Project Title: AutomotiveUI

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**Declaration of joint Authorship**

We, Akeem Abrahams, Asmaa Alzoubi, Cedric Wambe, confirm that this work submitted is the joint work of our group and is expressed in our own words. Any uses made within it of the works of any other author, in any form, are properly acknowledged at the point of use. A list of the references used is included. The work breakdown is as follows: Each of us provided functioning, documented hardware for a sensor. Akeem Abrahams provided MAX30100 Pulse Oximetry Sensor. Asmaa Alzoubi provided VMA340 Heart/Pulse Rate Sensor. Cedric Wambe provided AMG8833 Thermal Camera. In the integration effort, Akeem Abrahams is the lead for further development of our mobile application, Cedric Wambe is the lead for the hardware, and Asmaa Alzoubi is the lead for connecting the two via the Database.

**Proposal**

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).

Intended project key component descriptions and part numbers

Development platform:

Sensor/Effector 1: MAX30100 Pulse Oximetry Sensor

Sensor/Effector 2: VMA340 Heart/Pulse Rate Sensor

Sensor/Effector 3: AMG8833 Thermal Camera

The objective for the User Interface of our mobile application was to build a platform that could be useful to paramedics. This user interface should contain features that are capable of assisting a paramedic in completing tasks during an emergency scenario, thus, should reduce the amount of work that a paramedic has to perform when going towards the scene.

To facilitate this, we included features in the mobile application that will allow a paramedic to, communicate with a patient through video chat, retrieve vital readings of a patient in real-time, and track a patient’s whereabouts automatically with the use of GPS tracking.

The design specifications that we decided on, is as follows:

The User Interface must:

• be easy to use and understand

• allow patient->paramedic communication

• able to automatically track the location of patient

• able to provide some vital information about the patient’s physical and internal state to the paramedic, before arriving at the scene

Paramedic must be able to:

• View patient history

• Access vital information about the patient

• Retrieve client location in real time

Patient must be able to:

• Call and connect with a paramedic through the UI

• View the progress of paramedic as they head towards the scene

• Rate a paramedic

We will continue to develop skills to configure operating systems, networks, and embedded systems, using these key components to create a system capable of determining results for human vital readings in real-time, which includes: heart rate, temperature, and blood oxygen rate readings. This data will be sent to a database platform known as firebase, over the network, where it will then be retrieved for display on our mobile application.

Our project description/specifications will be reviewed by, Dennis Kappen, ideally an employer in a position to potentially hire once we graduate. They will also ideally attend the ICT Capstone Expo to see the outcome and be eligible to apply for NSERC funded extension projects. This typically means that they are from a Canadian company that has revenue generating for a minimum of two years, and have a minimum of two full time employees.

The small physical prototypes that we build are to be small and safe enough to be brought to class every week as well as be worked on at home. In alignment with the space below the tray in the Humber North Campus Electronics Parts kit the overall project maximum dimensions are 12 13/16" x 6" x 2 7/8" = 32.5cm x 15.25cm x 7.25cm.

Keeping safety and Z462 in mind, the highest AC voltage that will be used is 16Vrms from a wall adapter from which +/- 15V or as high as 45 VDC can be obtained. Maximum power consumption will not exceed 20 Watts. We are working with prototypes and that prototypes are not to be left powered unattended despite the connectivity that we develop.

**Executive Summary**

Throughout the development of the project, the main goal was to create a simple, compact, user-friendly system which serves to reduce the work-load of a paramedic while heading towards an emergency scenario. 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. These sensors function by outputting data about a patient who comes in contact with these sensors. This data provided by each sensor can be processed to, determine the temperature, heart rate, and the oxygen concentration in the blood, of a patient. In order to get this data, a patient must be in contact with the sensors, that is, all they need to do is place one of their fingers on each sensor, and the rest will be handled by the sensor and embedded system. For the user interface, our android application was designed to have these following capabilities:

* Video chat capability
* Retrieve patient information for display
* GPS tracking capability
* Update/Modify patient information as needed

Our goal for this user interface with regards to the paramedic, is to create a platform where paramedics can, easily and efficiently access the location of the patient by automatically tracking the location of the patient, provide visual communication that allows a paramedic to observe the state/condition of a patient, enable accessibility of a paramedic to vital information about the patient by displaying this information in a comprehensive format. With these functionalities, a paramedic will be better prepared for the emergency situation, since they won’t be required to ask a patient for their current location, and they will have some information about the state of the patient before arriving at the scene. This way, they can focus on the patient and be better prepared for their treatment upon arrival at the emergency scene.

Our goal for this user interface with regards to the patient, is to create a platform where patients can, visually communicate with a paramedic, track a paramedics progress when travelling towards the scene, and provide options that allows a patient to type in his/her home address if emergency location is not their home location. These functionalities will serve to lessen the stress on a patient while communicating with the paramedic, since they won’t be burdened with a requirement to provide their current location, or to possibly provide a description of their current state. The GPS tracking and the visual capability of the video chat app will remove these unimportant roles that a patient has to perform. By giving a patient the capability to track the progress of the paramedic when heading towards their location, this will also help to reduce stress on the patient since they will be relieved knowing that a paramedic is that much closer to providing them with the treatment they deserve.

We believe that this system will contribute greatly to the medical field, since this will have a positive impact on the responsiveness of paramedics towards an emergency scenario. Thus, investing in this product should have good prospects for success given time and effort.