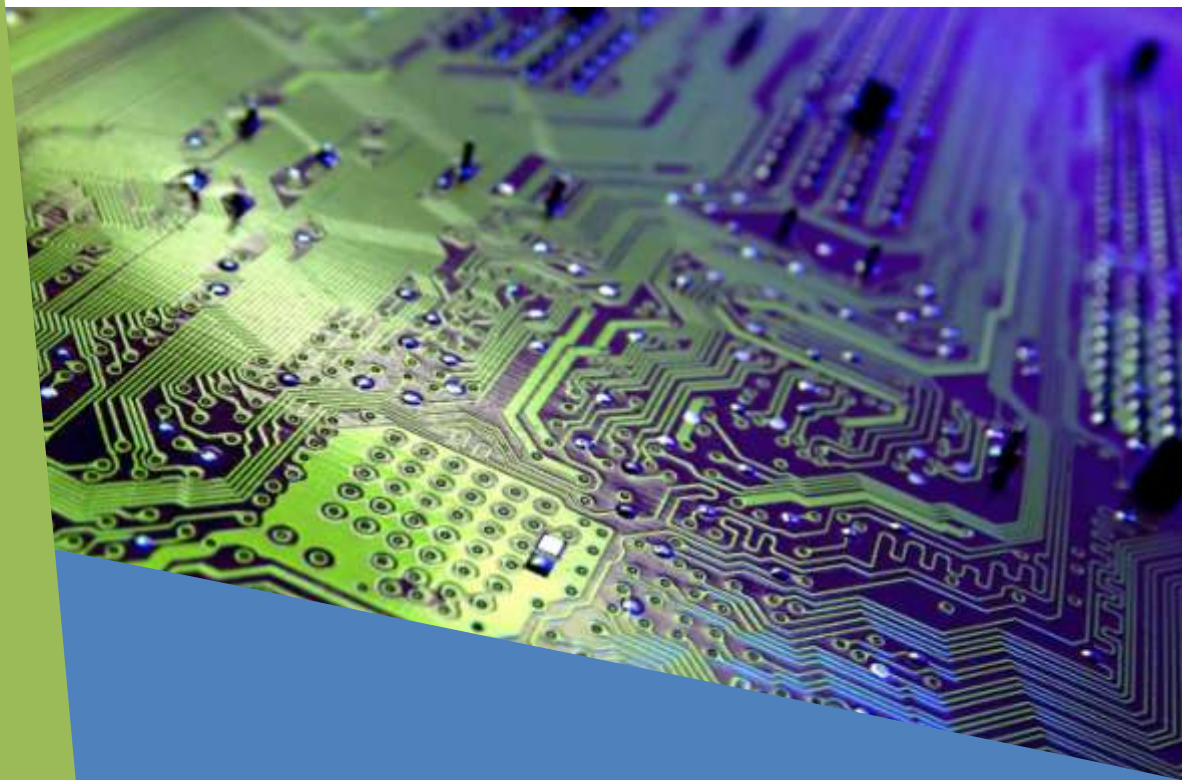# Post Mortem for

PillPal Medical Dispenser

Izaak Lee, Charanpreet Parmar, Clark Hsieh, Gurinder Dhaliwal

April 22, 2013

Revision 1.0

CAPSULE CORPE

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Introduction

For the past 4 months, Capsule Corp has been working diligently and efficiently on a medical dispenser. The medical dispenser is dubbed the PillPal and is currently in the proof of concept phase. The PillPal is a pill dispensing machine capable of generating schedules for multiple patients, dispense drugs automatically, and have multiple techniques to remind users that it is time for their medication. By developing this product, we hope to provide patients with a simple reminder to consume medication.

System Design

The PillPal system is consists of many smaller modular systems. The system overview is shown in Figure 1 below. The main 4 modular systems are:

- Label Reader
- Smart Pill Containers (SPC)
- Vacuum Arm Manipulator (VAM)
- Control Graphic User Interface (GUI)

Figure 1 – PillPal System Overview

Label Reader

The label reader is the system which reads the pill bottle labels and generating a schedule based on the image it collects. Of the 4 modular systems, the Label Reader is 30% hardware and 70% software. The development of this system was the simplest. The installation of all the components and measurements were done within the first week of construction. Due to the imperfect build quality of the label reader, we were forced to make software adjustments to our original planned actions, such as a situation a slight tilt on the pill bottle, thus the software group must adjust the image for the Optical Character Recognition to produce a clean image. Though not perfect, the creation of a flat image from a circular surface is still possible through hours of hard work. Figure 2 below shows the label reader module.

Figure 2 - Label Reader Module

Currently, the label reader has all the necessary functions implemented as listed in the functional specification document. The final stages of the Label Reader require us to integrate the label reader software to the core software trunk. In the future, a stronger structure should be built to avoid tilting of pill bottle and a cover to fully enclose the motor and other mechanical parts is required to meet safety standards.

Smart Pill Container

The Smart Pill Container (SPC) is a module which holds the patients pills and is able to accurately rotate the containers to precise locations for sorting and dispensing. Using a specific design with Photomicrosensors, we are able to accurately obtain the containers' current position. Unlike the Label Reader the SPC module was 90% hardware and 10% software. Because of this aspect, the installation required many weeks to be finalized. Figure 3 below shows the SPC module. The SPC required designing of:

- Pill holders
- Servo motor mounting
- Gear ratio
- Structural design
- Photomicrosensor designing
- Debugging circuitry

Figure 3 - Smart Pill Dispenser Module

The installation of the photomicrosensor required the most amount of time. The "dog" sensor's tabs required precise installation. To simplify our work, we developed a specialized debugging code and circuit to further assist our installation. After weeks, the SPC is fully functional and is ready to be implemented with the rest of the project. In the future we will prefer to have the photomicrosensor underneath our design to reduce space.

Vacuum Arm Manipulator

The Vacuum Arm Manipulator (VAM) is the system which picks and places pills utilizing a linear motor and a mechanical vacuum. The pills are placed into a holding area until the user is ready to confirm their identify via the finger print reader. Similar to the SPC, the VAM is a hardware dominant module. As a result, the installation and implementation required almost 3 weeks of discussion before construction began. The design of this mechanism was tedious as the placement of the linear motor was difficult. The limited motion of the linear motor required us to fixate the component on an angle which caused difficulty. Figure 4 below shows the VAM module.
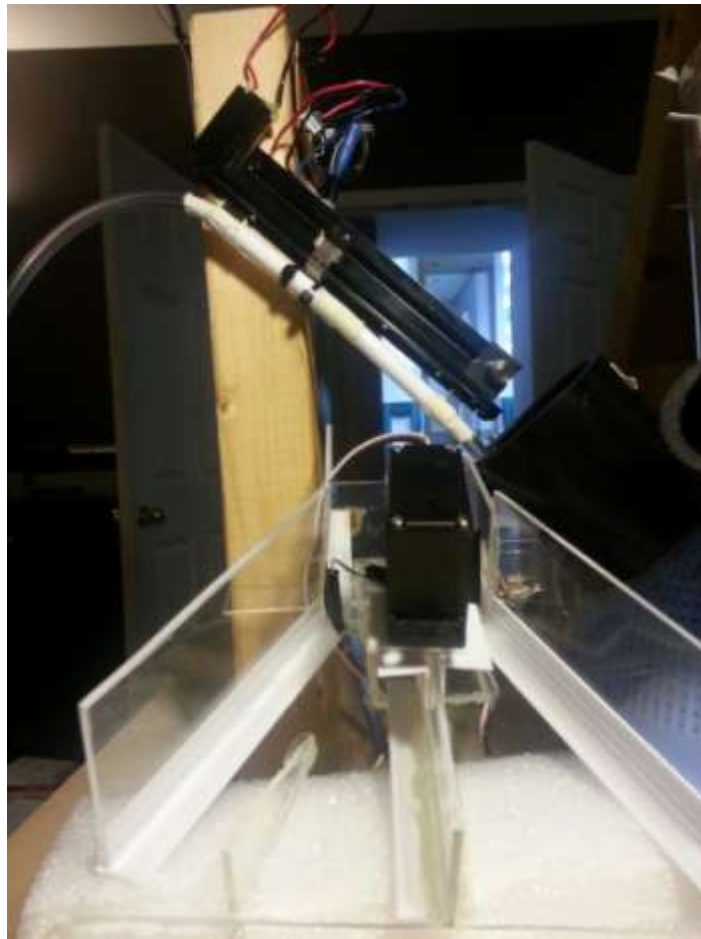

Figure 4 - Vacuum Arm Manipulator Module

However, utilizing the limited resources available, the VAM is fixated and the wired using ether cable. The code to control the VAM is completed and the integration of the hardware section is progress. For the future, a linear actuator would be more useful but costly. Other alternatives include the use of two motor to provide 2 degree of freedom for the vacuum arm. Utilizing two motors, the PillPal size can be reduced.

GUI Software Overview:

The GUI is the primary control interface for our system. It provides the high level abstraction of all of the functionalities of our system. The GUI is fully designed in C++ and the Qt framework. The GUI displays all relevant information and provides access to all functions to the user in a clear and easy manner. Figure 5 displays the GUI home menu which is shown at startup. The responsibilities of the GUI include but are not limited to:

- Displaying and managing all scheduling information
- Ability to access low level features such as pill loading and pill dispensing
- Displaying and managing user information
- Allowing the user to customize user information, scheduling, hardware settings such as brightness and volume, and emergency alert information

The GUI software has met all priority 1, most of the priority 2, and some of the priority 3 requirements listed in the functional specification. The lower priority requirements that have not been met will be added for the prototype and production models. All the core functionalities of the software have all been implemented and tested for correctness.

The size of the GUI software ended up being many thousands of lines of code. With such large software it was essential to modularize the code for easier testing and flexibility. One of the problems with this approach was that we had to make sure we implemented communication between modules correctly which took a quite a bit of time. As we delved deeper into the code we encountered more complex problems which required more time to solve. Much research had to be done through open sources online but eventually every problem was solved.

One of the most challenging and problematic part of creating the GUI software was getting it to work on the Raspberry Pi. We had miscalculated the compatibility between different versions of the Qt framework. The software was first developed using the newest Qt, Qt 5, with an understanding that it would be backwards compatible with Qt 4. Since Qt 5 was relatively new the Raspberry Pi only supported Qt 4 running directly on it. To use Qt 5 we would need to do complex configurations to cross compile from a Linux based device. So we developed the software in Qt 5 and tried running it on the Raspberry Pi which had Qt 4. This led to many unforeseen backwards compatibility issues including the sound not working. So we set the Raspberry Pi to cross compile and use Qt 5 but this caused another unforeseen problem that our software would not display properly because the Raspberry Pi did not

come with a required plugin and we were unable to install that plugin. So our final solution was to change the code to be compatible with Qt 4 and run Qt 4 on the Raspberry Pi.

In terms of scheduling, the software development and integration process took longer than expected due to the aforementioned issues.

These were some of the main challenges. The rest of the coding process was relatively straightforward and all problems were solved through more research or coming up with new ideas over time.
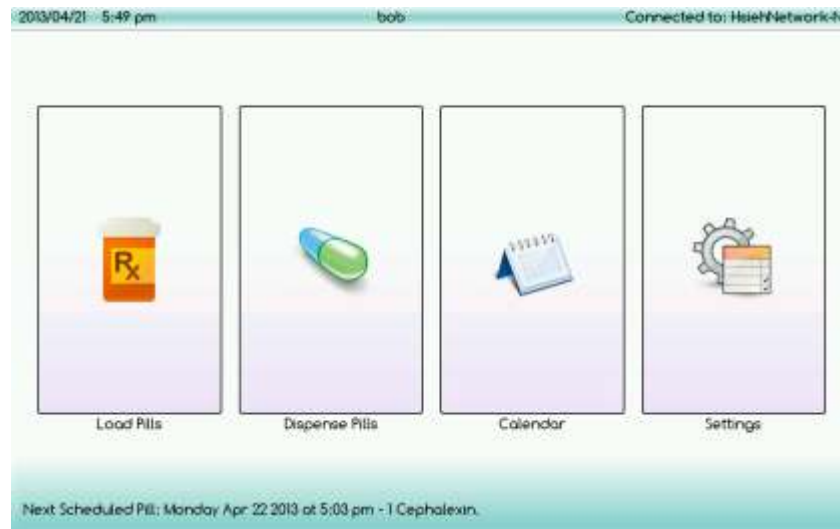

Figure 5 - GUI Home Menu

Schedule

The following timeline in Figure 6 illustrates our expected and actual schedules over the course of this project:

Figure 6 - Project Schedule

As can be seen above, the actual time required to do each task took longer than expected. We had planned for this earlier so in our expected schedule we purposely made short deadlines with the expectation that more time would actually be required. Also for our expected schedule we planned to finish by April 8 since this is the date we assumed the presentation would be. But later it was revealed that the presentation date is April 22. This gave us more time to fine tune and complete the project and that is another reason for the discrepancy seen in the above illustration.

The main difference is in the development portion of the schedule. This is mainly due to many material, parts, and compatibility issues encountered that caused us to reorder components and even rethink our design.

As with most engineering projects most of the project was done at a normal pace with a very fast pace integration and testing phase closer towards the deadline where many long days were spent finishing up the project.

Financials and Business

Table 1 highlights the expensive occurred over course of this project.

Table 1 - Estimate Cost vs. Actual Cost of materials

Hardware	Estimated Cost	Actual Cost
Home Depot-Building Misc.	$-	$92.92
Building Materials –Misc.	$132	$70.14
SPD-SI GEARS x6	$-	$40.83
Stepper	$50	$46.31
Vacuum (for prototyping)	$205	$28.00
	$387.00	$278.20
Electronics and MCU & Pi Misc.	Estimated Cost	Actual Cost
Digi-KEY - Sensors and Misc.	$-	$107.75
Servo-City - Servo Gears /Mounting	$-	$111.14
SDHC 8GB- C10	$-	$7.83
WI-FI N USB	$15	$11.19
Finger Print Reader+ PI	$105	$128.25
Spark Fun - servo, Drivers, Misc.	$180	$112.88
Coaxial Power DC cable	$-	$8.35
OSEPP Uno R3 Plus	$-	$33.54
Touchscreen 10" LCD LVDS-PI	$169	$183.49
HP 3100 Webcam 720p	$11.64	$11.64
Belkin Hub 7 Port USB 2.0	$27.99	$27.99
PCB Board	$100	$-
RP-Electronics – Misc.	$-	$10.74
	$608.63	$754.79
Final Total	$995.63	$1,032.99

At the start of the project, a budgetary assessment was completed and an estimated cost of $1000 was required to complete the project. As the project progressed, it was obvious that the miscellaneous building cost was under budgeted by almost 40%, from $100 to nearly $140. The 20% extra charges, shipping and handling costs that we factored into our original proposed design were insufficient to the actual spending incurred. To compensate for our increased in spending, we opted for a cheaper vacuum alternative to save on costs. In the end, we were slightly over budge, but were pleased that it is well within 5% of the initial projected budget.

Business

The project was aimed to develop and prototype a medical pill dispensing and reminder system for home and commercial use. Our targeted projected market price was to aim at the sub $1000 segment, to compete with the current smart products available. Our competitive advantage is that this machine can be used for multiple patients, and takes away all the hassles of pre-allocating the dispensed medication. We have confidence that this goal is realistic and it is not completely improbable to be competitive in this niche market.

Team Dynamics and Individual Reflections

Capsule Corp. understands that Professor Whitmore and Dr. Rawicz are expecting excellence from a team of and 5th year engineering students. It is this unique team dynamic and many years of teamwork that has shown proven experience in a number of key areas. With years of teamwork experience, it allowed us to solve problem quickly and reach mutual agreements instantly.

We met on regular basis to work on the project and discuss milestones. We often ask others for opinions and we are open to new ideas. Over the 13 weeks, we have completed our project with little to no problems between team members.

Izaak Lee

It has been a privilege for me to work with a team of engineers who share the same passion and drive to develop a system capable of helping people around the world. Our team of four engineers are highly skilled and knowledgeable in their respective fields. Over the past four months, I have been able to witness everyone's skill and knowledge first hand as we put countless hours into our project: PillPal.

Our team consists of two hardware engineers and two software engineers. I was one of the hardware engineers and Mr. Hsieh was the other. Over the months, I have spent more time with Clark than any other team member; we have worked into the middle of the night and worked before sunrise. The hardware portion of the project proved more difficult than expected. Our limited knowledge of mechanical design did cause some trouble but with time and effort between the whole team, we were able to overcome these difficulties and complete our design. The most enjoyable part of the project was designing circuits, our project also had multiple circuits to control our system. With 4 years of experience in circuit designing, we allocated more time to the mechanical design.

The overall project trajectory has demonstrated important life lessons that we shall not forget. It should be noted that the ENSC 440 course is indeed tough and I would not suggests people to take too many courses with it. When building a brand new product, ordering, shipping, designing, planning, documenting, assembling, completing takes more time than one imagines 4 months prior to completion. When working on the designing and planning stages of the project, there is a delicate balance between over planning and actually working on the project. Over designing and planning leads to delays of parts being order and often shipping take longer than expected (this is also another note). 1 week shipments, took 4 week, forgetting components means another $8 in shipping cost. Moving from the technical aspect, the management side of the project places a significant role. The budgeting of a project starts 4 months before the concepts are set in stone, this is where many teams under budget. Our group has managed to break even, however, it took many extra hours discussing about parts and reliability. Though this may seem like some small number of points listed, I believe they are some essential elements to keep your team a float during these 4 months.

If I were to complete this project all over again, I believe the first thing I would do is adjust the budget. Our shipping cost were nearly quadrupled our first estimated amount. By adjusting the amount this would allow us to freely order and test components at a swift pace. Also, it is very important to keep the wise word of Steve Whitmore: "Sometimes, the amount needed to go from an A to an A+ may not be worth your insanity". This was learnt when we completed a 92 page design report and took twice the amount of time to complete as other groups. The result in the end was not so glamorous.

Overall, the course is great and tests your knowledge and skill to its maximum. I am very proud of the work we have completed and it goes to show that working with a great team helped immensely. I wouldn't exchange any of my team members and would work with them again any time. In the end, there were a lot of problems, but we had fun and enjoyed the work we did, this has been one of the best courses offered at SFU.

Gurinder Dhaliwal

Over these past 4 months I had the good fortune to work with highly skilled teammates in creating a complex engineering product from inception to conception. I have learned a lot, from new technical skills to new soft skills. I am very grateful to have this unique learning experience in which I have learnt to transition from a student to a professional.

My responsibility in this task was to create the GUI software. I had wanted this role from the beginning due to my computer engineering background compared to the electronic engineering background of my teammates. Working on the GUI software I learned many new technical skills such as creating software using Qt, developing in the Linux environment, and serial communication with the Arduino microcontroller. I also gained valuable experience in using my skills I obtained in prior courses to create a large, complex, and unique software solution.

Aside from my technical skills I learned and developed a large number of soft skills. I was fortunate enough in working in a good team with good people and good synergy. I learned how to become more of a professional and be more accountable to my teammates. I improved my time management, project planning, communication, and problem solving skills. The one skill that was most improved from this project was my documentation skills. I learned the importance of good documentation and keeping engineering journals which I believe greatly benefits me in my professional career

The biggest challenges in working on this project were creating extensive documentation and ensuring everything in the software worked perfectly. I would always be constantly thinking about new solutions to problems. It was also challenging towards the end when the deadline was getting close and time was running out. A lot of work had to be done towards the end in terms of integration and testing since the GUI software is the high level abstraction of the whole system and needs to control everything without error. In terms of the software there are many things I would do differently in retrospect in terms of implementation and avoiding encountered problems that were mentioned in the previous pages. These are easy to think of now but in the moment they did not come to mind. But these changes can be made for further revisions of the product.

Overall, ENSC 440 was one of my favourite and most important courses I took in my academic career at SFU. It has been a great experience working with all my teammates in forming Capsule Corp and creating a unique engineering solution to a real world problem. I have learned a lot about what it is to be a professional and an engineer and although there were tough and stressful times, I believe they have made me a more successful person.

Charanpreet Parmar

For the past four months, my teammates and I have been working diligently on our PillPal Capstone project. Through careful planning and multiple open discussions regarding the projects direction, we managed to successfully coordinate our skills and talents appropriately in order to complete the PillPal as efficiently as possible.

My responsibilities were to ensure the interfacing between all modules worked correctly. This meant ensuring that the Raspberry Pi, the Arduino and all the hardware interacted reliably and that the Hardware and Software teams were both on the same page with regards to the basic design for the project. This mostly translated into finding the simplest and most time efficient ways to implements desired features for the project as well as writing most of the required firmware for the Raspberry Pi to get the required feedback and necessary control to and from the hardware.

To do this effectively, this entailed a lot of interaction with the Hardware team, Izaak and Clark, and the Software team, Gurinder. Fortunately, because the teams excellent interplay, there were hardly ever any major conflicts and discourse always remained respectful and constructive. By ensuring both teams were on the same page, once the integration phase of the project came, everything interfaced nearly perfectly. I also created and tested the image stitching algorithm for the label reader and assisted with implementing the optical character recognition software.

In order to do all these tasks, I was required to learn how to develop for linux environments and how to use linux to interface with hardware such as a microcontroller and a webcam. Overall, I would say that most of the technical skills I learnt and expanded upon were related to using and programming with Linux, in particular with how to integrate open source projects into a project and how to use Linux API's such as Video4Linux, which was used for the webcam, and with serial communication between the Raspberry Pi and the Arduino over a USB connection. In terms of soft skills, I gained a better understanding of the importance of planning and documenting for larger and more complicated projects, especially in cases where many components are intertwined and many people will be using and interacting with the same code and hardware.

The project itself was one of the more enjoyable experiences I had at SFU; putting nearly all the skills and technical knowledge I had learnt up to now to the test. If I were to do this again, the only thing I would change would be to take notes more diligently since at times I was the only one who knew how certain things worked, particularly for some algorithms used for the firmware that were developed by me which caused some problems for other teammates.

Clark Hsieh

The entire semester of planning, discussing, working, and learning has so far been an amazing experience. My team members, Charanpreet, Gurinder, and Izaak are all fantastic ENSC engineers and co-workers. They have demonstrated the true essence of teamwork, professionalism from all their hard work and best in all, friendship.

My main responsibility in this team, besides managing the finances, creating spreadsheets, and managing expenditure was the hardware portion of the project and worked closely with Izaak and the rest of the team to define the scope and realize our hardware designs. We put together the mechanical structures of the project and also the electronics associated with each of our 3 modules. The team would specify the actions required by our project then Izaak and I would perform the research and experiment and prototype the electronic circuits. The software portion of this project was undertaken by Charanpreet and Gurinder, and all I can say is that they have done an amazing job with the integration of their code and UI design.

Through the course of this project we have encountered many challenges and barriers. It was wonderful how our team was able to work together towards a unified solution and not put unnecessary blame or pressure on any particular member. What I found most challenging about this project was the actual realization of our idea, bringing the project from our heads to physically designing and building the contraption. We were required to specify precise device parameters, measurements, angles, and materials of which we have had no experience in doing. We also had to spend countless hours exploring our options then choosing one after evaluating each proposed methods. Another challenge we encountered were the design aesthetics of our overall project. We found that with no design experience, it was difficult to make design choices that were aesthetically pleasing and modern looking.

Some technical challenges during our building and testing were the many small electronic circuits we were required to construct for sensors and other control circuits. We were able to design and put together circuits that work, but were unable to predict its future reliability and robustness in fault tolerance design. An example would be the improper connection to the sensors, incorrect power options, or alerting the user for poor signal integrity.

Some things that we could have done differently with a design decision, was the placement of the power connection that was front facing. We instead would prefer to have the wire in a more discrete location. Some other things that we wished we could have done differently, was to order parts even farther ahead in advance to create more buffer in our schedule time. We experienced some shipping delays due to a mistake with our supplier. Other things that we can do differently are the robustness of our design right from the beginning. We had some small issues with the label reader not able to sustain its weight and hold itself upright, thus afterwards we built everything as robust as we can with our limited building materials.

Of course during the progress of development and experiment we manage to burn a few of our prototyping circuits, but were always able to pinpoint our errors and correct them on our final prototype. All in all, the integration of business, planning, and engineering process of this project contains valuable life lessons of which we can carry onwards with our lives.

10:34 AM 10/21/12

Things we need to discuss off the top of my head:

- Are we going to start this semester?
- Are we going to look for another member? Who else is taking it? Who do we want?
- What's going to happen with SPEC? Next semesters the last semester Izaak and I will be on campus so the future of the club needs to be discussed.
- Do we have any ideas we want to pursue? Anything more to research on? The scale of our project will probably need to be discussed as well to something we can actually complete, as well as what sort of skills each of us has that we can use (Probably lighter on programming and mechanical stuff is just us three)
- What will each of our schedules look like for Spring Semester? Any other classes going to be taken? Taking a job on the side as well?
Probably some more things that I can't really think of now.

Attendees: CH, CS, IL

General
- Eliminate projects which are not viable.
- Meeting Next week Sunday Oct 28th. Location TBD.

List of project

- Laser Distance for survey
  - Hand Held Stability Device
  - Measure distance between two points
  - Mostly Hardware
- Glasses which takes images
  - Reacts to the eye movement
  - Small cameras (cheap)
  - heavy processing
  - Mostly Software
- Disposable Sensors
  - Bio-degradable
  - To see if people are following you

- Personal Training System
  - Want to track heart rate
  - Body temp
  - GPS
  - Video Cam
  - CO2 tracking
- Data Capture
  - Logging Data
  - Heavy processing
  - expensive equipment?
- Clothing RFID

- - Meta Data for personal use
  - RFID cheap
  - Clothing Storage?
- Acoustic Mapping
  - Music calibration
  - simple phase detection
- Hand Held Chemical Detection Device
  - Detect Gas, Pollution
  - 3G network
  - Combined collection of data
- Attendant-less Parking System
  - License plate reader to track time and paying
  - Existing?
- Following camera
  - For Filming montages.
  - Wifi network
- Phone to counter Voice
  - Feedback system
- Cable Testing.
  - Make it check delay
- Smart Fridge?
- Sun Shades in the car following sun
- Automatically Adjust mirror to driver
- Wind shield display?

Charanpreet
clark
izaak
10:13 AM 11/04/12

1) Eliminate data capture, and others

2) looked into more of hud
- require projection system and screen, screen is very hard to do and expensive.
- found panasonic cybernavi product in japan,

3) left the aucoustic in place, because it might be simple + complicated and interesting

4) attendenless parking system may be a current fall 2012 440 project, stay tuned...

NEW LIST

- Glasses which takes images
    - Reacts to the eye movement
    - Small cameras (cheap)
    - heavy processing
    - Mostly Software

- Personal Training System
    - Want to track heart rate
    - Body temp
    - GPS
    - Video Cam
    - CO_2 tracking

- Clothing RFID
    - Meta Data for personal use
    - RFID cheap
    - Clothing Storage?

- Acoustic Mapping
    - Music calibration
    - simple phase detection

- Attendant-less Parking System
    - License plate reader to track time and paying
    - Existing?

- Following camera
    - For Filming montages.
    - Wifi network

- Cable Testing.
    - Make it check delay

- Smart Fridge?
- Sun Shades in the car following sun
    - Automatically Adjust mirror to driver
- Wind shield display?

Charanpreet
clark
izaak
10:13 AM 11/04/12

1) most proabable option: HUD DRIVING
- expensive beam splitter
- charanpreet: possible to get it in the local glass shop as sample?
- law issues
- Get the microvision kit in the future.
- Get a backup plan.

TO DO:
1. get beam splitter glass by next week.
       2. clark go talk to physics and engineering.
       3. All to find glass companies
       4. IL to call glass companies

GLASS COMPANIES:
http://www.mxglass.ca/ - no, table top, mirrors, shelves
http://www.altoglass.ca/solutions.aspx - no
http://www.glassburnaby.com/services/ - no claims too special. Maybe only get it in states.

NEW IDEA:
image processing, medication dispensing
read lable of medicine,
put medicine in slot. and it reminds you by text email or what.
dispenses medieine.

NEW LIST

- Glasses which takes images
    - Reacts to the eye movement
    - Small cameras (cheap)
    - heavy processing
    - Mostly Software

- Personal Training System
    - Want to track heart rate
    - Body temp
    - GPS
    - Video Cam
    - CO2 tracking

- Clothing RFID
    - Meta Data for personal use
    - RFID cheap
    - Clothing Storage?

- Acoustic Mapping
    - Music calibration
    - simple phase detection

- Attendant-less Parking System
    - License plate reader to track time and paying
    - Existing?

- Following camera
    - For Filming montages.
    - Wifi network

- Cable Testing.
    - Make it check delay

- Smart Fridge?
- Sun Shades in the car following sun
    - Automatically Adjust mirror to driver
- Wind shield display?

Phase 1: Project Set up
- Clark to contact Whitemore about registration
- Clark to present project idea to Andrew
- 4th / 5th member needed.
        - Update: Found 4th. Welcome Gurinder
- All to find previous 305 documentation so we can set it up properly

Phase 2: The design
- Barcode research. Find out what info is given from medical barcodes
- Dispensing technique
- Design of prototype

Time: 1:00pm
Location: SFU
Atendee: All

1. Topics

- Find a cad program, or solid works off torrents.
- Create a documentation. spreadsheet- functions we would: FIll in
- SET UP MS project learning- exploration time by tuesday dec 18
- we all agree to use G drive only.
- everyone explore how to read bar codes, how to read text. (mini scanner?)

1. Next Time:
    a. Company Name, Product name. Colour Scheme
    b. fill in spread sheet, functions we like... throw idea in.
    c. next meeting time? figure out by also tuesday
    d. start the proposal/ project money begging planning.

General
- Decide company Names.
- Decide on Product Name.
- Decide on product logo and colour.
- Learn MS project
- Learn CAD.
- Generalize storage (google Drive)
- Generate naming convention.
- Determine meeting minute layouts for submission.

Project
- All to research about how to read text.
- All to learn standards of pill sizes, bottle sizes, and label information
- All to research how dispensing method.
- All to develope list of functions.
- All to prepare for presentation.
- IL to start making template for proposal.

Project: Pill Dispenser (Name pending)

Attendees: IL, CP, CH, GD

General:

- **IL to update meeting minute template**

- **IL to bring in proposal template**

- **CH to provide list of company and product names**

- **All to research company and product name**

- **All to determine next meeting time**

- **Blue and green are dominant colours in logo**

- **CH to prepare inventory spreadsheet**

Preliminary Design Phase:

- **R&D:**

  o **CP to get capsules**

  o **All to determine cost and reliability of vacuum and motors**

  o **Need to research image processing**

- **Design:**

  o **Use vacuum for picking up drugs**

  o **Containers should be cone shaped**

  o **Modularity feature on hold**

  o **7 holders for one pill compartment (holds up to 7 different drugs at least)**

  o **WiFi used for connectivity**

  o **UPS (up to 24 hours)**

  o **3G for future development**

Next Scheduled Meeting: January 1st, 2013 in the afternoon

Project: **Pill Dispenser (Name pending)**
Attendees: **IL, CP, CH, GD**
General:

- IL to update meeting minutes template **(Completed)**
- IL to bring in proposal template **(In progress)**
- CH to provide list of company and product names **(Complete)**
- All to research company and product name **(In progress)**
- Blue and green are dominant colours in logo
- CH to prepare inventory spreadsheet **(Complete)**
- ALL to Install and learn AutoCAD
- Learn MS Project - Set Date/Time for Initial SetUp
- Powerpoint for money
- IP adress: charanpreetp.dlinkddns.com
  - Username: pi
  - Password: jdso2odac

Preliminary Design Phase:
1. **R&D:**
   - ~~CP to get capsules **(Complete)**~~
   - All to determine cost and reliability of vacuum and motors **(in progress)**
   - Need to research image processing **(in progress)**
   - CP to bring Aquarium Pump on Jan 2nd
     - http://garage-shoppe.com/wordpress/?p=109
   - CH to check ebay for capsules
   - CP to check LCD Display screens
1. **Design:**
   - Use vacuum for picking up drugs
   - Containers should be cone shaped
   - Modularity feature on hold
   - 7 holders for one pill compartment (holds up to 7 different drugs at least)
   - WiFi used for connectivity
   - UPS (up to 24 hours)
   - 3G for future development

Next Scheduled Meeting: Jan 2nd, 2012 10:30am... lol =) ill drive -Clark
(webcam will work)

Project: **Pill Dispenser (Name pending)**
Attendees: **IL, CP, GD**
General:

- IL to bring in proposal template **(In progress)**
- All to research company and product name **(In progress)**
- Blue and green are dominant colours in logo **(Complete)**
- ALL to Install and learn AutoCAD **(In progress)**
- GD to croeate Gnatt Chart fr proposal
- Powerpoint for money **(In progress)**
- IP adress: charanpreetp.dlinkddns.com
    - Username: pi
    - Password: jdso2odac
- IL to Use Sparkfun as a sponsor.
- Funding from other sources besides ESSS.
- All to find ESSS for free MSP.
- **Proposal Due Jan 21**

Preliminary Design Phase:

1. **R&D:**
- All to determine cost and reliability of vacuum **(Complete)**
    - CP to order vacuum
- All to determine cost and reliability of motors **(In progress)**
- Need to research image processing **(in progress)**
- ~~CP to bring Aquarium Pump on Jan 2nd~~
    - ~~http://garage-shoppe.com/wordpress/?p=109~~
- CH to check ebay for capsules **(Complete)**
- CP to check LCD Display screens **(Complete)**

1. **Design:**

    - Use vacuum for picking up drugs
    - Containers should be cone shaped
    - Modularity feature on hold
    - 7 holders for one pill compartment (holds up to 7 different drugs at least)
    - WiFi used for connectivity
    - UPS (up to 24 hours)
    - 3G for future development

Next Scheduled Meeting: **Jan 15, 2012 2:30**
(webcam will work)

Project:PillPal
Attendees (hangout): IL, CP, GD, CH
General:

- IL to bring in proposal template **(In progress)**
- All to research company and product name **(In progress)**
- Blue and green are dominant colours in logo **(Complete)**
- ALL to Install and learn AutoCAD **(In progress)**
- GD to croeate Gnatt Chart fr proposal
- Powerpoint for money **(Complete)**
- IL to Use Sparkfun as a sponsor. **(Complete)**
- Funding from other sources besides ESSS. **(In progress)**
- All to find ESSS for free MSP. **(In progress)**
- **Proposal Due Jan 21**

Preliminary Design Phase:

1. **R&D:**
- All to determine cost and reliability of vacuum **(Complete)**
  - CP to order vacuum **(Complete)**
  - CP to place recipet in box
  - Testing when parts arrive
- All to determine cost and reliability of motors **(In progress)**
- Need to research image processing **(In progress)**
- ~~CP to bring Aquarium Pump on Jan 2nd~~
  - ~~http://garage-shoppe.com/wordpress/?p=109~~
- CP to order LCD Screen when possible.

1. **Design:**

  - Use vacuum for picking up drugs
  - Containers should be cone shaped
  - Modularity feature on hold
  - 7 holders for one pill compartment (holds up to 7 different drugs at least)
  - WiFi used for connectivity
  - UPS (up to 24 hours)
  - 3G for future development

Topics covered.

Went over our funding presentation
charanpreet drew some more diagrams.

Gurinder did some more gannt chart
everyone wrote speaking notes

Next Scheduled Meeting: **Jan 15, 2012 2:30**
(webcam will work)

Project:PillPal
Attendees (hangout): IL, CP, GD, CH
General:

- IL to bring in proposal template **(Complete)**
- All to research company and product name **(Complete)**
- ALL to Install and learn AutoCAD **(In progress)**
- GD to co-create Gantt Chart from proposal **(Complete)**
- Powerpoint for money **(Complete)**
- IL to Use Sparkfun as a sponsor. **(Complete)**
- Funding from other sources besides ESSS. **(In progress)**
- All to find ESSS for free MSP. **(In progress)**
- **Proposal Due Jan 21**
  - CP to do introduction
  - CP to do Executive summary
  - GD to do Schedule
  - IL to do Title Page
  - IL to do T of C
  - CH to do Budget
  - All to do description of team
  - GD to do Reference
  - CH to do Conclusion
  - IL to do key elements

Preliminary Design Phase:
1. **R&D:**

- All to determine cost and reliability of vacuum **(Complete)**
  - CP to order vacuum
- All to determine cost and reliability of motors **(In progress)**
- Need to research image processing **(in progress)**
- ~~CP to bring Aquarium Pump on Jan 2nd~~
  - ~~http://garage-shoppe.com/wordpress/?p=109~~
- CH to check ebay for capsules **(Complete)**
- CP to check LCD Display screens **(Complete)**

1. **Design:**

- Use vacuum for picking up drugs
- Containers should be cone shaped
- Modularity feature on hold
- 7 holders for one pill compartment (holds up to 7 different drugs at least)

- - WiFi used for connectivity
  - UPS (up to 24 hours)
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Topics covered.

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charanpreet drew some more diagrams.
Gurinder did some more gantt chart
everyone wrote speaking notes

Next Scheduled Meeting:
(webcam will work)

Project:PillPal
Attendees (hangout): IL, CP, GD, CH
General:

- ALL to Install and learn AutoCAD **(In progress)**
- Funding from other sources besides ESSS. **(In progress)**
- All to find ESSS for free MSP. **(In progress)**
- **Proposal Due Jan 21 (COMPLETED)**

- CH to check IEC standards
- IL to email rawicz white mans fund
- CH to research - cost of finger print reader and driver for linux
- All to pitch in Function specification list
- GD to start Qt stuff

Preliminary Design Phase:
1. **R&D:**

- All to determine cost and reliability of motors **(In progress)**
- Need to research image processing **(in progress)**
- ~~CP to bring Aquarium Pump on Jan 2nd~~
  - ~~http://garage-shoppe.com/wordpress/?p=109~~

1. **Design:**

- Use vacuum for picking up drugs
- Containers should be cone shaped
- Modularity feature on hold
- 7 holders for one pill compartment (holds up to 7 different drugs at least)
- WiFi used for connectivity
- UPS (up to 24 hours)
- 3G for future development

Design Phase:

Topics covered.

Went over our funding presentation
charanpreet drew some more diagrams.
Gurinder did some more gantt chart
everyone wrote speaking notes

<u>Next Scheduled Meeting:</u>
(webcam will work)

Project:PillPal
Attendees (hangout): IL, CP, GD, CH
General:

- ALL to Install and learn AutoCAD **(In progress)**
- Funding from other sources besides ESSS. **(In progress)**
- All to find ESSS for free MSP. **(In progress)**
- CH to check IEC standards **(In progress)**
- IL to email rawicz white mans fund **(Complete)**
- CH to research - cost of finger print reader and driver for linux **(Complete)**
- All to pitch in Function specification list (FEB 11) **(In progress)**
- GD to start Qt stuff
- CP - cad tutorial - FEB 7th -
- GD - project tutorial - feb 7th

Preliminary Design Phase:

1. **R&D:**

- All to determine cost and reliability of motors **(In progress)**
- Need to research image processing **(in progress)**
- ~~CP to bring Aquarium Pump on Jan 2nd~~
  - ~~http://garage-shoppe.com/wordpress/?p=109~~

1. **Design:**

  - Use vacuum for picking up drugs
  - Containers should be cone shaped
  - Modularity feature on hold
  - 8 holders for one pill compartment (holds up to 8 different drugs at least)
  - WiFi used for connectivity
  - UPS (up to 24 hours)
  - 3G for future development

Design Phase:

- IL and CH to build scanning device
- GD to check camera distance visibility and software focusing
- CS to check camera possibility
- Call Peerless about vacuum
- All to decide on motors
- All to decide on how to control dispense pill
  - ir sensor?
  - vam movement?
  - pill container movement?

- All to decide on container size?

Topics covered.

izaak talks about pill standards

<u>Next Scheduled Meeting:</u>
(thursday feb 31)

Project:PillPal
Attendees (hangout): IL, CP, GD, CH
General:

- ALL to Install and learn AutoCAD **(Complete)**
- Funding from other sources besides ESSS. **(DELAYed)**
- All to find ESSS for free MSP. **(Comeplete)**
- CH to check IEC standards **(Complete)**
- All to pitch in Function specification list (FEB 11) **(Complete)**
- GD to start Qt stuff **(Complete)**
- CP - cad tutorial - FEB 7th **(Complete)**
- GD - project tutorial - feb 7th **(Complete)**
- CH, CP - read MORE about motor, and buy ASAP by feb 21
- CH - ordered WIFI N
- CH, IL to buy Plexi glass and Plexi glass glue, aquarium tube
- CS to find portable vacuum
- IL to purchase portable vacuum
- CS to check on shipping of touch screen
- CS to check on shipping of raspberry pi

Preliminary Design Phase:
1. **R&D:**

- All to determine cost and reliability of motors **(In progress)**
- Need to research image processing **(in progress)**
- ~~CP to bring Aquarium Pump on Jan 2nd~~
    - ~~http://garage-shoppe.com/wordpress/?p=109~~

1. **Design:**

    - Use vacuum for picking up drugs
    - Containers should be cone shaped
    - Modularity feature on hold
    - 8 holders for one pill compartment (holds up to 8 different drugs at least)
    - WiFi used for connectivity
    - UPS (up to 24 hours)
    - 3G for future development
    - current metallic gear servo use for pill rotation thing

Design Phase:
- IL and CH to build scanning device
- GD to check camera distance visibility and software focusing
- CS to check camera possibility

- Call Peerless about vacuum
- All to decide on motors
- All to decide on how to control dispense pill
- GD to work on GUI Design in Qt.
  - ir sensor?
  - vam movement?
  - pill container movement?
- All to decide on container size?

<u>Next Scheduled Meeting:</u>
(thursday feb 19)

Project:PillPal
Attendees (hangout): IL, CP, GD, CH
General:
- Funding from other sources besides ESSS. **(DELAYed)**
- CH, CP - read MORE about motor, and buy ASAP by feb 21 **(Completed)**
- CH - ordered WIFI N **(Completed)**
- CH, IL to buy Plexi glass and Plexi glass glue, aquarium tube **(Completed)**
- CS to find portable vacuum
- IL to purchase portable vacuum
- CS to check on shipping of touch screen **(Completed)**
- CS to check on shipping of raspberry pi **(Completed)**
- CH and CP Buy sensors and parts

Preliminary Design Phase:
1. **R&D:**
- All to determine cost and reliability of motors **(In progress)**
- Need to research image processing **(in progress)**

1. **Design:**

- Use vacuum for picking up drugs
- Containers should be cone shaped
- Modularity feature on hold
- 8 holders for one pill compartment (holds up to 8 different drugs at least)
- WiFi used for connectivity
- UPS (up to 24 hours)
- 3G for future development
- current metallic gear servo use for pill rotation thing

Design Phase:
- IL and CH to build scanning device
- GD to check camera distance visibility and software focusing
- CS to check camera possibility
- Call Peerless about vacuum
- All to decide on motors
- All to decide on how to control dispense pill
- GD to work on GUI Design in Qt.
    - ir sensor?
    - vam movement?
    - pill container movement?
- All to decide on container size?

<u>Next Scheduled Meeting:</u>
(thursday feb 19)

Project:PillPal
Attendees (in person:Clark House): IL, CP, CH

ISO STANDARDS:
safety stuff
material choices
electricity safety and design
medical privacy standards
mechanical reliability/ safety

General:
- Progress

HARDWARE
sound amp for speakers

-

~~schmitt trigger and laser diode for pill detection~~

microphoto sensor for cup

cup for holding pills (dispensed, and discarded)

~~flippy device need motor attachment~~

~~attach the vam and the vacuum hose~~

~~the latch for the label reader~~

routing of power wires, and signal wires
- in progress

spring for lable reader

attachment of vacuum cleaner

~~H Bridge Circuit also fixed~~

SOFTWARE & firmware
arduino control codes debug
- DEBUG MODE

- sound test debug mode
- spc photosensor code

- vam pid code
- vam control code

- flippy thingy code

- Label reader motor code

- laser code

software
- gui
- all the alarms and scheduling

Project:PillPal
Attendees (in person:Clark House): **IL, CP, GD, CH**

ISO STANDARDS:
safety stuff
material choices
electricity safety and design
medical privacy standards
mechanical reliability/ safety

Make warning labels

General:
- ● Progress

HARDWARE
sound amp for speakers
          -
schmitt trigger and laser diode for pill detection

microphoto sensor for cup

cup for holding pills (dispensed, and discarded)

flippy device need motor attachment

attach the vam and the vacuum hose

the latch for the label reader

routing of power wires, and signal wires

attachment of vacuum cleaner

~~H Bridge Circuit~~

SOFTWARE & firmware
arduino control codes debug
- DEBUG MODE
- sound test debug mode

- spc photosensor code

- vam pid code
- vam control code

- flippy thingy code

- lable reader motor code

- laser code

software
- gui
- all the alarms and scheduling

- Corrugated plastic

- Mount Touch screen

Project:PillPal
Attendees (in person:Clark House): IL, CP, GD, CH

ISO STANDARDS:
safety stuff
material choices
electricity safety and design
medical privacy standards
mechanical reliability/ safety

Powerpoint Presentation
Create Powerpoint presentation - 40%
Practice Powerpoint presentation - 0%
Print Proposal, Functional Specification, Design Specification
CP - Get Food, Juice.

Post Mortem
Documentation - 90%
Check figures
Check Gurinders section
Charanpreet add in his section
Add Meeting Minutes to post mortem

Make warning labels

General:
- Progress

HARDWARE ()
- sound amp for speakers (0%)

schmitt trigger and laser diode for pill detection MOUNT (50%)

~~microphoto sensor for cup~~

~~cup for holding pills (dispensed, and discarded)~~

attach the vam and the vacuum hose

the latch for the label reader

routing of power wires, and signal wires

attachment of vacuum cleaner

H Bridge Circuit

SOFTWARE & firmware
arduino control codes debug
- DEBUG MODE(95%)
        - cup picky uppy,,(just need to test)
        - flippy (just need to test)
        - sound test debug mode

- spc photosensor code - 85%
        - Go to nearest code
        - Return current position Code

- Fixed SPC Container position (4 and 8)
- Insert Floors into SPC containers
- vam control code

- flippy thingy code (70%)

- flippy device need motor attachment (99%)

- lable reader motor code (80%)

- laser code (70%)
        - counting

software
- gui (95,3%)
        - unexpected
- all the alarm\ s and scheduling
- FIX MMS
- Corrugated plastic

- Mount Touch screen

- OCR CODE - 70%

- Enclosure
    Measuring and designing
    Construction
    Mounting and fixing
    Finalizing

- Cup Code (90%)
    ~~Arduino Code~~
    Pi Code

- Finger Print Reader - 90%
    Finalizing (test cases - fool proofing)

- Mount Vacuum
    - DRILL it: hole
    Wire vacuum hose

- Power Supply Button

Project:PillPal
Attendees (in person:Clark House): IL, CP, GD, CH
third meeting

<mark>**ISO STANDARDS:**</mark>
safety stuff
material choices
electricity safety and design
medical privacy standards
mechanical reliability/ safety

Powerpoint Presentation
Create Powerpoint presentation - 40%
Practice Powerpoint presentation - 0%
Print Proposal, Functional Specification, Design Specification
CP - ask Food, Juice.

Post Mortem
Documentation - 90%
  Check figures
  Check Gurinders section
  Charanpreet add in his section
  Add Meeting Minutes to post mortem
  - read the copy over (10%)

Make warning labels
- do not touch
- ~~high voltage~~
- no water
- Logo
- FCC label
- ~~moving parts, (gears, and stabbed, and penatrated~~
- ~~make folder dump pics we find inthere~~
- ~~static~~

General:

~~HARDWARE ()~~

~~= sound amp for speakers (0%)~~

~~schmitt trigger and laser diode for pill detection FIX(50%)~~
~~= threshhold problem~~

~~SOFTWARE & firmware~~
~~arduino control codes debug~~
~~= DEBUG MODE(95%)~~
~~= cup picky uppy,,(just need to test)~~
~~= flippy (just need to test)~~
~~= sound test debug mode~~

~~= spc photosensor code - 85% - need testing~~
~~= Go to nearest code~~
~~= Return current position Code~~

~~= Insert Floors into SPC containers~~

~~= flippy thingy code (95%) - need testing~~

~~= flippy device need motor attachment (99%)~~

~~= lable reader motor code (80%)~~

- laser code (90%) - need testing
  - counting (CURRENT COUNT

~~software~~
~~= gui (97,3%)~~
~~= unexpected~~
~~= all the alarm\s and scheduling~~
- FIX MMS (only if we have time)
~~= Corrugated plastic~~

~~= Mount Touch screen (65%)~~
~~= wire~~

~~= OCR CODE - 80%~~

- Enclosure (10%)
  ~~Measuring and designing (60%)~~

~~Construction (10%)~~
~~Mounting and fixing (5%)~~
Finalizing (95%)

~~- Cup Code (90%)~~
~~Arduino Code~~
~~Pi Code~~

~~- Finger Print Reader - 90%~~
~~Finalizing (test cases - fool proofing)~~

~~- Mount Vacuum~~
~~- DRILL it. hole~~
~~Wire vacuum hose~~

~~- Power Supply Button~~

~~WIRING~~
~~- make inside look pretty~~

~~MORE BARREL JACKS~~

CODE CASES
 - check if person take pills, if not redo alarm, if they ignore,
- send email, text, or call,
- pre allocation - no time.

Project:PillPal
Attendees (in person:Clark House): IL, CP, GD, CH

Presentation Preparation

~~Print out Proposal~~
~~Print out Design Specification~~
~~Print out Functional Specification~~
~~Handout for People - High Level Diagram (Grab from functional Specification)~~

Get Food tomorrow by 10:30am (ASB 9896).
~~Extension Cord / Extension Bar~~
Print out safety labels
Bring extra router
BRING HOT GLUE, tape, electric tape, knife, screw drivers. usb cords
Bring Keyboard

Presentation Sections
CH - Business and marketing
GD - GUI and Schedule
CP - Label reader, Motivation
IL- Intro, Conclusion, SPC and VAM.

anticipated questions

why are the buttons/text so small?
what other target market do you have.

Last minute touch up

~~Cut hole for vam~~
add acronym after VAM
make hand outs
laser
speaker
code for scheduling dispensing changes
tape the pill holders