, extreme volumes, distance away from speaker, and accents
 - Mitigation: confidence rating
- Risk controller battery power consumption
 - Mitigation: minimizing power usage, battery pack
- Lack user friendliness, cannot just plug n' play
 - Mitigation: will have thorough documentation on how to set up wifi connection



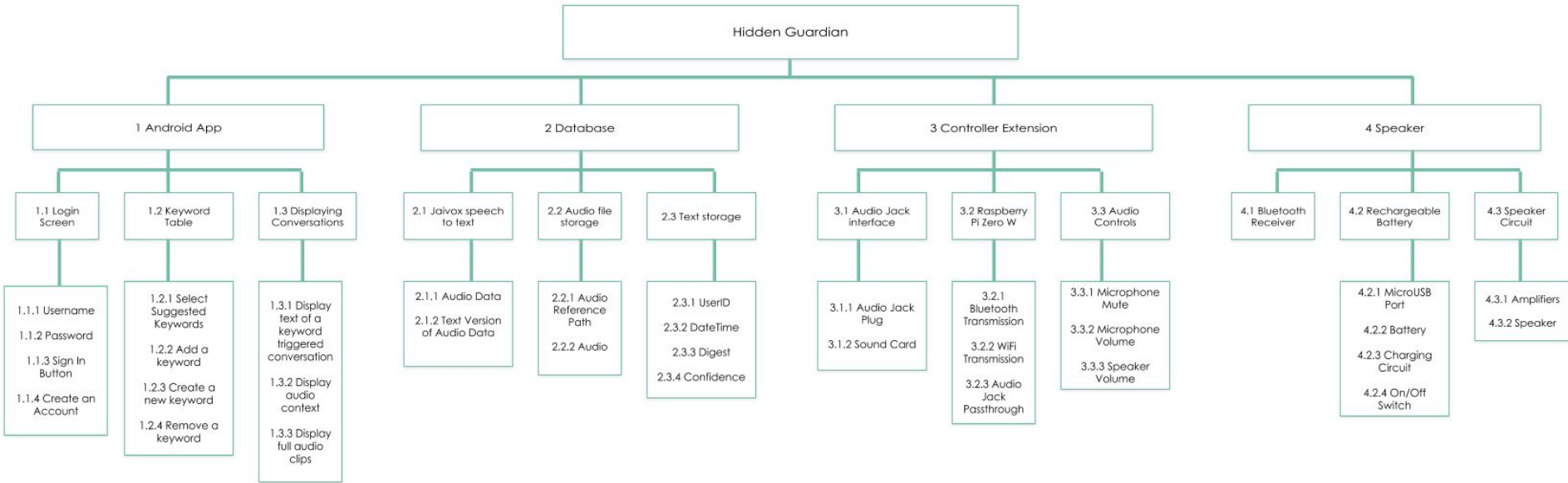
Functional Decomposition

- The controller attachment will use the 3.5mm audio jack on the bottom of the controller and will house a microphone, raspberry pi zero W, and a 3.5mm audio jack for passing through to the user's own headset, as well as buttons for various controls of the speaker and microphone.
- The speaker will have a rechargeable battery and bluetooth receiver to receive the audio data. It will have an on/off switch and be chargeable using a micro-USB cord.

Functional Decomposition

- The android app will have an editable list of keywords which the database will search for. Matches in the database will provide the user with the conversation text surrounding each keyword, as well as an option to listen to the audio clip.
- The database will receive the audio recordings and convert them to text, storing both versions. The database will also store various metadata along with the transcriptions including date, time, and confidence level of conversions

WBS



Test Plan



Functional Testing:

- Speaker's ability to receive a bluetooth signal and amplify it based on the volume setting.
- Maximum distance the bluetooth speaker can withstand before losing signal
- Transmission an audio signal and receiving microphone data through the controller extension
- Unit testing queries of the database server and keyword functionality on the mobile application.

Test Plan



Non Functional Testing:

- Unit tests to test our login feature to guarantee security
- Test compatibility between database and mobile application and microcontroller
- Test background application performance using corner cases with large amounts of data and stress tests

Hardware/Software/Technology Platforms Used

- TDA7266 (DUAL BRIDGE AMPLIFIER)
 - Audio amplifier
- Raspberry Pi Zero W
 - Small size microcontroller with wifi and bluetooth capabilities
- SQL Database
 - Jaivox Speech to Text Conversion
- Java Mobile Application
 - Android Studios

Resource/Cost Estimate

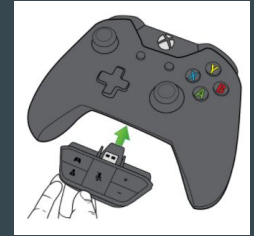
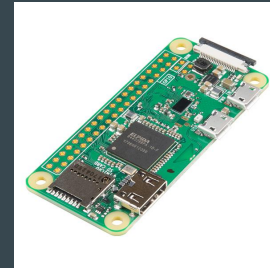
Speaker cost - \$15

Controller attachment(with microcontroller) - \$25

Battery pack - \$15-30

XBox One X - \$450

XBox Development License - \$20



Project Milestones

- Implement speech to text conversion
- Store conversation data in our database
- Android app can access our database
- Android app can implement dynamic list of keywords and identify conversations from the database containing those keywords
- Rechargeable bluetooth speaker circuit
- Microphone and bluetooth transmitter circuit

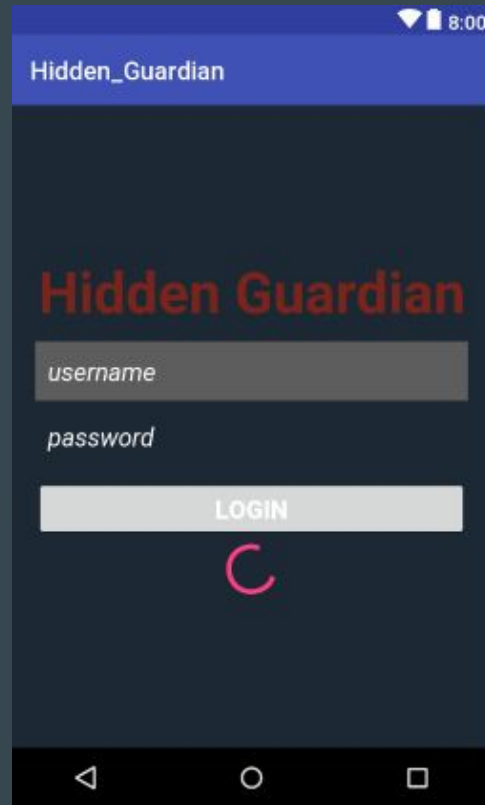
Current Project Status

- Background application has functional speech to text capabilities
- Mobile application has login frontend and a start to the backend
- Speaker prototype is created and can be demoed
- SQL Database has been created with tables inside it

Current Project Status

- There are diagrams and clearly outlined plans for future hardware configurations
- Team member's now have a clear vision and understanding of how to implement project with current changes
- Team member's are now more familiar with using Speech to Text tools and Android Studios usage (now past the learning curve)

DEMO



Plan for Next Semester



- Purchase hardware components in the first week
- Focus on hardware setup and communication
 - Speaker's ability to communicate with the microcontroller
 - Microcontrollers ability to communicate with the Database
 - Microcontrollers ability to interface with the Xbox controller
- Get database's speech to text capabilities functioning using Jaivox

Plan for Next Semester



- Have full functionality completed by November 15th
- Focus on testing and improving non functional requirements
 - Speed
 - Power friendly attachments
 - User-friendliness
 - Extra mobile application features

Deliverables

- Controller Attachment
- Wireless Speaker
- Android Application
- Database Implementation
 - Speech to text
 - Tables

Contributions of Each Member



Jenn Frank - Team Lead, Handled Weekly Reports, Communications and Mobile Application Front End



Jacob Stilwell - Mobile Application Lead, Mobile Application Back End

Contributions of Each Member



Matthew Pedretti - UWP Speech to Text Background Application, Hardware



Keng-Yik Ho - Hardware Lead



Thomas Kirby - Database/Server setup, UWP Backend

Resources

Webwatcher source: <https://www.webwatcher.com/>

Images

Child with parents:

<https://www.shutterstock.com/video/clip-2220922-stock-footage-children-playing-video-games-to-the-on-a-carpet-while-their-parents-are-watching.html>

Children playing videogames:

<https://www.express.co.uk/life-style/life/623643/Computer-gaming-children-Christmas>

Alexa speaker: <https://www.wink.com/products/amazon-alexa>

XBox:

Resources

Xbox One Controller Attachment:

<https://support.xbox.com/en-AU/xbox-one/accessories/connect-compatible-headset>

Battery Pack:

<https://www.digikey.com/product-detail/en/adafruit-industries-llc/353/1528-1835-ND/5054549>

Low Battery:

<https://ca.widex.pro/en-ca/care-counselling/people-hearing/talking-about-battery-life>

Resources

Risk Guy: <http://juegosmon.net/2015/05/23/risk-management-and-cyber-security/>

Calendar:

<http://www.iconarchive.com/show/small-n-flat-icons-by-paomedia/calendar-icon.html>

Power Consumption

Audio amplifier - 500mA

Raspberry pi - around 180mA

Raspberry Pi Zero W



-Bluetooth 4.2, wireless LAN

-To convert audio from 3.5mm to bluetooth signal

-Connect to the database

-65mm x 30mm, fits between xbox one controller handles

Speaker Diagram

TDA7266 (DUAL BRIDGE AMPLIFIER)

- Class-AB amplifier
- Wide supply range(3V-18V)
- Can provide 7W to two channels
- Fixed gain of 20

