EVA Control System

Progress Report

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Introduction

Over the past two and a half months we here at EVA Controls have worked tirelessly to develop and complete our prototype voice automated EVA Control System. The goal has always been to complete a fully functioning prototype under budget and on time. Throughout the various development phases there have been fundamental changes to the system design, which have affected our timeline, however we remain confident that we will meet our deadline of December 14, 2012. This report will outline what progress has been made on each of the system components as well as any remaining tasks.

System Progress

Voice Recognition Hardware

Due to the complexity and required precision of the voice recognition hardware we have encountered some challenges such as: programming the STC by C51 language and integrating the hardware with the Arduino MCU. So far, we achieved significant progress with regards to the outlined design specifications, however there are still some critical tasks remaining.

Tasks Completed:

- Hardware circuitry of the system and PCB have been built and printed
- Voice recognition lists are configured
- PCB has been tested on a PC and it operates as expected
- LED lights on the PCB board light up accordingly to specified inputs (voice commands)
- PCB board has been tested against environment noise

Yet to be accomplished:

- Testing of various voice commands to improve recognition and stability by grouping similar command tone into correct results
- Update software for integration with Arduino MCU

Microcontroller (MCU)

The Arduino MCU is the central control unit of the entire system and is critical to its functionality. For this reason most of the development time has been spent

programming and interfacing the various subsystems that are controlled by the MCU. The progress made on each of these subsystems is outlined below:

IR Transmitter

- The IR emitter has been purchased and configured for the Arduino
- We able to send IR codes using the Arduino
- The Lutron Maestro Dimmer Switch is able to pick up the IR codes and correctly execute the commands corresponding to the IR code
- Further testing will be performed to ensure this module is stable and robust

RF Transmitter

- Development was delayed due to a possible conflict between the RF and Ethernet shields because they both use the same SPI pins on the Arduino for communication
- Theoretically this issue has been resolved and the solution will implemented as soon as possible
- The INTESON Dual-Band switch still needs to be wired into the testing module, after which RF testing can begin

Daylight Harvesting

- The TSL235R Frequency to Light converting has been purchased and configured for the Arduino
- We are able to read in to the Arduino the frequency corresponding to the light intensity of the room
- The Arduino is able to determine whether the current light intensity of the room is too high or too low and adjust the light accordingly
- Further testing will be performed to ensure this module is stable and robust

User Interface

Initially, our user interface was designed as an iPhone app. However, after further analysis of our hardware capabilities, we decided to upgrade to a mobile web interface that would allow the hardware to be controlled from a broad range of Internet-capable devices. The layout of the interface has been completed and the result is an intuitive interface that permits the user to easily select the operating mode of the system, as well as control any of the connected devices located in a selected room.

The web-based interface currently runs locally on the development computer. However, as the hardware setup progresses, we will upload the software to the Arduino board and run the server on the MCU. This will make it accessible from the local network and, with proper port forwarding, over the Internet.

Device Enclosure

The last remaining task that must be completed in order to finalize our prototype is to build a properly sized and engineered case to safely enclose all components of the controller.

Budget

Currently our project spending is at $380 and we have already purchased and ordered all of the anticipated parts required to complete the project. This leaves us with $120, of the $500 we received in funding from the ESSS, for any unforeseen expenses.

Group Dynamics

Our EVA Controls development team has worked hard to constructively promote a healthy work environment. Even though everyone has not always agreed on all issues, we have been able to settle any dispute respectively and efficiently. We routinely hold meetings at least once a week to discuss the project progress. In order to achieve better communication between each team member we have continually been in contact with each other through email and have organized our documents online with Dropbox. So far under productive leadership and good team communication we have successfully met all deadlines while maintaining a friendly environment.

Going Forward

Continuing with the final push towards completion, we have scheduled an integration day on November 23th, with all the appropriate resources, to test all of the components of the EVA Control System. On paper every thing is in order and constructively conformed by the guidelines, yet the functionality of the system depends on the successful integration of each of the individual components. December 14th is the demo day for our final product, since we still have three weeks with some budget remaining we are confident that the final product will be completed on time.