

Overview

UControl Solutions is nearing the completion of their uControl Home Automation System. The system has been developed following the requirements outlined previously in the functional specification. The uControl system is made up of three essential sub systems which were developed separately. So far, we have finished the light switch module and most of the control software. Only the central unit remains to be finished, still requiring development on the infrared remote controls for the entertainment system and final integration of components.

Technical Developments

Control Software

The control software used to remotely control our home automation has been mostly finished. We programmed using C and created a simple user interface that also is able to send data via bluetooth. The only remaining task is to make button designs using photoshop to enhance the User Interface of our final product.

Light Switch Module

The light switch modules required development of a power supply, a brain to control dimming and communication with the central unit, and a means of communication to the rest of the system. We first researched into the design of power supplies (trying to find one that gave us the required voltage we wanted but at the lowest power consumption) and decided to use a simple capacitor driven voltage converter to create a specific voltage we could use, taken from the main AC power grid. For the brain, we developed on an Atmega168 microcontroller and programmed it to be able to create interrupts to be able to dim the lights. We chose to use RF transceivers to create a communication network. Furthermore, we decided to create our own radio protocol and used the SPI (Serial Peripheral Interface) bus to interface these RF transceivers with microcontrollers. To reduce space of the entire light switch module, we decided to etch our own PCBs, and the results were favourable at an affordable cost.

Central Unit

The central unit will be the hub through which all wireless traffic of our system will pass through and is by far the most complex piece of the system. We had to develop an infrared emitter circuit, a bluetooth transceiver, an RF transceiver, a memory unit to store IR databases, and something to control the communication system. Currently, the central unit is still in the prototype phase with several of the communication systems already implemented. The RF transceiver was completed when the light switch module was finished, but the bluetooth and

infrared communication are still under development. We are in the process of finishing them off so we can finally integrate the central unit and finish system testing. A flash memory unit was installed with a database of infrared protocols, required to be able to control any television currently on the market. The PCB is still being developed but should be completed soon.

Budget

UControl Solutions has spent all of the 500 dollars it was allocated by the Engineering Science Student Endowment Fund. This money was used to buy basic circuit components, such as resistors and capacitors, RF transceivers, the Arduino microcontroller, Atmel AVR ATmega microcontrollers and the required programmers. We would have come well under budget but due to unforeseen difficulties with the RF transceivers were required to purchase a specialized network analyzer to ensure that the wireless protocol and the RF transceivers were fully operational to our requirements. All the parts required to finish the project have been acquired, and little to no extra funding is needed to complete the remaining of the project.

Action Items

UControl Solutions is slightly behind schedule with the uControl Home Automation System. We had hoped to have completed the infrared portion of the central unit at this current point in time. Several setbacks with the RF Transceiver interfacing reduced our allotted time to finish the infrared. We are still confident that we will have a working prototype by the expected date 4th April 2011. We also plan to add some more days to our original expected date to do a lot of testing and debugging and ensure a fully functional working prototype with no or minimal error.