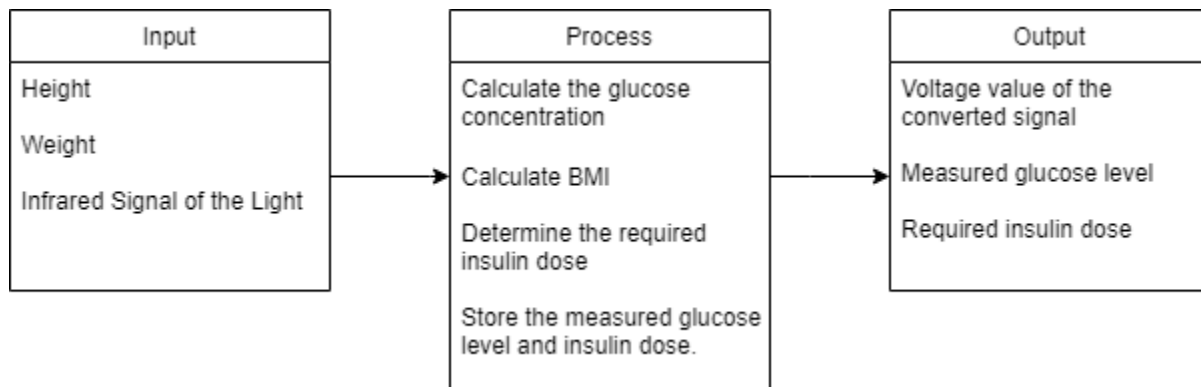


THESIS_GLUCOSE

The study aims to develop a non-invasive glucose sensor. The specific objectives of this research are as follows:

- To design a sensor patch that detects blood glucose using Near- infrared (NIR) radiation.
- To develop a device that determines the required amount of insulin dose based on the glucose level.
- To develop a mobile application that stores and displays the input and processed information of the user.



Patch Part

Consult your adviser how the patch will look like. If possible, request a sample image of Sir Noel's prototype so we'll have a guide.

Basically, the project just transmits an infrared light (NIR) through the skin. Depending on the number of bounces of glucose through the skin, the reflected light is sent back to the surface of the skin. A photo diode is placed near the NIR which is aligned towards the skin as well. The amount of intensity or voltage that it received is proportional to strong the IR led is transmitting based on the number of bounces it does from the blood's glucose. The higher the number of bounces, the weaker the intensity the photodiode receives and vice-versa.

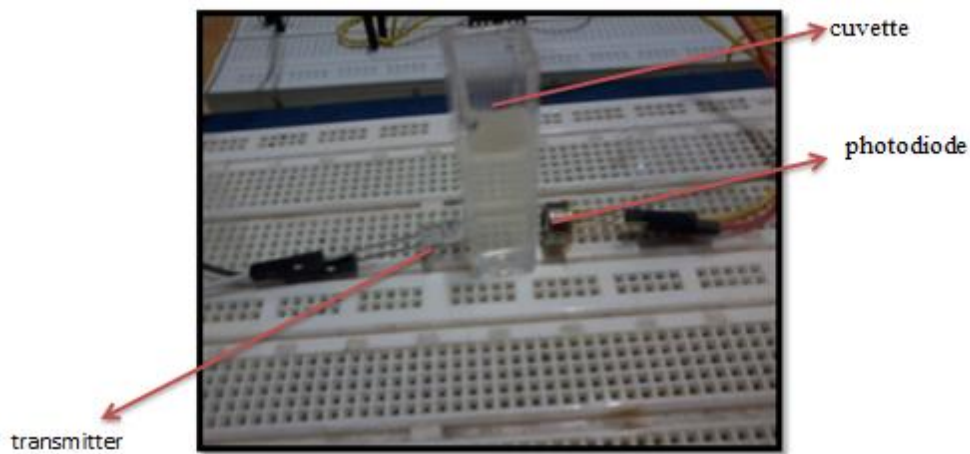
Calibration Part

Before placing the sensor in the patch, we need to calibrate it first. According to your paper's RRL you need the following:

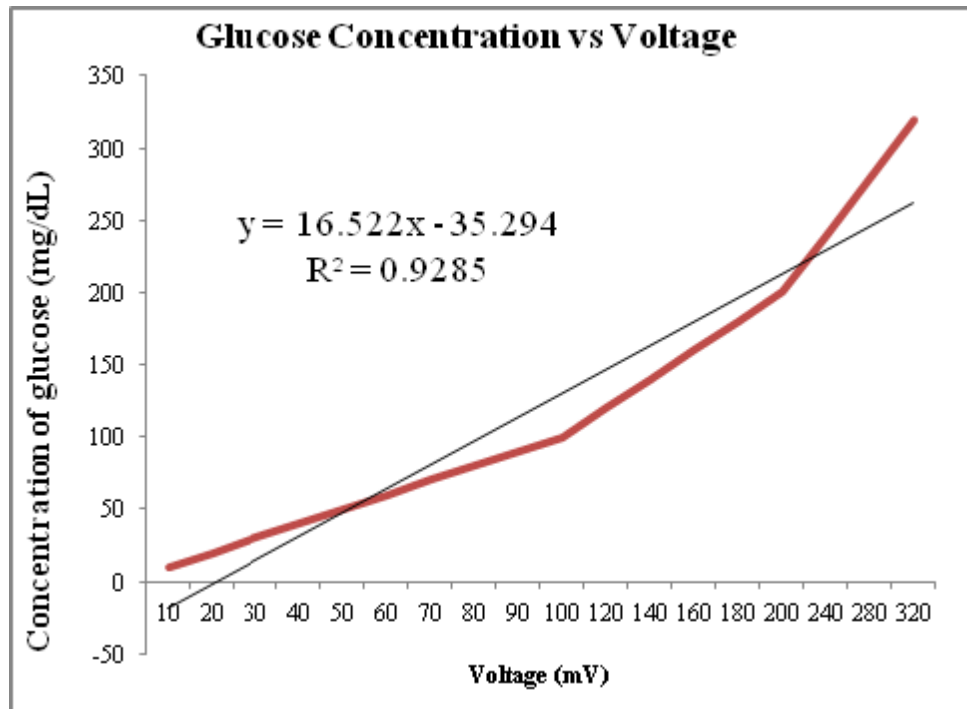
- Different concentration of glucose solution ranging from 10 mg/dL – 320 mg/dL (Dextrose monohydrate is the name of the solution).
- Tinted amber reagent bottles where the glucose concentration will be placed.
- Distilled water
- Cuvette

Kindly coordinate with a chemical laboratory assistant for this in our school.

To calibrate the device, we need to position the NIR and photodiode as shown below. We will dissolve 30 ml of glucose solution for each test. Each test we will use different level of glucose concentration and we will record the voltage reading of the photodiode from that.



Once we have a list of glucose concentration (mg/dL) and voltage readings (V), we will use linear regression to create an equation for that.



Once the equation is made, we will use that to compute for the glucose level based on voltage readings alone. Then we will use proceed in placing the sensors in the patch to test it to an actual person. Then we will compare the readings of the proposed device with the invasive method and make adjustments if necessary.

Android Application Part

- The app should connect to the patch using Wi-Fi.
- There is no user account needed.
- The user should enter their height and weight in the app.
- Once the height and weight are entered, the android application will compute for the BMI.
- Once the BMI has been computed, the glucose level will then be fetched from the device.
- Depending on the BMI and glucose level, the app will output how many units of insulin should the user take.
- There are three pages in the app, namely "Home", "Main" and "How to Use".
- In the Home page, it contains the app logo, and two buttons to navigate to the other pages.
- In the Main page, it contains the interface where the user will enter its height and width then two buttons again, one for computing the BMI and another for getting glucose level from patch.
- In the How to Use page, it just contains manual on how to use the device along with the app.

Tasks

Our job will be to:

- Create the circuit.
- Create the program of the microcontroller.
- Create the Android Application.
- Connect the microcontroller and the Android Application via Wi-Fi
- PCB
- Assist you in data gathering for calibrating the sensor.

You job will be to:

- Data gathering
- Planning and making the patch.

Materials

- WeMos D1 Mini:
<https://www.makerlab-electronics.com/product/mini-wemos-d1-wifi-board/>
- Near Infrared Transmitter LED 1550E
- Photodiode (FGA10)
- OP491 DIP Package
- 200 ohms resistor
- 1 k ohms resistor
- 100 nF capacitor
- 50 k ohms resistor
- 100 k ohms resistor
- 3.9 k ohms resistor
- Breadboard, 800 points size.
- USB cable, type A to micro USB.
- Solid wires.
- Battery is to follow, but I think I'll be using this one:
<https://www.makerlab-electronics.com/product/3-7v-550mah-li-po-battery/>
- DC-DC Booster 5V (For boosting the 3.7 V battery)
<https://www.makerlab-electronics.com/product/usb-dc-dc-0-9-5v-600ma-boost-converter/>