Deliverable E: Project Schedule & Cost

Ah Chuen, Kate; Ayed, Evanna; Eid, Ziad; Onusko, Belle; Watt, Kymani

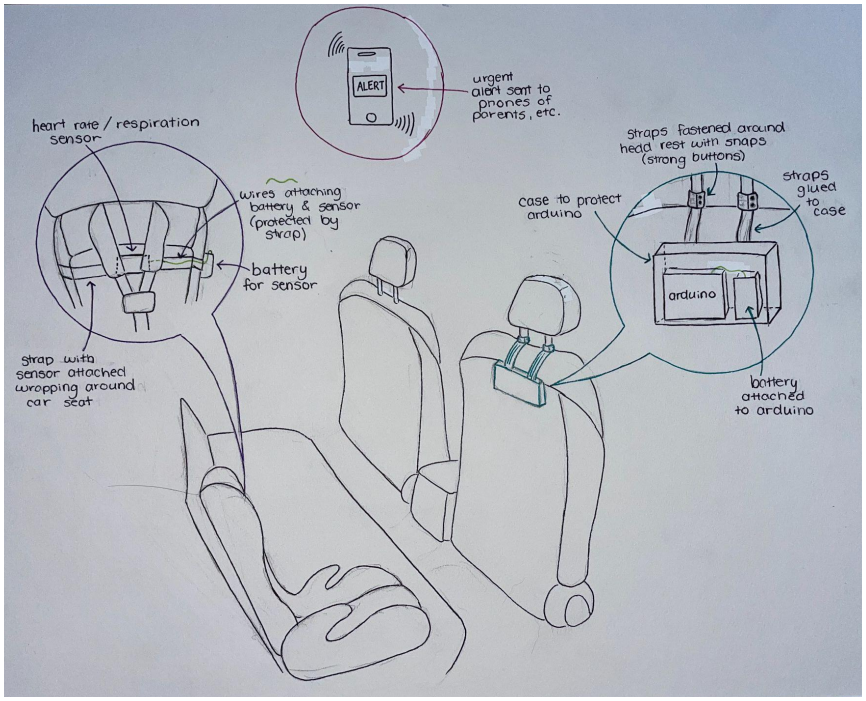
Group 1

GNG1103 - B01

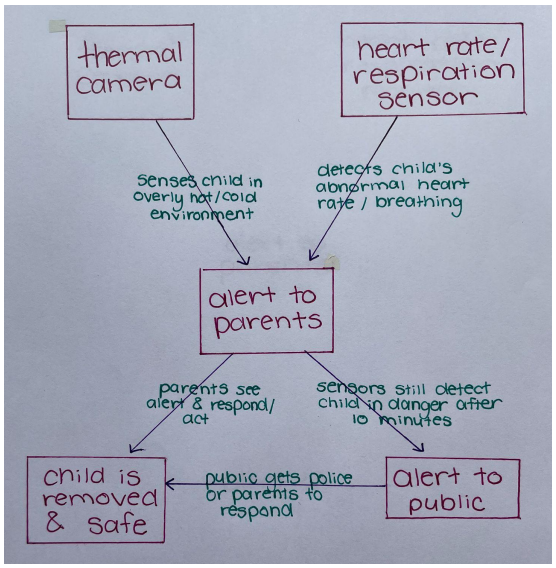
TA: Kaleb Mannion

University of Ottawa
Tuesday, October 26th 2021

1. <u>Belle</u>
    a. Clear and detailed design drawing with all the parts and their placements:
        i. Thermal camera in backseat (on side that kid will be on, above them)
        ii. Heart rate and respiration sensors (at the back of the car seat, in the general area of the child's lungs and heart)
        iii. 'Amber alert' to parent
        iv. 'Amber alert' to public (after short amount of time if parent does not respond)



    b. Flow chart documenting the process from the initial detection of the problem to the response activation



2. Kate
    a. Plan and schedule for prototyping and testing the solution to the client's needs
        i. List of all the tasks that need to be completed
        ii. Estimated duration
        iii. Teammate who will be responsible

Tues. Oct. 19 2021	Client Meeting - Team shows the client the ideas that we have come up with so far (included in deliverable D) - 15 minutes (All) - Client gives his feedback on what he likes/doesn't like, what can be improved/what should stay - 10 minutes - Team takes notes and reconvenes after the meeting to talk about the parts that will be included in the design for the prototype due for Deliverable E - 1 hour (All)
Tues. Oct. 26 2021	Deliverable E due - Design for prototype completed based on changes that were made to the best global concept (which was presented to the client during the Oct. 19 client meeting) - 1 week (Belle) - Flow chart with a general idea of the steps that are taken from when the sensor detects unusual activity to when the alerts are sent - 1 week (Belle) - Make a schedule for the prototyping/testing process for the rest of the semester - 1 week (Kate) - List of required equipment for all prototypes and a spreadsheet with their costs and links- 1 week (Evanna) - Make an outline of the prototyping test plan - 1 week (Kymani & Ziad)
Tues. Nov. 2 2021	Client Meeting - Team shows the client the design for the prototype that was built for Deliverable E as well as the flow chart that was created of the general steps - 15 min (All) - Client gives his feedback on what he likes/doesn't like, what can be improved/what should stay - 10 min - Team takes notes and reconvenes after the meeting to talk about the parts that will be included in the design for the prototype due for Deliverable E - 1 hour (All)
Thurs. Nov. 4 2021	Deliverable F due (Prototype 1) - Prototype 1 created - In person - Kymani & Ziad: Help Evanna with the coding aspect, will be able to do some basic coding

	experimentation with the Arduino board, in charge of assembling all of the hardware components together - 5 days - Belle & Kate: Work on the project's overall outer aesthetic (ex: how the sensor will stick to the car seat, find a material that is easy to clean, find a way to conceal the wires) - 5 days - Virtual - Evanna: Research for existing codes online that have similar functions to the ones that we need (ex: how to program the sensor to send its data to the Arduino board, how to code to identify a pattern that we do not want, how to make the Arduino board send an alert) and research the 'healthy' 'average' values of respiration and heart rate in kids from (0 months old to 7 years old) - 5 days - No major testing (simply test the Arduino board to make sure it works and make sure that the material from the 3D printer will be good to use) because we want to focus on getting a general idea of how our project will look and feel
Tues. Nov. 9 2021	<u>Client Meeting</u> - Team shows the client the prototype that was built for Deliverable F to give the client a general idea of the project (size, functionality, design) - 15 min (All) - Client gives his feedback on what he likes/doesn't like, what can be improved/what should stay - 10 min - Team takes notes and reconvenes after the meeting to talk about the changes that will be made and what will be kept for Prototype 2 - 1 hour (All)
Thurs. Nov. 11 2021	<u>Deliverable G due (Prototype 2)</u> - Prototype 2 created - In-person: - Kymani & Ziad: Help Evanna make the existing codes more specific to our project, test the new codes on the Arduino board and manipulate them - 5 days - Belle & Kate: Work on refining the outside aesthetic of the project - 5 days - Virtual: - Evanna is in charge of the coding aspect of the

	project. It is up to her to delegate the tasks to Ziad and Kymani - 5 days
	- Testing:
	  - Testing the code to make sure that the sensor can detect a certain range and that the device can release a sound(don't have to be connected yet)
	  - Have a teammate breathe rapidly and see if the sensor detects it
	  - Have a teammates breathe very slowly and see if the sensor detects it
	  - Code the Arduino board to produce a noise and listen to hear if it does
	  - Testing the outer design of the project to make sure it is waterproof, sturdy, 'kid-proof' and comfortable
	  - Pour water on device
	  - Spill food on device and attempt to wipe it off
	  - Place a teammate's arm against the sensor and gently apply pressure

Tues. Nov. 23 2021	<u>Client Meeting</u> - Team shows the client the prototype that was built for Deliverable G that is a semi-functioning version of the final device - 15 min (All) - Client gives his feedback on what he likes/doesn't like, what can be improved/what should stay - 10 min - Team takes notes and reconvenes after the meeting to talk about the changes that will be made and what will be kept for Prototype 3 - 1 hour (All)

Thurs. Nov. 25 2021	<u>Deliverable H due (Prototype 3)</u>
	- Prototype 3 created
	  - In-person:
	  - Kymani & Ziad: Help Evanna make the finishing touches to the existing code and test the new codes on the Arduino board - 5 days
	  - Belle & Kate: Work on refining the outside aesthetic of the project and can help with coding if needed - 5 days
	- Testing:
	  - Testing the code to make sure that the sensor can detect a certain range and that when it does, it releases a sound
	  - Have a teammate breathe very rapidly and very slowly and listen for a noise output

	- Testing the outer design of the project to make sure it is waterproof, sturdy, 'kid-proof' and comfortable
Tues. Nov. 30 2021	<u>Client Meeting</u> - Team shows the client the prototype that was built for Deliverable H that is a fully-functioning version of the final device - 15 min (All) - Client gives his feedback on what he likes/doesn't like, what can be improved/what should stay - 10 min - Team takes notes and reconvenes after the meeting to talk about the changes that will be made and what will be kept for the final device - 1 hour (All)

b. <u>List of significant project risks and our associated contingency plans to mitigate the critical risks</u>
    i. Injuries when building or testing the prototype
        1. Making sure that we follow the proper precautions (ex: wear safety equipment when required, follow lab manager's instructions)
        2. If we get injured, we should tell the lab manager as soon as possible
        3. Being aware of how machines work prior to using them and staying focused when using them
    ii. Not having enough time to complete a certain task by a certain time
        1. Planning ahead of time to make sure that the task is doable within the offered time frame
        2. Consistently working on the task instead of doing everything last minute because the quality will suffer
        3. Asking help from teammates if a single teammate is having difficulty
    iii. Conflict or tension between teammates
        1. Engage in open communication all of the time to prevent misunderstandings
        2. Solve the small problems before they become big problems
    iv. Our device doesn't perform the output we want/keeps failing the testing process
        1. Never give up, keep putting in effort
        2. Research to figure out how to fix the problem or how to make the task occur

3. Ask other teammates for suggestions
4. Ask the TA for pointers

v. Needing more supplies but not having enough money
1. Constantly referring back to the product/project cost spreadsheet. It includes a list of all of the products that we will need as well as the sum of their costs. We will need to keep a little bit of money in case of an emergency where we will need to buy a component last-minute.
2. Asking other teams or our TA if they have extras of a component
3. Researching to see if there are cheaper options online or if we can make the component for free using materials we have at home

3. Product/project cost spreadsheet (Evanna):

Cost Estimation and Bill of Materials:		
Component	Description	Cost($)
The thermal camera	The main component, we have two in mind that we still need to decide on as a group	30.00-40.00
Wires	Always in need of wires.	2.00
The Arduino case	Plastic casing that covers the arduino	0.35
An arduino starting kit	Containing the arduino board, breadboard,some wires and transistors	6.04
The overall casing	The casing of the whole product will most likely be made out of fabric	0.00
	Overall Cost :	38.39 - 48.39
	Allocated Budget:	50.00
	Money left (in case of emergency):	1.61 - 11.61

4. List of equipment (software or hardware) needed to build each prototype (Evanna):

Objects required for the device	Best possible costs	Cost ($)
Normal camera with thermal filter	Using an app on the phone	0.00

Actual thermal camera for the device	For our future device: Found this thermal camera https://www.aliexpress.com/item/1005002530697753.html?spm=a2g0o.cart.0.0.6fc53c007C8Uqd&mp=1 Also found this one, comes with wires and such so it could be cheaper https://a.aliexpress.com/_mPepFeQ	40.00 30.00
Wires	The type of wire we chose should depend on the thermal camera we buy so here are some available wires. https://www.aliexpress.com/item/32825558073.html?spm=a2g0o.cart.0.0.7fff3c00LTsUqY&mp=1	2.00
Arduino case	Is it possible to 3D print the one we designed in the CAD lab? If not this is pretty cheap so it should not affect our overall budget. https://www.aliexpress.com/item/4000955600143.html?spm=a2g0o.cart.0.0.36f93c00Uv69w6&mp=1	0.35
The outer structure of our device	We can use any type of fabric/plastic casing.	0.00
An arduino starter kit	Link for the ardunio board with the breadboard https://www.aliexpress.com/item/1005003157558933.html?spm=a2g0o.cart.0.0.7cb73c00M16IyK&mp=1 Link for transistors: https://www.aliexpress.com/item/1060598203.html?spm=a2g0o.cart.0.0.667d3c00BO9IEs&mp=1	5.19 0.85
*Heart rate sensor	https://www.aliexpress.com/item/1005002981990942.html?spm=a2g0o.cart.0.0.76263c00OEoawo&mp=1 I found this,not sure if we're still getting one but found one in case we need it.	7.00

5. Prototype 1: (Basic Subsystem Outline)

- Mini devices (Thermal sensors + mobile) used to find and show changes of the temperature inside the car.
- Basic code to transmit temperature information from the sensors to the application on a mobile device.

- Alert system that goes off once high temperature information is detected by the device. (Phone application)
- Another alert system that goes off to alert the public if a child is still not taken out of the car under 10 min. The alarm will not be harsh in order to not scare away the public and rather grab their attention.

Prototyping 1:Test Plan

a. Purpose of the Test/Objectives:
    i. Determine if the required subsystems work together properly
        1. Does the flow chart need to be more complex? More simplistic?
        2. How quickly does the sensor transmit the required information to the phone application?
    ii. Receive feedback from the client on if the prototype satisfies the needs of the client, and how the prototype can be improved as well as what they liked about it.
    iii. Making sure that the hardware components will be safe around kids.
    iv. Making sure that the hardware will be reliable and easy to use.
    v. Making sure that the hardware and the software pair well together and is coded well so that a concerning detection from the hardware is immediately followed by a response from the software.

b. Stopping Criteria:
    i. We will end testing once we are satisfied that our prototype has achieved all of the testing objectives that we have listed above. We want our sensors to be functioning, to pair well with our alert notification software and to be easy and reliable for the busy everyday parent.
    ii. We will end testing if, by any chance, our prototype ends up being a failure, which is very unlikely but we need to have a plan for everything!

c. Testing method and what we are trying to measure :
    i. Testing how ‘kid-proof’ the sensors are by thinking of events that occur with children in cars (ex: drinks spilling, kids moving a lot, food falling everywhere, kids sweating a lot) and recreating them (ex: pouring water on sensor, thoroughly rubbing on the sensor to see if it will come off the seat, making sure that food is easy to remove from the sensor)
    ii. Stimulation with a dummy that can replicate unusual respiration and heart rate to see if the sensors can detect unusual patterns.

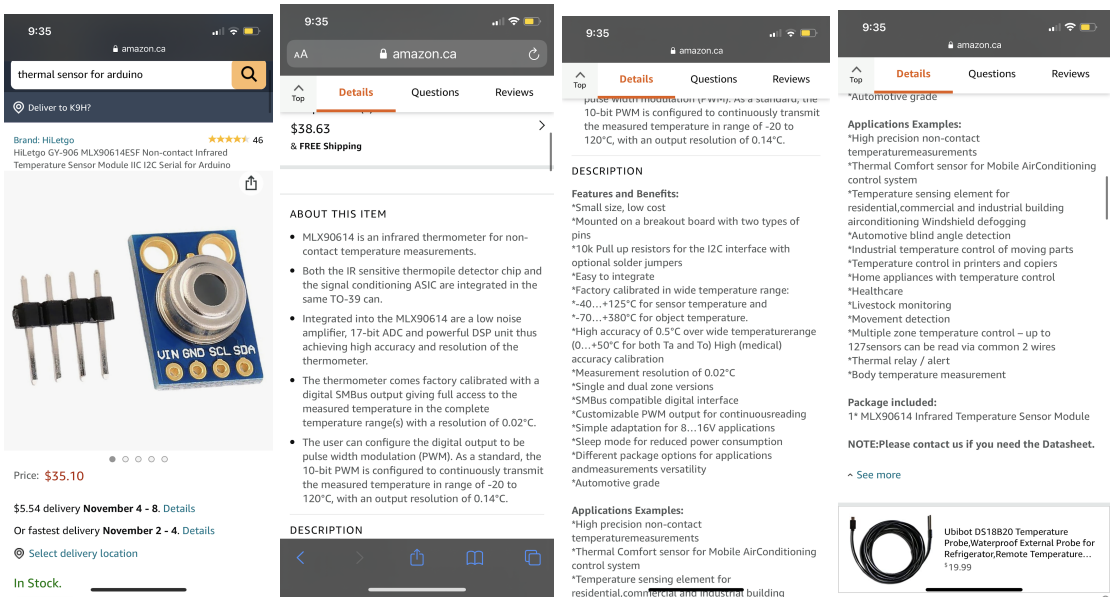
iii. Testing if the thermal sensors can detect the surrounding thermal energy, as well as making sure it can detect the temperature of the human body and evaluate whether the temperature in the car is rising or not.

iv. Puting prototype devices in a warm environment to simulate high heat/humid temperatures found in the UAE.

Thermal sensor?

Not sure if we were thinking a sensor too but here's one I found -Belle

https://www.amazon.ca/HiLetgo-MLX90614ESF-Non-contact-Infrared-Temperature/dp/B071VF2RWM/ref=mp_s_a_1_25?dchild=1&keywords=thermal+sensor+for+arduino&pscroll=1&qid=1635514447&sr=8-25&wIndexMainSlot=40



Yeah i found the same sensor