Assistive Device For the Seeing Impaired

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Introduction

This project aims to incorporate assistive living technology into a relatively simple do-it-yourself (DIY) project. Often times the sight-impaired have to wait for a family member to come help in person if something is lost in their home. In an attempt to remedy this, the project will consist of a remotely controlled iPad mount with X, Y, and Z axis movement.

Objectives

- A remotely controllable iPad mount
- Pan, tilt and up/down movement
- Remote audio and video feed
- Open source mechanical designs and source code
- Easy to follow documentation on instructables.com

Design Testing

The video feed can either be embedded in the mount control webpage using appear.in, or viewed separately but more securely with skype.

![Figure 1: The mount control page with appear.in.](image)

The control page was tested with human subjects attempting to make the page crash, and rating ease of use and aesthetic appeal.

Chrome developer tools were used to test the functionality and layout of the webpage on various devices. Features of this tool include setting aspect ratio to be the same as on device under test, throttling to provide a more accurate simulation, and network timing diagrams.

![Figure 2: The mount control in google developer tools.](image)

System Assumptions:
- Strong and uninterrupted internet connection
- Sight-impaired user has an iPad
- Mount will be placed near a power outlet
- Active DNS allows the system to work remotely: The user can type the address to access the control page. That address references the router connected to the Raspberry Pi 2 and WF32.
- The computer is connected to any internet connection.
- The iPad has appearance of use Skype installed on the computer.
- Alternatively for added security, but decreased ease of use Skype is installed on the computer.
- The mount contains an HTTP server with multiple connectivity options.
- The WF32 also contains the appear.in webpage embedded in the control page, and streams the video feed.

![Connectivity Diagram](image)

Impact Analysis

A particular concern with this product’s use, as discovered from numerous news articles, is security. Hacking of cameras connected to the internet is becoming increasingly common and is a violation of privacy and possibly even dangerous. Through iterative design processes, we have worked to make this design ‘hacker-resistant’ through a variety of security features.

![Figure 4: The Braille representation of Top in CAD.](image)

Future Work

Rostrum would like to suggest:
- Additional mechanical work on the mount for stability. A knowledge gap in mechanical design provided usable and functional, but not optimal designs.
- Integration of a custom application that hosts the video feed to ensure cross platform compatibility between a wider variety of devices.
- Mount adapter, and additional cases made for more devices.

Glossary

- **Active DNS**: A service that connects the web address with the IP address of the router.
- **RF32**: Digilent microcontroller board with WiFi.
- **Port Forwarding**: A form of Network Address Translation that forwards data from one address and port number to another.
- **Appear.in**: Remote calling service that allows audio-video connectivity for two users through a custom chatroom.
- **HTTP Server**: A network protocol used to distribute information.
- **LAMP server**: Open source software used for web servers.
- **DIY**: Do it Yourself, can be used to describe projects that can be done in a person’s free time.

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Team: Rostrum