Hidden Guardian

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

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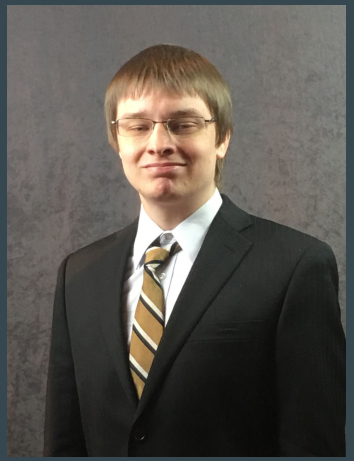
Members

Jenn Frank (SE) - Communications Lead and Mobile Application Developer



Jacob Stilwell (CPRE) - Mobile Application Developer

Members

Matthew Pedretti (EE) - Speaker Hardware

Keng-Yik Ho (EE) - Controller Attachment Hardware

Thomas Kirby (SE) - Database/Server setup

Problem Statement

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

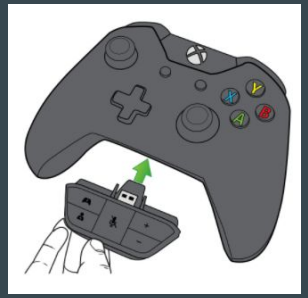
- Unwanted personal information, password theft, receiving viruses, being cyberbullied and more.
- No practical parental monitoring system for consoles

What is on the market for this problem?

- 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 natively support wireless audio, our device will be able to enable wireless connectivity.
- It is multi-functional
    - Headset replacement
    - Speaker can provide live stream audio for guardian

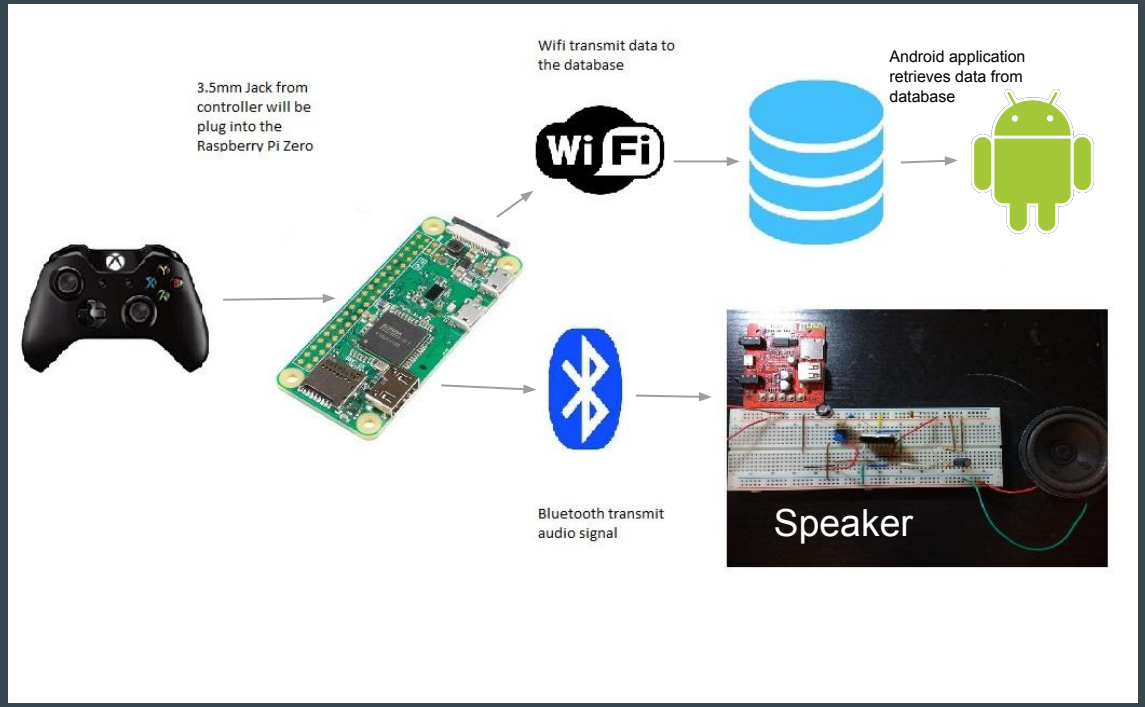
Hidden Guardian

- Combination of speaker, controller attachment, mobile application



- Provide a way for parents to monitor effectively
  - Relay live audio data
  - Comb through conversations using keywords

Conceptual Sketch



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 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

Design decisions

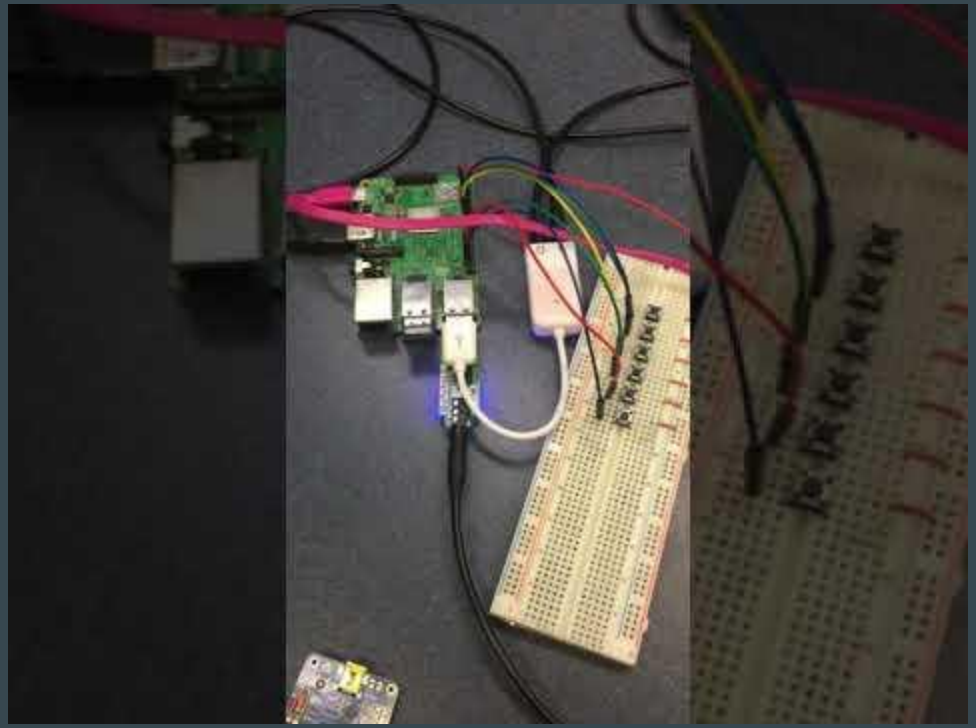
Software

- Android Studio 3.2
- Python scripts
- SQL database
- MQTT protocol
- EMQx Broker

Hardware

- Raspberry Pi Zero W
- Speaker Prototype

Demo



Key Features

- Each device is paired with a Hidden Guardian profile
- The user's keywords will apply for multiple devices
- The Hidden Guardian toolbar allows users the opportunity to logout, switch accounts or add a device
- There are three pages that display gaming session data
  - They get more specific and provide more context the farther you navigate in
- User can swipe left and right for context around text clips that have triggered a keyword

Software Testing

Functional System testing

- Login Security
  - Limitations on username/password creation
- Page navigation
  - Pages lead to and from the correct locations in an appropriate amount of time
- Mobile Application Features
  - Keyword manipulation, viewing entry context, adding/switching devices

Hardware Testing

- Controller Attachment:
  - Power consumption testing: We ran the attachment using two AA batteries on a 5V regulator. Using the Pi Zero W running on a minimal build of raspbian the total current draw was between 100mA to 180mA.
  - For 2 AA Alkaline batteries the estimated battery life should be around 10-12 hours
    - We had to switch to a Raspberry Pi 3B+ when the SD card reader failed on the Zero, and the current draw was over 600mA. (Not able to run using our regulator)
  - Functional testing:
    - Button functionality was tested for each of the controls
    - The full device test with both speaker and database
      - Sometimes significant mechanical noise
      - The database connection ran well on the Pi Zero, but inconsistent on the 3B+ due to power issues

Hardware Testing

- Speaker:
  - Power Consumption:
    - Powered by a 3.7V Li-Ion battery through a 5V regulator the continuous current provided by the battery reached 0.5A at louder parts of a song, and was between 0.1-0.15A during quieter parts.
    - With no bluetooth pairing idle consumption was 0.09-0.095A
    - With a battery capacity of 2000mAh the battery life can be estimated to be between 4-20 hours depending on the activity level of the audio signal.
  - Functional Testing:
    - Audio received from a phone had very little noise
    - When paired with the controller attachment the signal was noisy, but this was determined to be caused by the controller attachment, and the lack of speaker enclosure

Challenges

- Redefining our scope in the first semester
  - XBox One Application -> Speaker + Controller Attachment
- The database/servers inability to meet common speed standards
- Documentation and support for Javoix speech to text
  - Switched to Google Speech to Text API
- Microphone failure
- Raspberry Pi Zero W SD Card Slot failure

Limitation/Concerns

- Data storage and transcription costs
  - Based on Amazon data storage rates we expect data storage to cost 2.6 cents per month per user assuming 15 hours of recording per week per user
  - Transcription costs are significantly less than this per user
- The database/servers inability to meet common speed standards
  - Better servers to improve file transfer speed
- Audio quality
  - Having a enclosure for the speaker will increase the sound quality
  - Having all the components all the same board to reduce noise from the environment

What is next for Hidden Guardian?

- Mic addition to the controller attachment

- Added mobile application features
  - Deleted gaming sessions
  - Help page
  - Notification
  - Audio clip on gaming entry message page

- Implementing Google Speech to Text Beta features
  - Support for multiple languages
  - Ability to detect and assign text to different users

Questions?

Resources

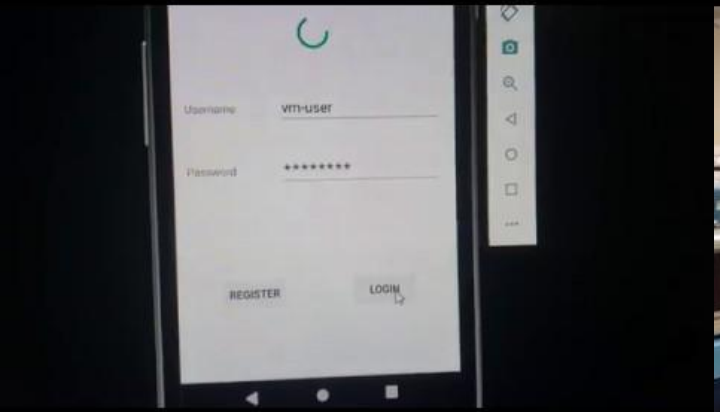
Webwatcher source: https://www.webwatcher.com/

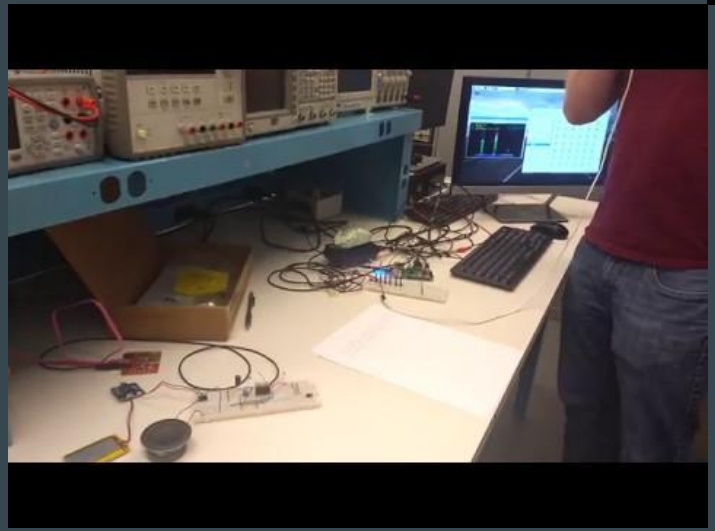
Images

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





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