February 21, 2006

Assigned Project: Western Protective Relay Conference Speaker Timing System

Team Times Up! -  
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Project Description:

5. Western Protective Relay Conference Speaker Timing System

Sponsor: WSU Conferences and Institutes  
Deadline: Mid-October 2006.

Background

The Western Protective Relay Conference (WPRC) is interested in replacing a system that indicates to a moderator and speaker how much time is left in a presentation. The conference is in need of two systems that can be synchronized because there are concurrent presentations being delivered.

Description

Develop two synchronized speaker timing system that indicates to a moderator and speaker how much time is left in a presentation. Each system will consist of a moderator station and speaker remote station.

Initial Ideas

The moderator stations should be: 1) powered by 120 volts ac, 2.) programmable (the presentation parameters of length, intermediate time signaling, etc.), 3.) able to display the present time, 4.) able to display indicators for warning time(s), and 5.) able to display a countdown timer.

The remote speaker station should be: 1.) wireless, 2.) able to display the present time, 3.) able to display indicators for warning time(s), and 4.) able to display a countdown timer. The warning indicators should be easily visible to the moderator and speaker but not the audience.

Project Outcomes

Two sets of portable, yet rugged, speaker timing controllers  
Each set contains a programmable master and slave as described in the Initial Ideas section above

First Assignment: Initial Project Summary

Will meet on Saturday, February 25, to write the IPS.

Team Meetings: We will have team meetings on Tuesday at 12:30 if we do not have class. If class meets, we will have meetings after the class at 2:00.
February 25, 2006

The Times Up! Team met in the HP lab at 1:00 to work on the ISP. We finished all but Research and Learning needs. We will meet on Monday, Feb. 27, at 12:30 to finish the IPS roughdraft.

We will meet with Brian after ECE 480 on Tuesday, Feb. 28, to have him look at the IPS roughdraft and sign off.

The following is a list of the responsibilities of each team member:

Tim - Client Liaison and Team Coordinator
Frank – Web Master
Jesse – Procurement Specialist and team accountant.
Hugh – Record keeper and assistant web master

February 28, 2006

Meeting with Brian

Brain informed us that we need to make contact with Dave Angell to determine if he is our contact.
Dave’s phone numbers are (208) 388-2701 or 859-2012.
Email address is: daveangell@idahopower.com

Suggestions from Brian on IPS:
1) Return on Investment: Make better use of time for people attending the conference. Want it to be a good experience so people continue to attend.

2) Concerns about Security: We need to determine if we need to make the system secure.

3) What is estimated design life of units?

4) In budget, include travel expenses to Spokane and back at 36 ½ cents per mile and also include food expenses. Poster for the project would be a minimal of $50. Dorota has the numbers we need and we can look at the Travels Management Website.

5) WSU will provide the money. We need to find out how to get it and how much is our budget.

We now need to finish IPS. Tim will contact Dave Angell and send him a copy of IPS for his review and feedback.
March 7, 2006

Meeting with Dave Angell was at 9:30 today. Tim was the only team member who could make it. Hugh and Frank had a class and Jesse was sick.

Tim and Dave talked about the project and the questions that we had. Some of the things Dave said were:
1) don’t put the current time on the slave unit,
2) slave unit sits on podium,
3) they would like a 20 year life out of the system,
4) last week of October is the conference.

The rest of the answers can be found in the final IPS.

March 9, 2006

We met from 12:30 - 2:00 and finished the ISP. We included the answers to the questions we received from Dave Angell.

March 21, 2006

Meeting with Brian

We are still waiting for answers to other questions from Dave Angell. However, we have most of them answered and we can get going with the project. Brian will give us stuff for writing proposals to request money for parts.

We still need to get a more definite budget from Dave Angell. Moderator will be about 12 feet away from speaker.

Frank wants all our schedules so he can make a master schedule.

March 26, 2006

The team met and finished the Needs Analysis portion of the project. Hugh was not in attendance because of prior commitments.
March 28, 2006

Meeting with Brian
Brain looked over our Needs Analysis. He commented that we need to include that the system will be easy to use for anyone.

Brain suggested to ask Kellie Newell to our Snapshot presentation. Tim will email her and cordially invite her to attend the presentation.

April 3, 2006

As a team, we finished the Specifications Analysis for our project. It took us about 3 hours.

April 4, 2006

Meeting with Brian
Brian reviewed our Specifications Analysis and he says that they look good. Our web page looks good also.

Comments on presentation:
1) Don’t put hands in pockets while presenting.
2) Don’t put so much text on slide.
3) Sound more sure about yourself.

April 6, 2006

Met as a team to complete the Ethics assignment. We met for about 2 hours and completed it.

April 11, 2006

We have divided our project into 4 areas and assigned them to team members.

Hugh – Clock (GPS or WWVB)
Tim – Power
Jesse – Microcontroller and keypad
Wireless – Frank
On Thursday, we will meet to look for solutions to design the speaker timing system.

For the design review presentation, we are looking at April 27, 2006.

**April 13, 2006**

We met as a team and looked for parts to build the system. Jesse made a flow chart on how the master terminal will function. One of the designs alternatives will be a master slave with arrows to program.

**April 18, 2006 – Team Meeting minutes**

A) On Thursday at 3:00 in the Chem E conference room on the top floor of the BEL, we have a meeting with Kelly Newell to go over the budget and how we will pay for parts we need. At that time, we will show her our presentation and get any feedback from her.

**Question to ask her:** How far ahead of the conference does the speaker timing system need to be done?

B) The teams’ design review with Dave Angell is on Thursday, April 27, 2006 from 2:00 – 3:00. Brian will let us know where it will be.

C) Discussed the housing unit for the stations. People to contact are Ed Odem or Elger.

D) Deadline for the application to request funds from the department is this Friday.

E) **Team Member reporting of findings**

1) Frank – Is looking at wireless – Bluetooth.

2) Jesse – Looking to use a Rabbit microcontroller for the master terminals. If we use a Rabbit, we have support for it in the ECE department and we already have Dynamic C. Jesse will look into seeing if we can just get the microcontroller and not the development kit.

3) Tim – To power the board,
   Also, an LCD with a backlight would be good to use for the master units, probably with 4 lines and 20 characters. For the slave, we
should use 6 7-segment displays for the countdown timer in the format of hh:mm:ss.
Will narrow down the LCD’s selections.

4) Hugh – Found parts to make a radio controlled clock and attach them to a circuit board. The company is called Galleon and they are in Great Britain or Europe. We would need to buy a receiver module, antenna, and microcontroller to decode the signal. The modules are tuned to a 60 KHz frequency to receive the WWVB signal from Boulder, Colorado. Prices are: Antenna- $27, Receiver - $47, Microcontroller - $49. Prices do not include shipping.

Will look at small atomic clocks that may be attached to the master unit. My be a cheaper option than the parts to make the clock. However, it will depend on the type of Rabbit microcontroller that is purchased; it depends if it has it’s own timing.

For time synchronization using GPS, Hugh has not found anybody that sells the parts to attach to a circuit board. However, GPS has a higher accuracy than what is needed; therefore, the higher price may not be justified.

F) For the next meeting:

1) Everyone will continue to refine their searches. In particular: Hugh – find prices for small atomic clocks. Keep searching for other companies that may make parts to build an atomic clock on the circuit board.

Jesse – look for a Rabbit microcontroller that has timing.

Frank – Narrow down choices for wireless.

Tim – Narrow down choices for LCD’s.

2) Other tasks to do next meeting:
   a) Fill out form to request money from the ECE department.
   b) Work on Design proposal paper. Need to have a rough draft done by Friday.

April 20, 2006– Team Meeting minutes

Meeting with Kelly Newell from WSU.

We showed her our snapshot presentation. She says it looks good to her.
Comments from Kelly:
1) They want a good product delivered on time within budget.
2) Conference is October 17. She would like the timing system by the second week of October, at the latest. She would prefer to have it earlier.
3) Kelly will send a letter of recommendation to Brain to help us get supplemental funding.
4) To purchase parts, give Kelly all the specifics so she can order them.
   a) Specifics include Web site, part number, item name, price, store name, etc.
5) Let Kelly know of any changes that arise.

At the meeting, we showed Brian our roughdraft for supplemental money. He made some changes in which we implemented after the meeting. Jesse emailed the supplemental proposal to Brian on Friday.

April 21, 2006– Team Meeting minutes

Jesse and Hugh worked on the outline for the report. Jesse turned in the outline. Jesse and Hugh also reworded the proposal to make it sound better. Travel costs were also added to the budget. Jesse emailed the proposal to Brian.

April 25, 2006– Team Meeting minutes

Jesse and Hugh worked on the presentation for our Conceptual Design Review. Frank and Tim worked on the work schedule in Microsoft Project.

Brian informed us of a change to presentation time. It will be at 8:30 to 9:15 in the morning on Thursday, April 27 in the ECE conference room.

For ordering parts: We will give the information to Kelly Newell. If we have them shipped here, the address is:
ECE Department, PO 441023, Moscow, Id 83844-1023
Or
ECE Department, Route 213 BEL, 6th and Urquhart, Moscow, Idaho 83844

The department phone number is (208) 885-6554.

April 26, 2006– Team Meeting minutes

The team finished the presentation. Jesse and Hugh worked on the roughdraft of the report for 2 hours. The budget was finalized and printed for the presentation.
April 27, 2006– Team Meeting minutes

Conceptual Design Review Presentation

8:30 – 9:15 AM in the ECE conference room.
Those in Attendance: Dave Angell, Brian Johnson, Team Time’s UP!, five students from other groups.

Hugh did the first half of the presentation and Frank did the second half of the presentation.

Questions and comments from Dave:
1) How do we know if there is a strong signal between the master and slave?
   Can we put a Signal Strength Indicator on the Master?
   We told him that we have talked about a TEST button to ensure that the master and slave are talking to each other.

2) How many channels are on the wireless modules?
   We did not know and would research that to find out and make sure they have many channels so as to avoid interference.
   We need to make sure that each unit uses a different channel so they don’t interfere with each other.

3) Does the timing parameters have to be programmed into the master terminal for each presentation. At the WPRC, the presentations are 30 minutes, so could we make the master to where once we program the timing parameters into the master for the first presentation, it will save those parameters and default to them if no new parameters are entered? The presentation length would be 30 minutes, first warning time at 5 minutes and the second warning time at 1 minute.

4) When the countdown timer reaches zero, can it start counting forward? This way, the speaker can see how much time he is going over.

5) Can the displays on the master station be backlit? Many times, the moderator is in the dark.

Tim has talked to the ME shop about making a housing unit when we need it next semester. They said that could be done.

Tim wrote the questions down. Here is what he wrote:
-How will you know if the units are working? Is there a test?
-Will there be a way to choose different wireless channels?
-Will there be a way to default to the last programmed settings?
-We need this in a dark room, so everything needs to be lit in some way
April 27, 2006

Meeting with Kelly Newell from WSU.

We showed her our snapshot presentation. She says it looks good to her.

Comments from Kelly:
1) They want a good product delivered on time within budget.
2) Conference is October 17. She would like the timing system by the second week of October, at the latest. She would prefer to have it earlier.
3) Kelly will send a letter of recommendation to Brain to help us get supplemental funding.
4) To purchase parts, give Kelly all the specifics so she can order them.
   a) Specifics include Web site, part number, item name, price, store name, etc.
5) Let Kelly know of any changes that arise.

At the meeting, we showed Brian our roughdraft for supplemental money. He made some changes in which we implemented after the meeting. Jesse emailed the supplemental proposal to Brian on Friday.

April 28, 2006

Jesse and Hugh wrote up an outline for our report. Jesse put it in Brain’s box.

May 2, 2006– Team Meeting minutes
**Brain’s comments:**
We have been approved for supplemental funding of $750. Dr. Wall would like to see us to talk to us about the microcontroller to use for the project.

**Presentation comments:**
Use Arial on powerpoint slides. For handouts, use Times New Roman.

Don’t use vague language. Sound more sure of yourself.

If we need to look at the same slide more than once in the presentation, make duplicate slides to avoid skipping around.

When explaining items and alternatives, give more background as to why we are going that way.

Shave for presentations.

They liked our software Timer we built.

Overall, Dave said we were heading in the right direction and everything looked good, minus the questions he asked.

**Report Comments:**
The report looks really good. Brain made some comments on the report were fixes needed to be made. The final report is due May 5.

**Next Meeting:**
The team will meet on Thursday to finish the final report.

**May 4, 2006– Team Meeting minutes**

The team met to finish the report. Frank wrote up what he found on the wireless modules and Tim wrote about the power converter and voltage regulator. Jesse integrated everything into the report and Hugh formatted and proofread the report, making minor changes to make it sound better.

Frank and Jesse talked to Dr. Wall. He said that the Rabbit 3000 would be a better choice for what we want to do. He also said that the 900 MHz Zigbee wireless module is a good choice and will work well with the Rabbit 3000.
August 18, 2006 – Team Meeting

Inspected the parts. Parts that have come include:
1) 4 Rabbit Microcontroller Development Kits
2) 2 Radio-Controlled Clocks
3) 10 2.3” 7-Segment Displays (Green)
4) 2 LCD’s

We are missing the wireless modules. Tim emailed Kelly Newell to see if they got ordered.

August 24, 2006 – Meeting with Brian (Joe could not attend)

Brian said that Dustin Dafoe may be someone to talk about the LED intensity. His office is between Dr. Noren and Dr. Egolf. Tim will talk to him.

Greg Klemesrud in room 1 of GJ can help us with soldering.

Brian suggested that if we are going to have a lot of wire running around, we should use ribbon cable to reduce noise, crosstalk, etc. For the 7-segment display, we should call the company and see if they have drivers.

Dr. Wall suggested to Frank that we should be able to use mosfets to drive the 7-segment displays and the leds. However, we will look for a driver chip for the 7-segment displays and use mosfets for the LED’s.

August 31, 2006 – Meeting with Brian and Joe

Wireless module as arrived. Driver for the 7-segment display has been found. Jesse will be in charge of housing.

Tim is in charge of making a design plan to deliver next week.

Hugh is taking over the webpage since Frank will be really busy with the programming of the speaker timing system.

Need to update the task sheet and send to Joe.

September 5, 2006

Tim and Hugh revised the task list and sent to Joe.
**September 7, 2006 – Meeting with Joe and Brian**

Detailed design review is next Friday at 8:30 AM in the conference room. We need to make sure that the ribbon cable we use is cut exactly. Jesse says that the ME shop can mill the boxes out with a weeks notice. Jesse will try and have the slave boxes designed by next week. We should plan for two testings in Spokane.

**September 11, 2006**

Jesse prepared the LCD for wiring. For the clock, a battery will be used for power. It will not be attached to power. This way, it can always be searching for the radio-signal to keep accurate time.

**September 14, 2006**

Jesse wired the prototype board for the wireless modules. Tim will work on designing the 5-digit 7-segment display tonight. However, cannot fully hook up the LED’s on the displays until the voltage regulator arrives. Dr. Odam said that the clock will need to be mounted on top of the housing.

**Meeting with Brian and Joe**

For the design review, talk about the progress we are making on the project. There is no set format. Put the budget on the web. Backup plan if wireless doesn’t work – run a serial cable. Power cable needs to be attached to case when not in use.

**September 15, 2006 – Design Review Presentation**

Attendees: Dr. Law, Jesse, Frank, Hugh, and Tim with Dave Angell on the phone. The presentation was put on the website so Dave could view it and follow along. Pictures of the system were put on the website.

Comments: No comments. Dave had a question about the U of I budget. U of I bought two of the microcontrollers with they will give to the WPRC. However, U of I will keep the licenses for all the software.

**September 21, 2006**

We have had unforeseen circumstances arise that has put us behind. We will work the weekend to get caught up.
September 27, 2006

Tim and Jesse have wired the 7-segment display to a bread board. However, it does not work correctly. Discovered that one ground was on the board and another ground was on the display. Put both on board and it is working. Tim and Jesse will begin soldering the display tonight.

September 28, 2006

Frank is programming the Keypad to enable it to program the LCD. Tim and Jesse soldering the 5-digit 7-segment display.

September 30, 2006

Digits on the 7-segment were wired backwards. Frank will change the code so we don’t have to redo the wiring.

October 5, 2006 – Meeting with Joe

The design for the housing has been complete for 2 weeks. However, the ME shop keeps putting off milling our boxes. They were supposed to be done a week ago. They said they will be done on Monday. If they are not done by Monday, we will cut the boxes ourselves. The wireless is still not working as it should. Dr. Wall said he will look at the code with Frank. We should make a quick reference guide to attach to boxes. Hugh will do this. Jesse talked to Dr. Odam about the delay and he will talk to the people who will cut the boxes and make sure they get cut on Monday.

October 7, 2006

Jesse is gluing the LED’s to board. Will finish wiring LCD’s (backlight and contrast). Will install a potentiometer to control the contrast. Tim is finishing the wiring of the 2nd display.

October 9, 2006

ME shop finished cutting the boxes. Began installing the parts in the boxes. Frank got the pause to correctly work. Jesse and Tim installed the LCD, 7-Segment Displays, Clock, and LED’s. Tim worked on wiring the power to the boxes.
**October 10, 2006**

Tested the master and slave units. Everything works according to the instruction manual. One problem has arisen: every time the system is paused, a 1 second lag between the master and slave occurs. Frank will try and figure that out.

**October 11, 2006**

All units are assembled and working properly. Master A talks only to Slave A. Master B talks only to Slave B.  
Another problem has been found. It looks like Master B has a power problem with the LCD. After a while of counting down, the LCD begins to flicker then reboots itself. After careful research, we found that the power going through the resistor that is attached to pin 15 on the LCD is 1/3 watt. However, the resistor we are using is rated at ¼ watt, so it dies. Solution: We replaced the resistor with two 6.2 ohm resistors in parallel. The problem never happened again.

**October 12, 2006**

Demonstrated the systems to Joe and Brian. We have a little ghosting problem. However, the systems function the way they should. Brian and Joe said it looks really good.

Tim and Jesse demonstrated the systems to Kelly. She was really impressed.

**October 16 and 17**

The speaker timing system was used at the conference. Everything worked well. Dave Angell and Kelly Newell were really pleased. The moderators were able to easily program the master units. The slave units worked well for the speakers. The project was a success!