uOttawa

Faculté de génie
Faculty of Engineering

Project Deliverable E: **Project Schedule and Cost**
GNG 1103 - Engineering Design

Overdose Detection Device

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Table of Contents

Introduction

The goal of this deliverable is to develop an effective plan for the prototyping part of our design process. In this document, we will create a plan and prototyping schedule and we will assign specific tasks to the members of this team in order to be able to accomplish our prototyping goals by the date limits.

In this document can also be found the cost estimate of our project and our bill of materials for all of the components that we will need in order to create our three prototypes. We will include the risks of our project plan, as well as a contingency plan in case something goes wrong or in case we can't make it on time.

To make it easier to visualize the tasks that need to be accomplished for each prototype, we will insert them into a Gantt chart that we will update if needed.

For prototype 1, we plan on doing a very low quality/no fidelity model of our product that we will produce using the resources at our disposition in MakerSpace or simply using some scrap material we already possess. The second prototype will be a medium quality model that expands on the first prototype. It will show the functional/electronic aspects of the product made from materials purchased online. Lastly, the third prototype will be a fully functional model. The sole will be 3D printed, and all of the components will be built into it.

This project plan will be very important for us because it will guide us through the next few weeks, up until design day. If we want to stay on top of our tasks, it is thus necessary that we stick to this plan, respect the duration of each task, applying our contingency plan if needed and communicate with each other/seek help from the other members of this team if needed. Moreover, if something goes wrong, which is likely considering the outside factors of each of our individual lives/material delivery/other elements of the making of this project (ie. lack of time due to exams, impossibility to get one of the components, etc.), we will have a backup plan or alternative solutions described in this deliverable that we can come back to and apply to our situation.

CLIENT FEEDBACK FROM MEETING ON FEBRUARY 13

Shoe is a good

Would need lots of different sizes

More difficult due to differences

Ear is good, might look like a hearing aid

Merge the watch and the ear oximeter

Need gps to alert help

Can't send a signal directly to ems

Have to send to a loved one or someone that can help

Has to be readily available for all people

Foot is very sensitive

Stimulus can't prevent overdose

Foot idea is generally positive

Contact ems for a prolonged period like 1 min

Error on the side of caution

Don’t be too proactive when contacting EMS

Failsafe is a good thing- be cautious about it

We have decided from these notes taken during our meeting, from our conversation with our clients and from a team conversation that our product will be a shoe insole that measures pulse oximetry.

Project Plan

Prototype 1 (Due Date: March 1):

The first prototype that we will be making is a low quality, low fidelity shoe sole. Considering the fact that we have to make three prototypes and we want each one to be a better and evolved version of the previous one, we figured our first prototype would just help us see if the idea we have come with is feasible in terms of the dimensions of the sole itself, as well as the dimensions of each components of the microcontroller system that will be inside the sole. With this prototype, we want to assure ourselves that the sole we will create will be a comfortable one, all while being able to fit and mostly protect the electronic components inside of the sole. In the best case scenario, we will already have the actual microcontroller components necessary for our project and thus we will be able to see how everything fits into our sole. However, in our opinion, it is unlikely that we will have time to discuss what we can obtain from the MakerStore/what we have to order ourselves with our project manager so we don't think we will have the actual pieces in time. If we can't access the actual components yet, we will cut scrap metal material that we can find in the MakerSpace into the dimensions of these parts and simulate a version of our product.

Tasks to be completed:

Tasks	Assigned Person(s)	Duration
1. Purchase Sole Material	Heidi	2 days
2. Cut scrap metal into component dimensions	Brendan and Tony	3 days
3. Assemble parts and sole	Tara	1 day
4. Evaluate final prototype 1/come up with alternative solutions if necessary	Joe, Brendan, Tony, Tara, Heidi	1 meeting

Dependencies:

Here, task #3 depends on task #1-2 and task #4 depends on task #3.

Buying List:

- 2 square feet of leather

Other materials needed:

- Scrap metal material
- Tape
- Shoe (for fitting purposes)

Prototype 2 (Due Date: March 8):

The second prototype will be of medium quality and build off of the design of the first prototype. This prototype will be more technical than the first prototype but not be a complete product. The goal of the second prototype is to show the functional/electronic part of the product. This includes the pulse oximetry device as well as the app. Making this prototype will require purchasing materials online and ensuring they arrive on time. It will also require research on making apps for both Android and Apple users and creating the app. The size of the pulse oximetry device will be modelled after prototype one to ensure it will fit in the sole. The pulse oximeter will be made using an Arduino Nano. The app will send a text to a family member/friend in the case of a detected overdose and have a failsafe cancellation option. The finished prototype would have both the functioning pulse oximeter and an app however they may not be connected. The second prototype will be used to show the functionality of the sensor and get customer feedback on the layout and function of the app.

Tasks to be completed

Tasks	Assigned Person(s)	Duration
1. Purchase Arduino nano and needed components	Tara	2 day
2. Research app development on android and apple devices	Brendan and Joe	2 days

3. Assemble Arduino nano pulse oximeter	Tony, Tara, Heidi	4 days
4. Program app for android	Brendan	4 days
5. Program app for apple	Joe	4 days
6. Evaluate final prototype 2/come up with alternative solutions if necessary	Joe, Brendan, Tony, Tara, Heidi	1 meeting

Dependencies

Task #3 depends on task #1, task #4 and #5 depend on task #2 and task #6 depends on tasks #4 #5 and #3.

Buying list (deadline March 3rd)

- Arduino Nano
- Tape to flatten wires
- Battery pack
- GPS

Prototype 3 (Due Date: March 22)

The third prototype will be a fully functioning model of the product. The sole will be 3D printed out of a light plastic material. All of the components will be integrated to fit inside of a compartment built into the sole. This model will be able to go into a shoe and actually be used. The microcontroller will be paired with the apple and android apps created. These apps will be fully done and cooperating with the micro controllers with minimal irregularities. This model will have to be visually pleasing as it is the model we will be presenting with during design day.

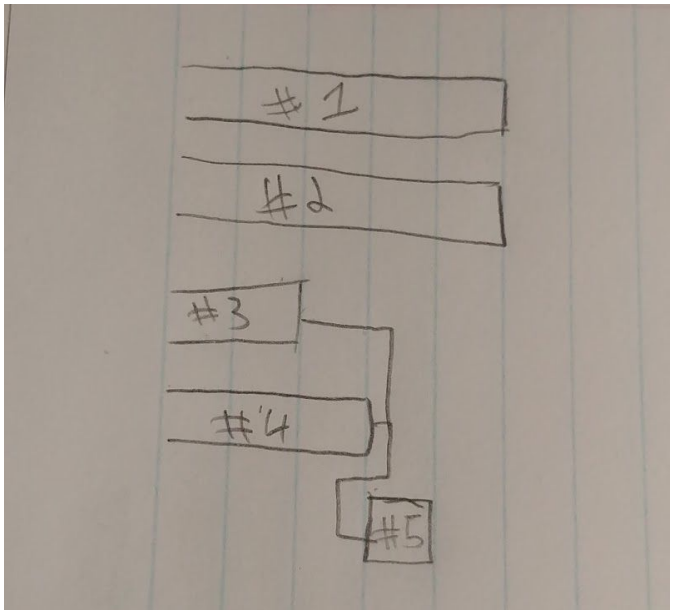
Task	Assigned Person(s)	Duration
1. Finish Android app	Brendan	5 days
2. Finish Apple app	Joe	5 days
3. Connect all hardware	Tara, Tony, Heidi	2 days
4. Model and print the container for all of the hardware	Tony, Brendan	3 days
5. Insert the hardware into the container	Heidi, Tara	1 day

Dependencies

Step 3 must be completed before the beginning of step 5. Step 4 must also be completed before the beginning of step 5.

Gantt Chart

One bar is equal to one day.



Project Risks

When completing a project like this one there are many moving parts, along with many deadlines. Using these considerations we are able to account for the risks involved, and create a contingency plan to deal with them if they arise.

As we are all students, having busy schedules with loads of classes and work. Another factor is midterms which can have a large hindrance on our tasks for the project. A possible solution to this problem would be to get rid of unnecessary features to lessen the time that is spent in creating the product. This solution may include a very comfy sole as this would take a long time to properly integrate. Dropping unneeded parts of the product would allow us to focus on the more important details of the product.

Another hindering factor would be technical problems with the micro arduino where it would not cooperate with the batteries and/or the pulse oximeter preventing it to work properly. For example, if the micro arduino did not get the signals from the pulse oximeters, the product would not work effectively and would then put the user at a high risk of injury. Another example would be if the battery does not have a proper connection with the micro arduino and the pulse oximeter, which would also cause the product to not function.

From the possible issues above, these can all cause the product to malfunction and possibly put the user in danger. In order to ensure that these problems do not arise, we are going to ensure that all of the connections and parts of the assembly are running efficiently. We will do this through testing in various settings such as hot and cold temperatures.

Another possible outside factor would be the ordering of products. This may cause a delay in the creation of prototypes, as when ordering parts online they may take an extended amount of time to come in. This will be accounted for by ordering the required materials in advance and making sure that we are getting them from reliable sources.

Finally, to account for all possible issues that may arise during the course of the semester we will use the strategies listed above to ensure that we are able to get all parts of our product to work. This will allow us to have a finished product that will be ready for design day.

Bills of Materials and Cost Estimate

In order to achieve portability, the cost of the product will increase due to the reduction in component size, but we try our best to simplify the system to reduce costs. Our prototype plan enables us to use our materials effectively because, theoretically, every electronic component we purchase can be tested with a test board. We know that parts can be damaged and they can be damaged during testing, so we have increased the number of excess parts to well prepare for a backup prototype under reasonable circumstances.

ID	Description	Vendor	Part Number	Qty	Cost
1	1.75mm MATERIO3D PLA FILAMENT	MakerStore uOttawa	--	1	$40.00
2	Jumper Cables	Make Store uOttawa	--	30	$3.00
3	Arduino Nano With Bluetooth	Mouser Electronics	782-ABX00030	2	$60.72
4	Battery Packs	Mouser Electronics	409-EP-UPSHATB3000M	2	$79.52
5	Pulse Oximeter Sensor	Mouser Electronics	700-MAX30112EWG+T	2	$18.00
6	Bluetooth Modules	Mouser Electronics	377-BMD-360-A-R	2	$23.78
7	Breadboard	Mouser Electronics	424-240-131	2	$14.18
8	USB Cable	Mouser Electronics	562-3023001-01M	1	$8.78

Note1: These prices are all in CAD on their respective websites and are calculated before Ontario HST rates of 13%.

Note2: These prices are doubled in order for a backup prototype for the finalizine one.

Total sum at the uOttawa Maker Store with tax and shipping: CAD $ 43.00

Total sum at Mouser Electronics with tax and shipping: CAD $ 204.98

Total Sum of Material Costs: CAD $ 247.98

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Conclusion

This Deliverable outlined our three prototype plans to ensure we all understand our responsibilities and the upcoming deadlines. It also described the possible project risks and the bill of material/cost estimate.

The first prototype is a low quality low fidelity shoe sole designed to show the dimensions of the final product. The second prototype is a medium quality functioning pulse oximeter and app. And the third prototype is a finalized fully functional shoe sole and paired app. All tasks have been assigned to one or more people and given a duration. This ensures everyone knows what their duties are and can be held accountable. Our Gantt chart was updated with all the required tasks to show the expected timeline which is expected to be followed. During the prototyping process all members will keep the project risks in mind. The materials will be re-evaluated and adjusted to fit the $100 budget.

Creating this plan is imperative to staying on task and on time. It is an important tool which will be referenced many times in the future and if followed will ensure a successful prototyping process.