System Architecture with Diagram (HW+SW)

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Introduction

This project aims to use multiple sensors to track the situation of pancreatitis and prevent future occurrence. I chose MAX30100, Hamamatsu G11193-10R, and a OLED screen display to measure the heart rate, blood sugar, pulse oximetry, and finally display on the screen to notify users.
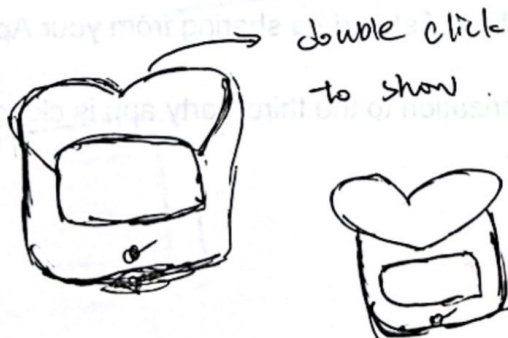
① display

necklace

rings

②

③ double click
to show
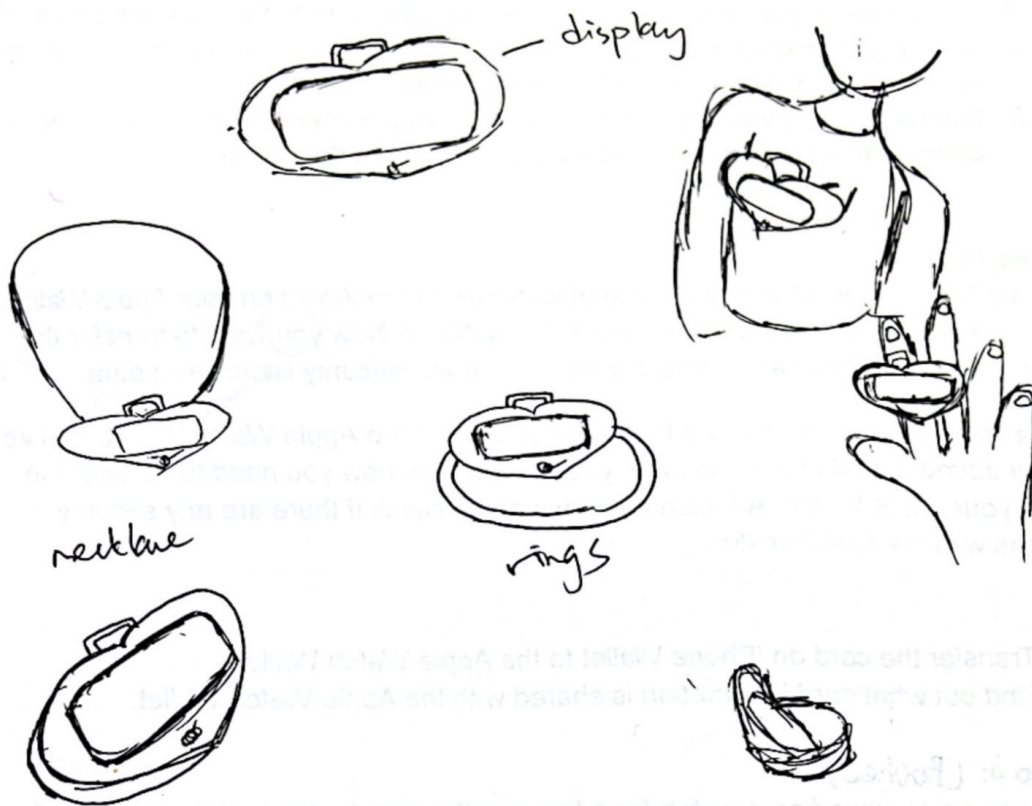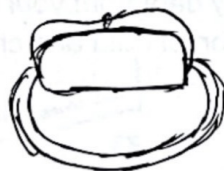
Sensing Device

This device is designed based on the easy-to-carry and convenient features of a changeable wearable device that could be applied to different places, such as necklace, rings.

• Hamamatsu G11193-10R: have spectral response detected to measure blood sugar.

• MAX30100: Heart rate sensor, track the heart rate which may reflect the signals of pain, warn users if there are unusual heart rate patterns

Technical details: • Connection: Wireless through Bluetooth or Wi-Fi

• Power: Lithium Polymer, 3.7V, 1000mAh, high energy, rechargeable, small pack, 12-24 hrs, able to work for multiple sensors with wireless connection

• Microcontroller: Arduino / ESP-32 / Seeed Studio XIAO

• Processing: collect data (blood sugar, heart rate, and pulse oximetry from the sensors, process and generate real time results. Specifically process the blood sugar values. Filter the results from sensors and set thresholds to process signals.
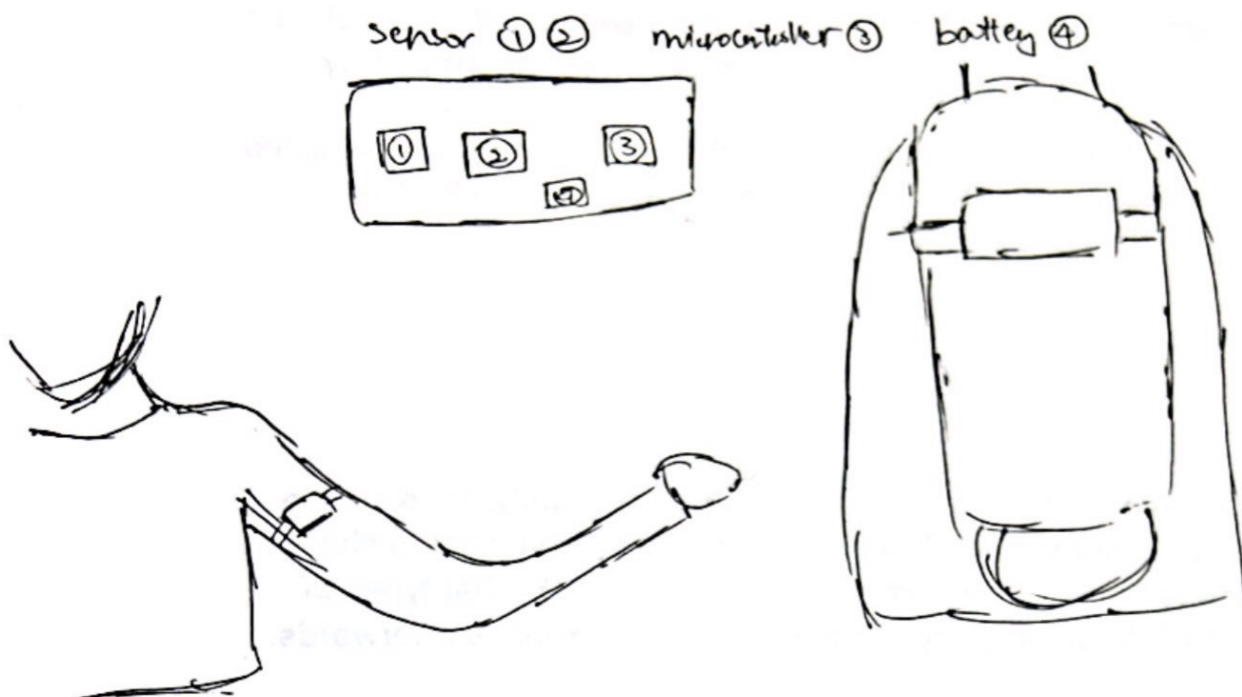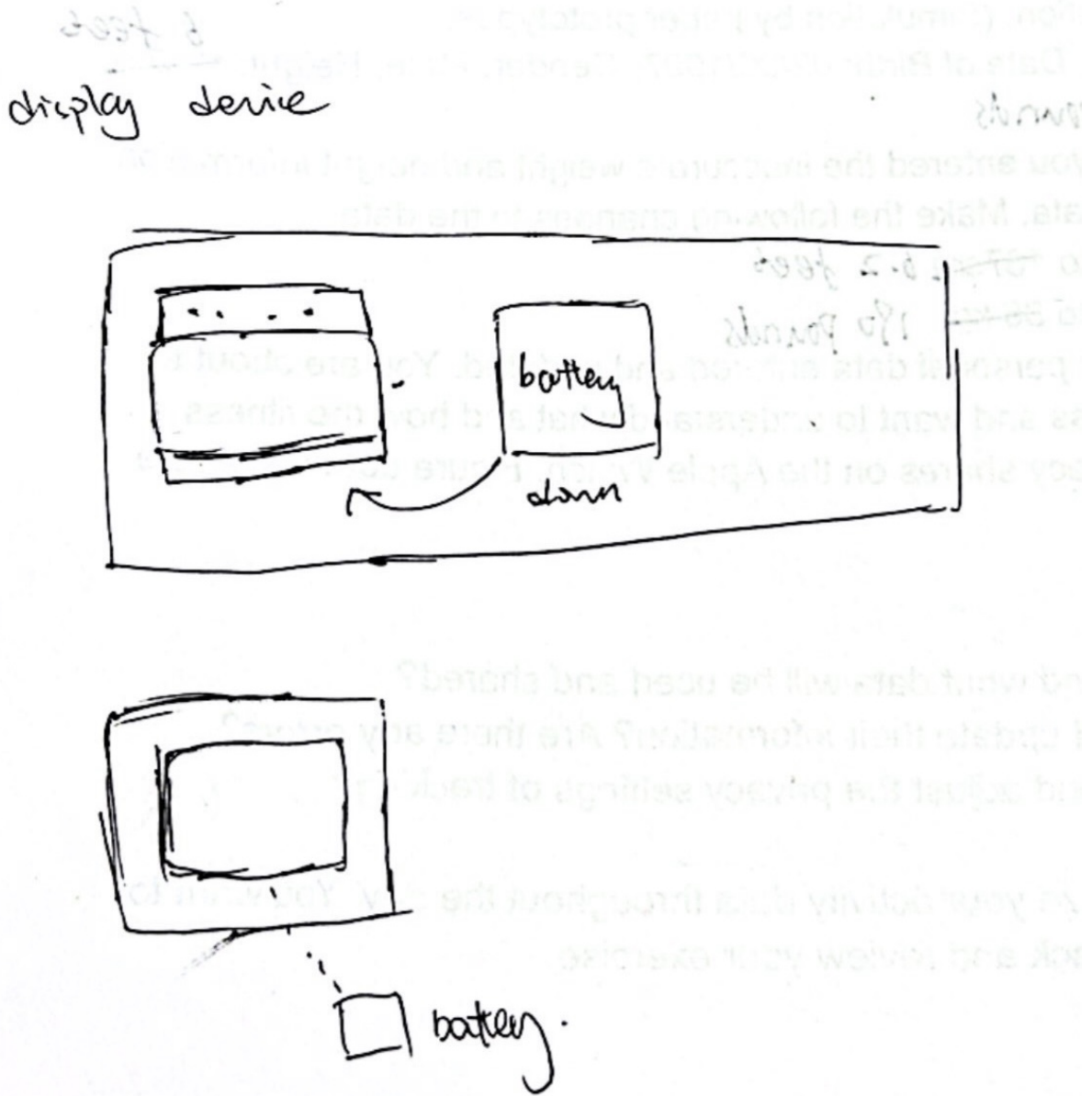

Display Device

I aim to use a stepper-motor-driven gauge needle, a display screen, and a LED to track and display abnormal activities to alert users. This device is designed based on the main function to display the important information. It should be touchable on the skin to detect the blood sugar. The final display design is shown as the first session.

• A stepper-motor-driven gauge needle to indicate when there is abnormal activity in changes of blood sugar / heart rate / pulse oximetry level

• Additional warning signs by LED when unusual activities occur in order to alert user

• An OLED or E-link display to alert users by show warning signs, continuously showing the synthesized health values

• Other than the abnormal activities detected from sensors, display the trend of values before and after meals

Technical details:

• Connection: Wireless through Bluetooth or Wi-Fi

• Power: Lithium-Ion or Lithium Polymer Battery, 3.7V typically, 1000-2000 mAh to support signals from stepper-motor-driven gauge needle, LED, and display

• Microcontroller: Arduino / ESP-32 / Seeed Studio XIAO

• Processing: Based on the signals, display the output and alert users by LED, stepper-motor-driven gauge needle, and screen when the real time values exceed the preset thresholds.

display device

battery

clock

battery.

Connection & Communication Diagram

SDA

SCL

GND   OLED
          Screen Display
VIN

Send processed real-time data to
display: blood sugar, heart rate and
pulse oximetry

5V

GND

A5 (SCL)

A4 (SDA)

Arduino Uno

It generates a current that is converted into
a voltage using an Op-Amp. And converts it
to a voltage.
Use resistor to determine the sensitivity of
the circuit to get the given change in light
intensity.

Cathode   Anode

Hamamatsu
G11193-10R

Supply power for
Arduino with 5V

Battery

Send raw data of heart rate and
pulse oximetry

SDA

SCL

GND

VIN   MAX30100