USER GUIDE FOR THE SAMPLE HOLDER

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1. Introduction

This document serves as a guide for setting up the project for normal operation, and what you need to get going. This document assumes the reader is familiar with electronics, embedded systems. The project title is:

Digital Tracking and Connectivity of Samples for Integrated Diagnostic System.

The aim was to provide real-time information about the medical samples in transit.

The circuit connects to a remote server (website/cloud). This document will address both cases. All files can be found at:

https://github.com/EyitopeIO/Final-year-project

As at the time this document might be read, the author might have forgotten a few things about the project. If necessary, he (Eyitope Adelowo) may be contacted:

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The project was carried out in tandem with a colleague, *Moyinoluwa Anifowose.* She did all the work on the website and the cloud. She may be contacted on:

+234 814 830 2306, *anifowosemoyin@gmail.com*

We also got support from another developer in working out the web interface, *Tunmise Akinade,*

234 708 291 2358, *akinadetunmise8@gmail.com*

All required files may be found on the Github page in the link above. For further assistance, contact Eyitope.

2. NOTES ABOUT THE HARDWARE.

The system is fairly easy to implement. Find the block diagram and other general overview in chapter 3 of the project report. Known issues and challenges will be discussed.

The circuit diagram implemented was:

Circuit diagram 4 –Diptrace.png

Install Diptrace to open the schematic file.

2.1. General Layout

From the soldered side of the circuit board (veroboard), it's not hard to identify the power rails (5V and GND). They are on either end of the board. If you're ever confused about wiring, use your multimeter to trace.

Figure 2.1 shows the author holding the sample holder. It might not look that way when you come across it. Parts might have moved. For example, the glue used to hold the battery might have failed at the time the project is revisited.

Figure 2.1: Me holding the sample holder

There's an IPEX (external) antenna for the GSM module was left in the container. Though antenna was soldered to the module already, it is advisable the external antenna be used. There is also a long black cable. It is the temperature sensor and has a metal cylinder at its end. There are spaces for you to reach the power button (switch A in circuit diagram) fairly conveniently and adjust parts in the container if things move about.

2.2. POWERING THE SYSTEM

There would be flashing lights. It makes projects look cooler to those who know nothing about it. On startup, look out for that blue LED at the corner. It should be flashing on at about 100ms interval. When you press that push button (the ARM button) to the right of the buck converter, it flashes at 500ms interval. The *void setup( )* function shows exactly what is going on.

Read the manual for SIM800L to know what its flashing light means. Ensure GSM module registers on the network before you press the ARM button. That's because the microcontroller expects the GSM module to have registers when it begins communication.

If you notice the system keeps restarting (going back to the 100ms flashing lights), the battery is most likely down. Charge it until the battery charger light goes green. Find the part in the report. You may read about how the module works.

The switch B in the circuit diagram is a slide switch. It is used to connect/disconnect the battery from the circuit. The system may run entirely on power from the LiPo battery charger, however, it will not supply enough power for the GSM module to transmit data. Please disconnect the battery when not in use, and ensure terminals are protected. A short circuit may lead to an explosion and fire.

2.3. Other Hardware Issues

Do note that the channel between the GSM module and the Arduino on the board is somewhat noisy (I think). Meaningless characters on a serial monitor were seen when communication was monitored. Somehow, the Arduino and GSM module communicated without ambiguity. You may however improve this by using a level matching circuit as documented in the SIM800L datasheet. Otherwise, don't fix it if it's not broken.

DO NOT use a power supply greater than 1A to connect the LiPo (battery) charger. You will need a USB Mini cable. The LiPo charger on the circuit deals with about 700mA at most. If you use your 3A mobile phone charger, inrush current to the drained Li-ion (system) battery could fry the charger. Preferably charge from a USB port (500mA). Visit the project report for the exact part.

That GPS module never picks a signal indoors. Carry out your tests by an open window or even better, outdoors. Once it picks a signal, its red light flashes.

If temperature sensor returns rubbish numbers (-3.2°C on a hot sunny day), check the connection. It has definitely been altered. You may de-solder and test at your discretion.

How would you know if a component is bad? You may have to pull it out of the circuit. Anything could have happened while it was in storage.

3. NOTES ABOUT THE SOFTWARE/FIRMWARE

As at the time I delivered the sample holder to the department *12th February 2020*, the firmware used for demonstration was on the sample holder (the microcontroller). For whatever reason (author does not anticipating anything), the firmware could have been modified. Simply full out the Arduino Nano and flash it again. Again, all files are on the Github page. You might have to make an opening in that transparent plastic pack to pull out the Nano for flashing. Take note of the orientation of the Nano and the header you pulled it out from. Because there are more header holes than microcontroller pins, you may insert the Nano with a one hole shift down/up and not even realize it.

For other issues about its operation, visit the comments in the code. Libraries used are on the Github page too. For files about the website, and setting it up, open *ids.zip* on my page.

Figure 3.1: Opening for power button

Figure 3.2: Random photos of the project in good condition

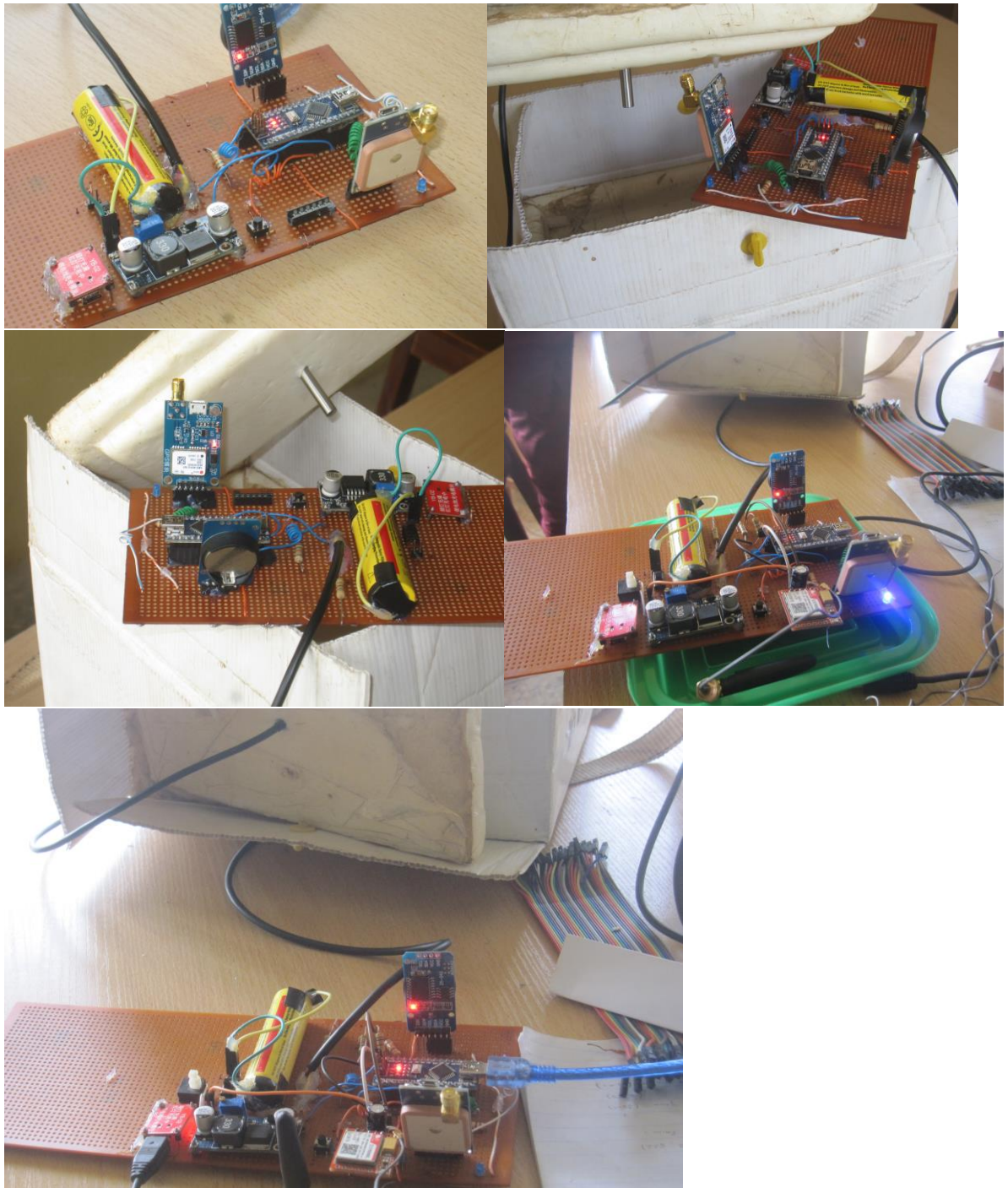
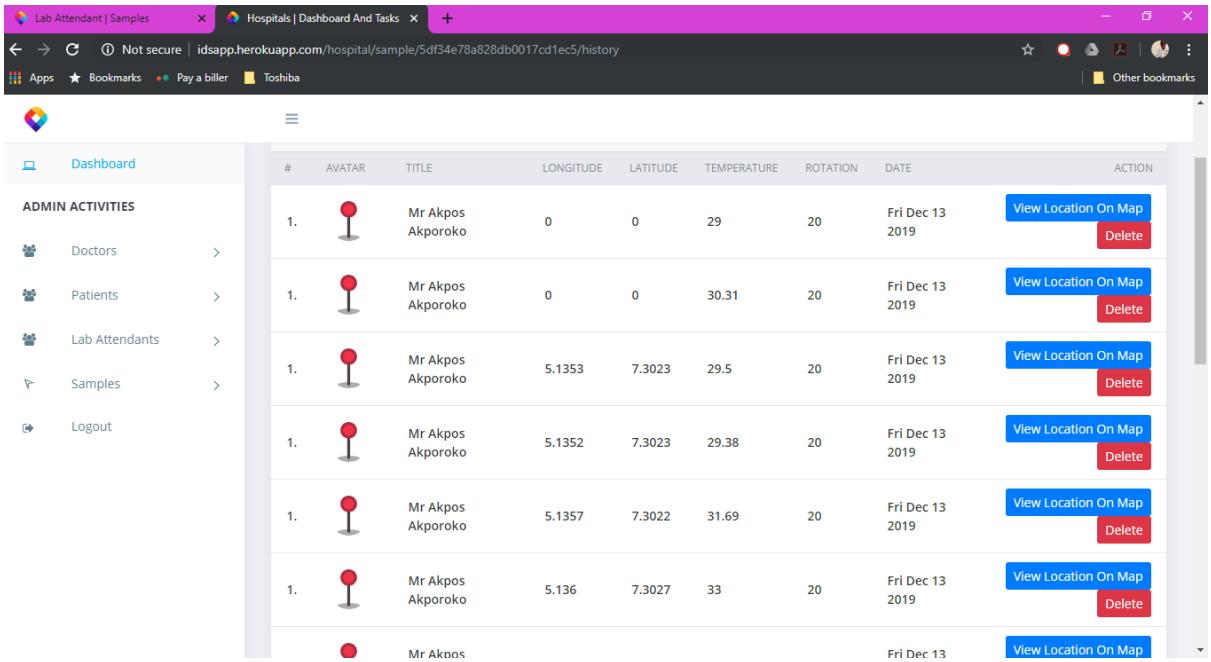


Figure 3.3: Web page of tracked sample



4. USING THE WEBSITE

For information about the website, visit the project report. Using the website is fairly simple. Simple create accounts with any different email for hospital, doctors, lab attendants, and patients accordingly. After a sample has been created and assigned to a lab attendant, and set as moving, login to the lab attendant page and view tracking history. The entire web interface is easy to navigate.

Default values for latitude and longitude is zero, pending when the website receives data from the sample holder. The rotation value is immaterial because a tilt sensor, initial considered in the project, was removed at the last moment. You may change the default from the firmware of the sample holder.

Contact Moyinoluwa for further information about the website. She primarily managed its development.