

ECE 480 Team 3 Pre-Proposal

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Introduction:

An emerging trend in modern households is to have a centralized control panel to control all functions within the home, such as climate control, security, and lighting. While such control panels aren't commonplace yet, they may become the standard in the future. Texas Instruments has commissioned us to develop a demonstration to show that their OMAP3 series processors are a capable and cost-effective platform on which to run such control panels. This demonstration will allow the user to manipulate a fully interactive display which gives data on the household's status, controls devices such as a programmable thermostat, and even uses a video camera to monitor a visitor at the front door.

Objective:

The primary objective for this project is to implement a powerful and friendly interface that allows the user to fully explore various functionalities provided by Texas Instruments' OMAP3 series processor. With great expandability of OMAP3 processor, we will be able to interface many external devices and create a system that is capable of collecting, processing, displaying, and controlling all of the information at your fingertips.

Problem and Suggested Solution:

We envision the system will be used as a platform to organize and utilize information that is gathered from different sources. The challenges we have to overcome in this project mainly involve collecting and presenting this information to user.

Information Collection

In order to collect useful information, we will need to interface different external devices with the beagle board. To configure the hardware and make it work on beagle board will be a real challenge due to lack of support from most hardware vendors. As our time is limited, we will expected TI to provide us with most of these external devices. Our task will be to utilize these devices to collect and integrate information we get and present it to user in a way they can easily understand and manage.

Information Display:

The information we get will be wrapped into a Graphical User

Interface(GUI) that we are going to design. The GUI will retrieve data from the external devices and display them to the user in an organized and user-friendly way. The display will also provide basic controls, such as buttons, tabs, and sliders, which will allow the user to issue commands to change the state of the control panel and household.

We will use a two phase approach to design and implement the project. We will break down our tasks as follow:

Design Phase 1:

GUI Design:

The GUI(Graphical User Interface) design is one of our most important priorities. An appealing and intuitive user interface is the key to the success of this project. We aim to design an interface that is both easy to use and impressive to potential customers.

Install Operating System:

Having a correctly configured and usable operating system on the beagle board is the starting point for this project. We decided to install eLinux after careful review and comparison of its functionalities and cost.

Configure development environment:

We need to set up an easy-to-use and efficient developing environment for the project. Excellent Java IDEs like Eclipse from IBM and Netbeans from Sun Microsystem are our potential choice. A version control system like CVS or SVN will also help us manage and organize our code and ensure timely delivery of project.

Initial GUI layout:

This will provide the pictorial view of how and what kinds of data will be displayed on the screen for every application that we build for our demo.

Implementation of GUI:

After we gather all the GUI design specifications and the GUI layout,we implement the GUI design using Java programming language. This HMI(Human Machine Interface) for our home automation demo display. This will actually make the applications interactive and get things working. We will program this HMI using the Java Programming language.

Interface the video device:

TI will provide us with the drivers to interact with the video camera. Our goal is to figure out a way to display and control the video captured by camera and display it within a GUI element created using Java.

Incorporate the video into GUI:

Upon successful completion of embedding video into GUI element. We will integrate that into our design.

Design Phase 2:

Decode the weather band:

We will be able to receive the National Weather Band's RF. Using the receiver, we will gather weather information that will be later displayed on the GUI.

Incorporate weather information:

Displaying weather information is an important feature of our demo. After gathering weather information from the National Weather Band, we will format the information in the way that fits in with the rest of the GUI.

Design Specification:

This system will use the OMAP 3530 processor mounted on a platform called a Beagle Board. The Beagle Board provides several ports to connect devices such as a DVI-D enabled monitor, USB peripherals, and audio devices. Then we will install Linux with Kernel version 2.6.28 and Java Virtual Machine to handle the operating system and GUI interface roles of the control panel. Using the Java Virtual Machine, we will design and implement our user interface and program the various devices we will connect to the Beagle Board. These devices include the video doorbell, a radio receiver/decoder to receive weather data from the National Weather Service, and a thermostat system.

The control panel will be controlled by a mouse and keyboard, and will display information on a standard computer monitor, along with playing sounds on a stereo speaker system.

Budget:

Beagle Board (Provided by TI)	\$ 149.00
SD Card (8G)	\$ 14.59
SD Card Reader	\$ 7.99
USB 2.0 3-Port Hub with Ethernet Adapter	\$ 40.99
USB to 5.5mm Barrel Jack Adapter	\$ 2.95
Acrylic Case for Beagle rev B5	\$ 29.00
Monitor Cable(HDMI A to DVI-D)	\$ 8.00
USB Std-A-Female to mini-A-Male Adapter	\$ 9.00
DB9M to 1DC10F AT/Everex Serial Adapter	\$ 2.00

DVI-D 19" Monitor

\$ 123.99

Total

\$ 238.51

Conclusion:

In order to stay ahead of this emerging trend of home automation, we need to develop a prototype that will establish the OMAP3 series processor as an optimal platform for a control panel. We will develop a full GUI and configure a few peripherals, which will demonstrate the processor's capabilities and make it an industry leader in the field of home automation.

Reference:

BeagleBoard.org

Information and support on the features and operation of the Beagle Board

<<http://www.beagleboard.org>>

Beagle Board Shopping List - Google Code

List of items needed to configure and run the Beagle Board

<<http://code.google.com/p/beagleboard/wiki/BeagleBoardShoppingList>>

CVS (Concurrent Version System)

<<http://www.nongnu.org/cvs/>>

eLinux operating system

More info on eLinux

<<http://elinux.org/BeagleBoard>>

Eclipse

<<http://www.eclipse.org/>>

Netbeans

<<http://www.netbeans.org/>>

SVN

<<http://subversion.tigris.org/>>