Project Plan: Version 2

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Team Overview
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Problem Statement
Our goal is to create the infrastructure and 4 labs to be used for CprE 388. The current CprE 388 class does not offer as much embedded system work as our client, Professor Tyagi, would like. By the end of the two semesters our goal is to have approximately 4 labs that work with an Arduino ADK board and any necessary setup required to get these working well in a lab environment.

System Description
The final setup will consist of an Arduino ADK board attached to a computer running the Android development environment.The Arduino board will be used to communicate with external hardware in the form of an LED board.

The LED board comes with libraries to be used with the Arduino that will make some communication easier for students. This should make the expected completion time for the labs more reasonable. There are also libraries provided by the Arduino for communication between Android and Arduino.

We have been working with CSG to try and find the best way to set up environments on machines. We have been running into issues getting the drivers installed on machines and are looking into using a Virtual Machine instead. There are benefits and downfalls to both of these, and we will continue working with CSG to find the best, and most maintainable, solution.

Lab Breakdown
Our project requires that we come up with 4 labs that involve the Arduino ADK board and some form of external hardware. This includes a rough breakdown of our current plan and at what completion point each of the labs is at.

Lab 1: Blink and Morse Code

Status: Complete without write-up

This will be a 2-part lab aimed at introducing students to the LED board that they will be using for most of the labs following. The first part is a simple "blinker app" that will involve a simple button on the Nexus Tablet that can toggle an LED on the board on or off.
Part 2 is creating a "Morse Code translator" . Users should be able to type a string on the Nexus 7 tablet and the LED board should flash with the Morse code equivalent in long or short blinks. This is very similar to part 1, but takes it one step further requiring the use of the LED board.

Lab 2: Heart-Rate Monitor
Status: Started

The previous 388 class used heart-rate monitors that the department already has. We intend to use them to read data about a user and display the heart rate on the Android tablet. It will also require students to visually represent the heart-rate of the user using the LED board. Our intent is to require a low heart-rate be shown with green dots on the LED board (what is considered low, medium or high will be included in the lab write-up), a medium displayed with yellow and a high heart rate with red. It will also require that there be a gradual transition between colors as the heart rate moves from low to high.

Lab 3: Sketchpad
Status: Started

This will be the final lab, and as of now may be a 2-week lab. This will require that a user be able to draw something on the Nexus tablet and in real-time it will be shown on the LED board. The current outline for this lab involves displaying a 32x32 grid on the tablet along with color selection buttons so users can draw on the tablet coloring in spots on the grid. This will then be sent to the arduino and communicated to the LED board where it will be 'drawn' on the board and displayed. This will be the most difficult and time-consuming lab and will require that students smartly keep track of the state of the LED board, what the user had drown and make sure they are sending what to color correctly.

Lab 4: Undecided

If we decide the sketchpad app is an appropriate workload for a 2-week lab we will not have a fourth lab. If we decide that we do want a fourth lab we will decide and complete it before testing.

Deliverables
4 Labs using the Arduino Mega ADK and Nexus 7 tablets to communicate with some additional hardware
Lab write-ups will be complete and tested by students
An in-depth guide describing the setup process for a new lab station as well information regarding the maintenance of the set-up

First Semester

We will have full understanding of the Arduino ADK board being used and the components.

All hardware will be ordered by mid-November.

All labs will be roughly planned, with one lab roughly written and completed. The is will allow us ample time to test the labs in the next semester.

Draft of setup guide complete.

Second Semester

All labs written and initial testing done by the middle of March so that user testing can be done.

Will have students complete labs to evaluate their usability and understandings gained from them.

Labs will be re-evaluated after reading through feedback from students and re-written to reflect this feedback.

Finished and polished guide is complete for future use with the class.

Specifications

The project should include 4 labs working with the Nexus 7 tablets and the Arduino Mega ADK board. These labs will also involve LED boards that will require students to interact with hardware outside of the LED board.

The labs will be written out with clear requirements, but should require students to think critically about the task. The physical setup for each lab should be as simple as possible so that there are as few issues as possible and the labs can focus more on learning and less of troubleshooting.

Schedule and Gantt Chart
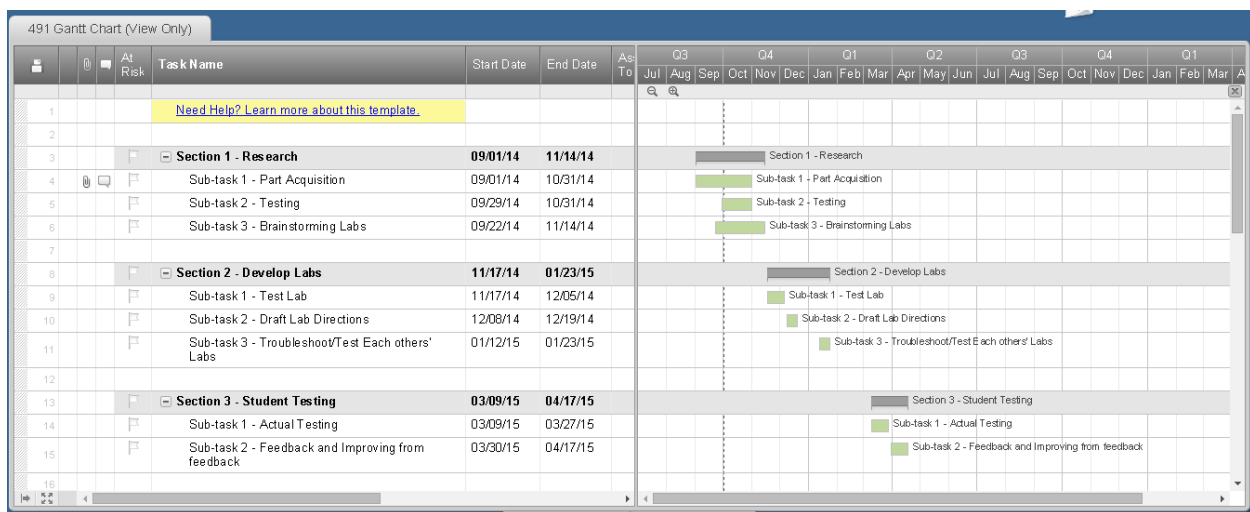
Resources Required

Resource	How will we get it?	Estimated cost
Arduino Mega 2560 board x N	Provided by client	$59 x N
Heart Rate Monitors	Provided by client	$0
LED Board	Provided by client	$40 x N

Testing

In order to test our project we intend to put together a small class where we can bring in students with previous Android programming experience to test out our new labs. This class well be approximately 3 weeks and involve just the 4 labs. Once we have had the students complete them, we will get feedback from them. This will allow us to see how actual students understand our labs and will give us an approximate completion time.

Risks

Documentation that we have found to interact with the Arduino is not sufficient, then we will have to research further for proper documentation.
Reliability of the hardware for consistency in lab is important and may pose a challenge.