Automotive UI

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INTRODUCTION

We have created a mobile application, worked with databases, completed a software engineering course, and prototyped a small embedded system with a custom PCB as well as an enclosure (3D printed/laser cut). Our internet of things (IoT) capstone project uses a distributed computing model of a smart phone application, a database accessible via the internet, an enterprise wireless (capable of storing certificates) connected embedded system prototype with a custom PCB as well as an enclosure (3D printed/ laser cut).

The project's objective and goal is to create a simple, compact, user-friendly system which serves to reduce the work-load of a paramedic while heading towards an emergency scene. With this in mind, we designed a system which is capable of providing some helpful information about the patient, that will make life just that much easier for a paramedic, and in some cases, the patient as well.

This system consists of three sensors, an embedded system, a database over the network, and an android application, implemented/developed by the team. The role of the three sensors are to provide vital information about the patient, and save this information automatically in the database by taking advantage of a network.

AIM

Required Resources

The connectivity and the functionality of the whole project was done in conjunction with a number of components, materials, tools and facilities. A list of materials used are:

- MAX30100 Pulse Oximetry Sensor
- VMA340 Heart/Pulse Rate Sensor
- AMG8833 Thermal Camera
- Raspberry PI 3 B+
- 32GB SD card
- two 220 ohms resistors, one 2.2 kilo ohms resistor, two red LED and finally, one NPN-Transistor
- An MCP 3008 analog to digital converter

The assembling of the component on to the PCB board was done in the lab. The prototype lab was used as additional facility resources to accomplish this task. For the most part, the tools used for the project were the soldering iron, helping hard, safety glass, Inkscape, fritzing, Gantt, SD Card Formatter, and Android Studio.

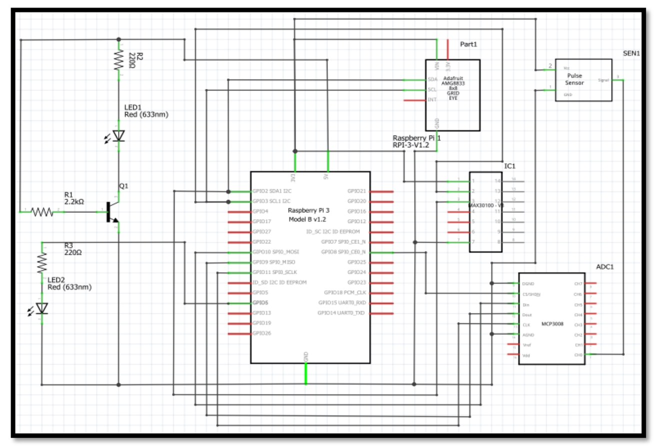
METHOD

PCB

The integrated PCB was accomplished by merging the circuit diagrams of the three sensors. This was facilitated using third party software, Fritzing. PCB was tested using the DLC check function, provided by the fritzing software, before exporting the design for production using Gerber format. The zip file created, containing these Gerber files, was then sent to the prototype lab for production via email. The printed board was received in about 3 days from the time of submission. The PCB was then built and soldered. After realizing that the copper wires connecting the pin-outs for the Raspberry Pi, were printed on the wrong side of the board, the design was reviewed sending the connecting wires of the pin-outs to the top of the board instead of the bottom and the second version was then send back for production at the prototype lab.

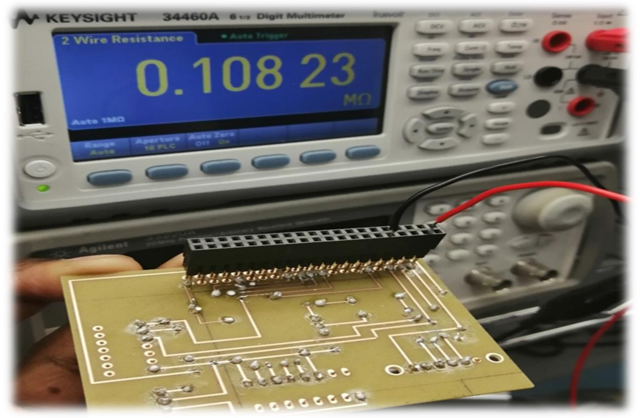
Firmware

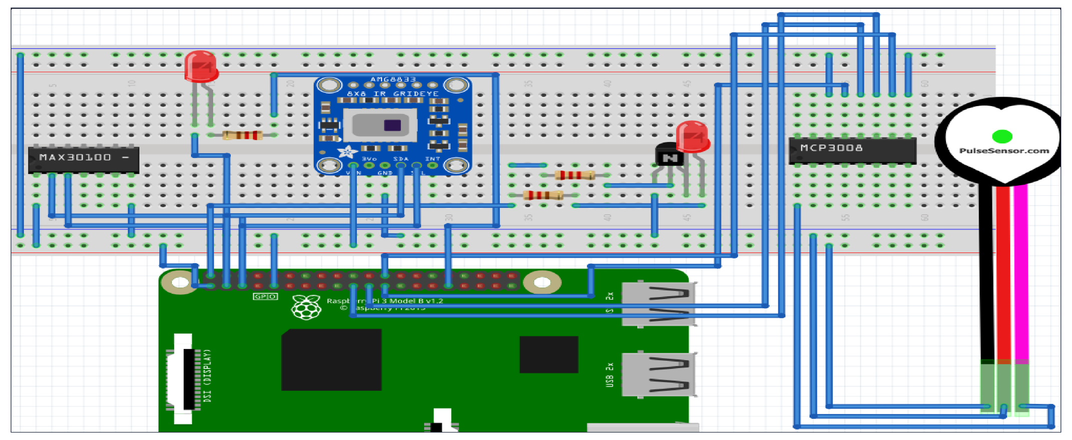
The image of the raspberry Pi 3 B+ microcontroller was build from the NOOB files stored on the 32GB SD card which was used during the installation and setup of the Pi interface. Python was used for code compilation, sensor testing. VNC was enabled for remote connectivity.



Integrated schematic design

Testing integrated PCB using multimeter: Showing an example of multimeter results in ohms when there is an electrical connection on the PCB





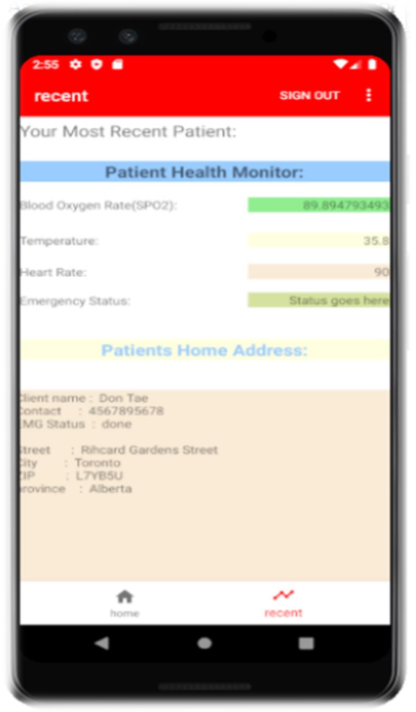
Breadboard layout

RESULTS

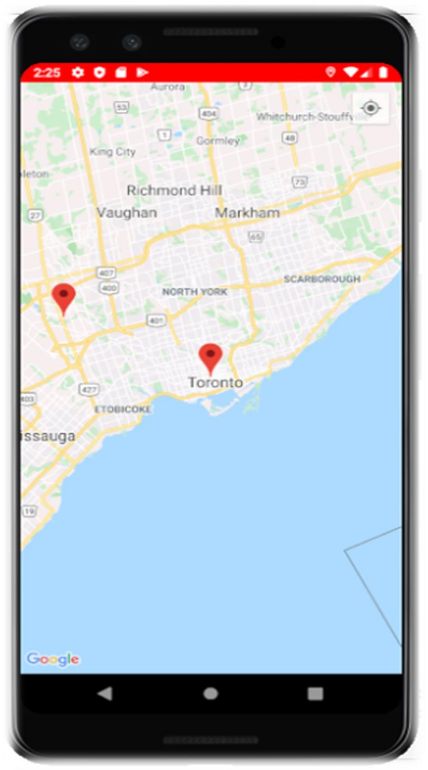
Mobile Application & Database

The mobile application's interface was developed using android studio with majority of its functionalities and features implemented. A user is capable of using the application to contact a paramedic in case of an emergency. In return, any login and active paramedic will receive the call and answer to need of the patient while heeding to the location of the incident. The patience's location is accessible through google map embedded in the application. Live tracking was made possible with the help of GPS tracking which will enable both the paramedic and the patient see their current location as they move.

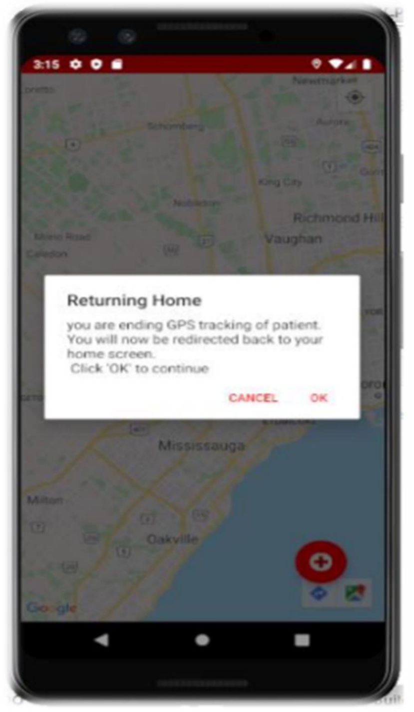
The implemented database system in the project is Firebase. Firebase is used to store data collected from the patient and the paramedic's information. Our database also contains all activities carried out by paramedic and can be accessible through our mobile application. Our mobile application is connected to the database and can retrieve and push data effectively.



Recent Screen: shows paramedic, when logged in, is able to view the latest emergency scenario that has been done



By Android Studio. Clicking the 'Go to Maps' options generates a map module



Dialog box prompting the end of GPS tracking

TESTING

Testing of the whole project was do at different levels during production. After designing the PCB board on fritzing, it was teste for connectivity and error checking with DLC check function provided by the software. In addition, the board was tested using a multimeter once the it was printed and soldered before connecting it to the raspberry pi. Once connected to the Pi, the following command **sudo I2cdetect –y 1** was issued on the terminal to test for sensor connection.

Meanwhile the mobile application was tested using the emulator on android studio. A physical device was also used for testing.

CONCLUSIONS

ACKNOWLEDGEMENTS

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