E90 Project Proposal:
Personal Remote Display

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Abstract

A proposal to design a system that will allow users to easily display information on a screen which is remote from his or her personal computer. The screen could be placed on or outside his or her door, for example, and the user could update it with information about his or her location or expected return time. The remote device would receive data via wireless communication for simplicity of use and low-power in order to conserve energy.

Introduction

In a world in which there is so much information available online, it can be surprisingly hard to find information as simple as the schedule or current location of an individual. A student may visit the office of a professor only to find that he or she needs to use a personal computer in order to look up a schedule. An employee may visit the office of his boss to find the door closed and wonder as to when he should return to ask for that well-earned raise. Both the professor and the boss are likely to have calendaring software or a PDA, yet the frequently changed information that the software contains is not always available to others.

A Personal Remote Display (PRD) is proposed to help solve this problem. The PRD will be wirelessly connected to the user's personal computer, making it easy to physically install and move. The display will consist of a LCD touchscreen that will display the user's calendar and current location. Ideally, the calendar would be linked to current calendaring software on the user's computer or to Google's Calendar application. The user could then place the PRD outside his or her office or dorm room and keep it updated with accurate information. If the PRD is linked to an online application such as Google Calendar, the user could update it from any computer with internet access.

This proposal outlines the technical issues of this project and outlines a schedule for project completion.

Technical Discussion

The Personal Remote Display Project has six main tasks to implementation in order to obtain a complete product: controlling the LCD display output, interpreting the touchscreen input, ensuring wireless transmission of data, managing power, implementing a GUI on the user's PC and on the device, and linking the GUI to an external calendar application. Figure 1 shows a block diagram of the system and how the components relate to each other.

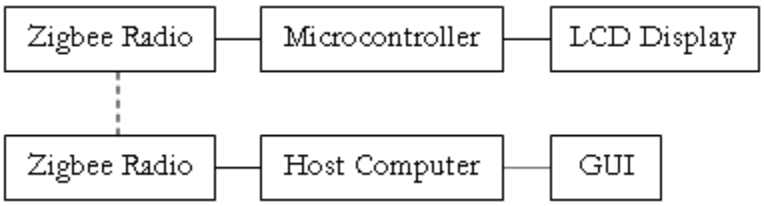

Figure 1. Block Diagram of System

LCD Touchscreen – Input and Output

Since the main goal of this project to produce a product and not to develop specific hardware, the LCD screen will be purchased in an off-the shelf package which includes a

touchscreen. It will come with a software development kit, so using the display for both input and output will be fairly straightforward. For example, the GUI will be able to draw lines and add text with a built-in commands. After the screen is usable with the software provided, it will need to be able to be controlled with a microchip and integrated with the GUI.

Wireless Transmission of Data

In order for the display device to be wirelessly updated, the user's PC must be able to send wireless commands to the device. Zigbee RF wireless provides a simple, serial interface in which to do this. The GUI will send commands to the display via the wireless and the commands will be stored on the microprocessor so that the host will not need to send the current command set continually, but instead display data based on the microchip.

Managing Power

With the display being modified by the microcontroller, the device should have the ability to sleep when it is not in use by the host or an external user. If the screen is not being updated or viewed, it should display nothing, drastically improving average power consumption. If an external user wishes to interact with it, a single tap on the touchscreen should wake it up.

The GUI

Designing and implementing the GUI for this device will be an essential component of the product, as it is key to the usability of the device. From the GUI, the user will be able to display status messages which will appear first to a viewer. Additionally, the user should be able to update and edit a calendar or a link to calendaring software so that his or her schedule will be available from the device. The GUI on the device itself must also be designed and implemented so that this information can be viewed, but the development of both GUIs are closely tied because the implementation of one is highly dependent on the implementation of the other. The GUI on the device will be controlled using the microchip and its content will be modified through wireless communication.

Project Implementation

The following is a list of identified activities which are essential in order to implement this project.

Task breakdown:

A) Order materials

Identify and order materials needed (see materials list)

B) Investigate LCD touchscreen

Understand the applications that come with the development kit

C) Investigate wireless communication

Implement test programs with the Zigbee wireless technology

D) Wirelessly modify the LCD

Using the wireless, modify the LCD remotely

E) Design a GUI

Design layout and features of GUI (including sleeping when inactive)

F) Implement Preliminary GUI

Implement layout and features of the GUI (without wireless communication and excluding linking it to an external calendar)

G) Integrate GUI and wireless communication

Add wireless communication to the system

H) Explore possibilities of linking GUI to an external application

Investigate how to link to an external application such as Google Calendar

I) Link GUI to external calendaring application

Implement the feature of linking to an external application

J) Testing the system on new users

Test the system with new users for easy of installation and use

K) Make changes to the system/dubug

Change any features or debug issuse discovered during testing

L) Present mid semester progress

M) Write draft report

N) Write final report

O) Give Final Presentation

Critical Path Method

A critical path method (CPM) analysis was performed on the identified activities. Table 1 associates expected duration and required effort for the tasks and lists dependencies. In order to complete this project in a timely manner, dependencies of tasks must be taken into account.

Generally, only one task will be worked on at a time and the project will progress in approximately the order the tasks were presented in.

Table 1. A Table listing the tasks and estimates of duration and effort to complete them.

Activity	Need	Feed	Duration (weeks)	Effort (man-hours)
A	-	B,C	-	-
B	A	D,F	.5	5
C	A	D	1	15
D	B,C	G	1	10
E	-	F	.5	5
F	B,E	G,K	1	10
G	D,F	J	1	10
H	-	I	1	15
I	F,H	J	1	15
J	G,I	K	1	20
K	J	M,O	1	20
L	D	-	1	5
M	K	N	2	20
N	M	-	2	20
O	K	-	1	10

The critical path for this project is A, C, D, G, J, K, M, N. All other tasks may be parallelized with the critical path in order to ensure completion of the project on time.

Materials List

LCD Touchscreen - ezLCD-002-EDK Intelligent Programmable LCD Module with Touch Screen - Development Kit, $229

Microcontroller - PIC18F4321, $5.73

Xbee Wireless - 2 XBee™ ZigBee OEM RF Module, $19.00 each ($38.00 total)