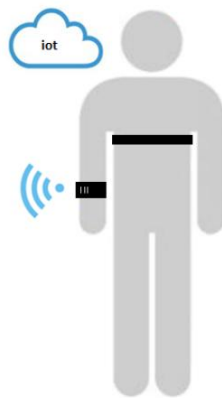


Project Reg. ID: pratyush.gehlot@in.bosch.com

Project Title: Personal Health Assistance



Personal Health Assistant

Powered By-



Team Name: BOSCHLERS

Project Members :

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YouTube Video Link: [https://youtu.be/ FYf1FZ7xkg](https://youtu.be/FYf1FZ7xkg)

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1. Abstract:

Personal Health Assistant

Project theme:

In present scenario the available health checkup and measurement solutions are not reachable to rural area and also costlier for common people so in order to reduce diseases or early detection and making people more conscious on health we need a cost effective and portable health checkup solution.

Detail:

In order to bridge the gap between people and their health we came up with an idea of having a personal health assistant which can be able to perform following things -

1. Early detection of disease
2. Regular body checkups (for a person or Family member on demand basis)
3. Health Monitoring (For old people continues health monitoring)
4. Body part Diagnosis (Heart beat, ECG,BP etc.)

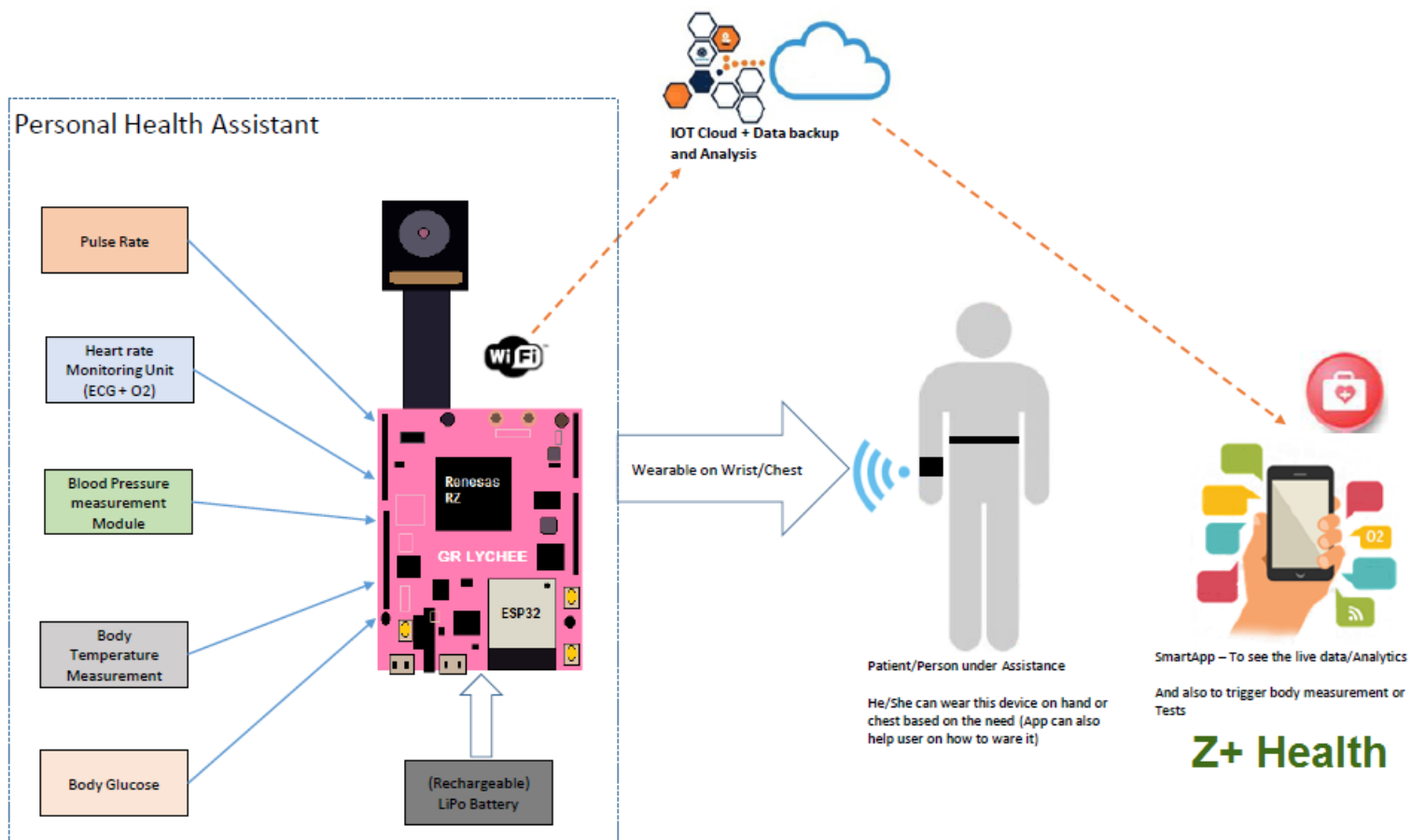
It uses GR-Lychee board along with body data measurement sensors powered with portable battery.

How it will work:

1. Person will wear the device either on hand or on chest depends on the need.
2. Device is capable of measuring body parameters continuously or on demand basis.
3. It sends data to the IOT cloud server where it will be analyzed and if needed can be informed to person or respective doctor directly with proper reports.
4. Person can see any this live health status in Mobile App, and can also trigger test from the app.

Solution: wearable and cost effective mini equipment which serves the purpose of providing health assistant at any time.

2. Block Diagram:



3. Concept and Challenges:

To make a small and handy wearable device which can measure measure body parameters noninvasively and continuously.

For Blood pressure monitoring we are using PTT algorithm to estimate the body blood pressure this part us challenging.

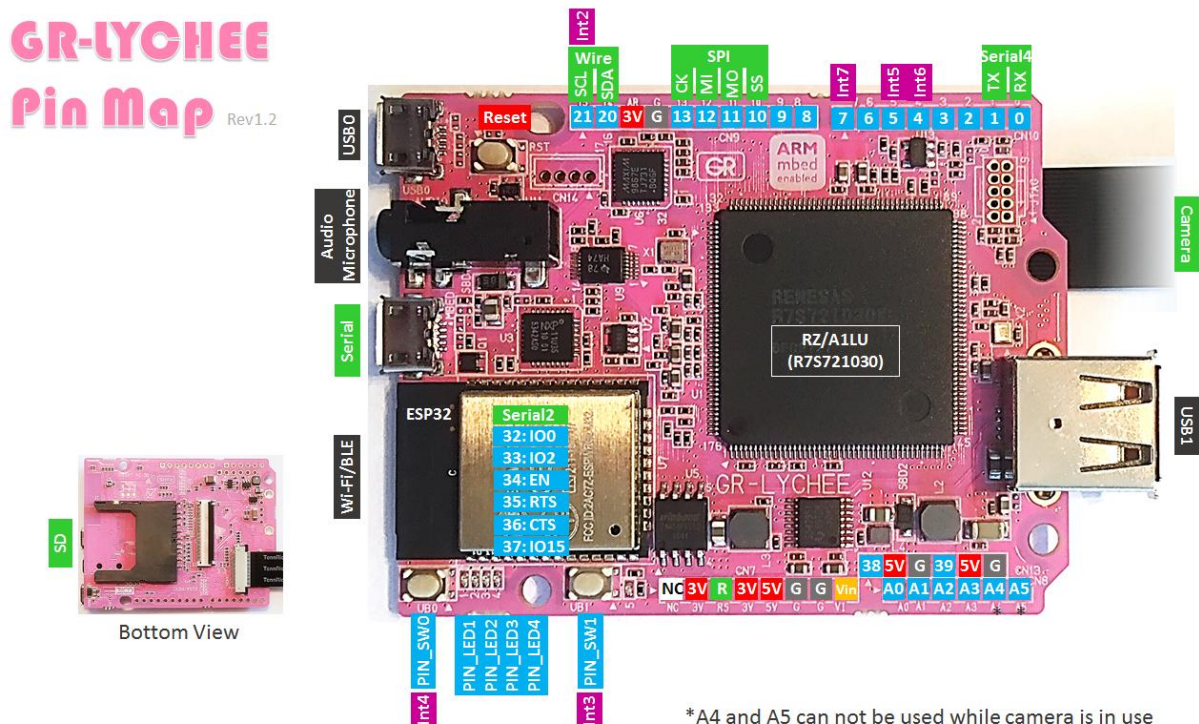
For glucose measurement we are taking sample of mouth air and sensing the presence or Acetone gas which gives the approximate proportional value of body glucose level other parameter like air temperature is also important in the calculation.

The available solutions in the markets are costly and not non invasive and each measurement need a specific device which will make more cost so not so useful.

And those available solutions are not able to record or monitor body parameters continuously as well.

We came up with an idea which will eliminate all those limitations and it will reach to rural area people as well, so that early detection of decease possible with this device.

4. GR Peach Board: Basic features of the board are listed below.



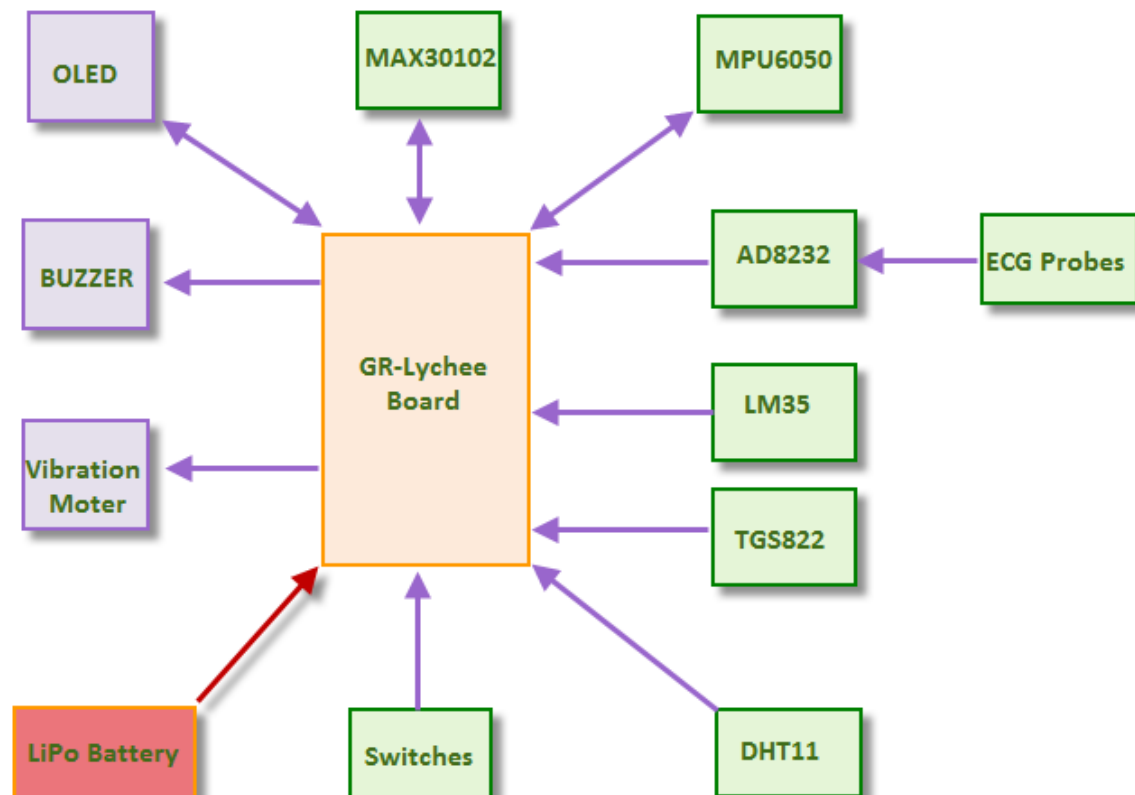
Item	Description
Micro processor	RZ/A1LU (R7S721030VCFP 176pin QFP)
ROM/RAM	External FLASH 8MB/internal 3MB
Operating Frequency	384MHz
RTC clock	32.768Hz
Operating Voltage	3.3V/1.18V
Camera	Shikino High-Tech KBCR-M04VG-HPB2033 VGA 640x480, up to 60fps

Horizontal angle 98 degree, vertical angle 75 degree

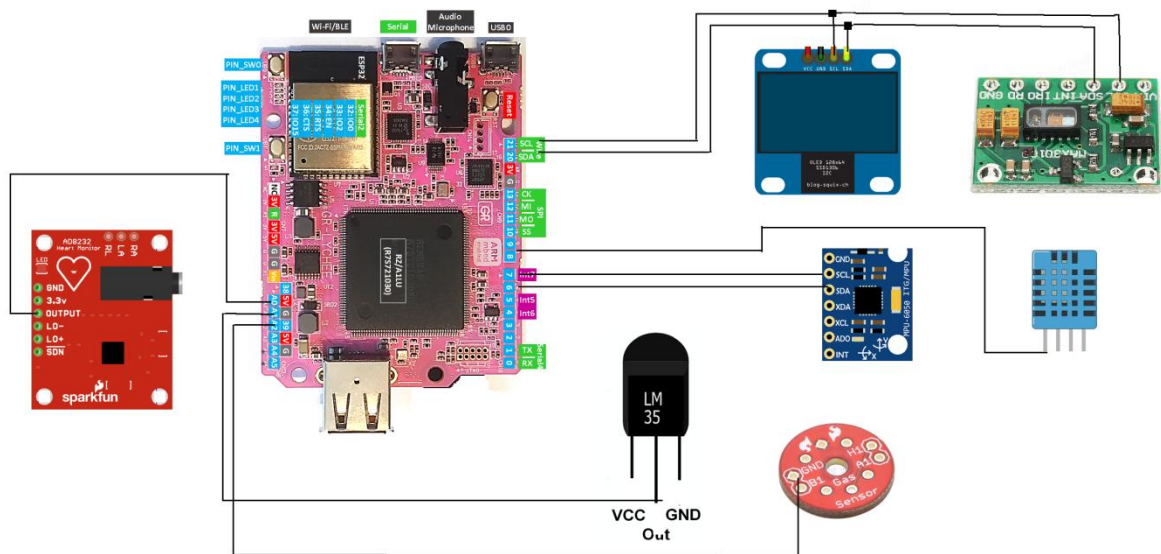
Board Function	Camera interface (camera module included)
	ESP32 wireless module (Wi-Fi, BLE)
	USB peripheral(micro B connector)
	USB host (option)
	4 pole audio input / output jack
	SD socket
	LCD connector
	User button switch(2 pcs)
	Reset button switch
	JTAG interface
	Connector for Arduino shield(option)
	LED for user(4 pcs)

5. Schematic and Hardware Setup:

a. Connection diagram



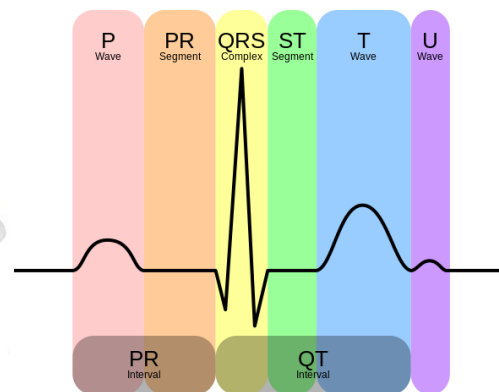
b. Flow diagram

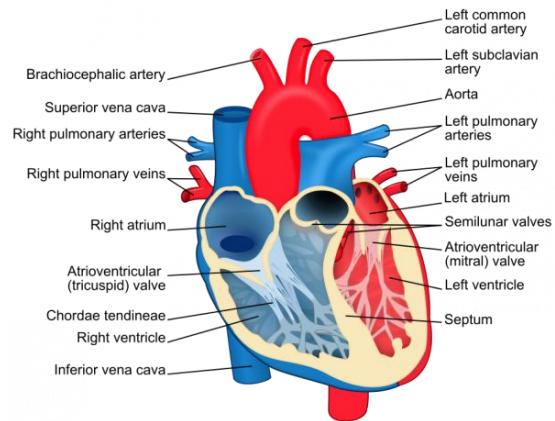


Hardware Components interfacing with GR-Lychee:

1. AD8232 - ECG Pulse Monitoring Measurement Sensor

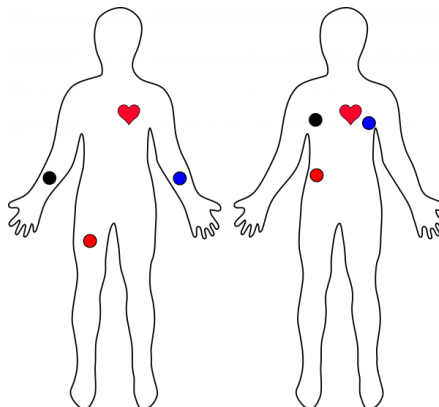
The AD8232 Single Lead Heart Rate Monitor is a cost-effective board used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram and output as an analog reading. ECGs can be extremely noisy, the AD8232 Single Lead Heart Rate Monitor acts as an op amp to help obtain a clear signal from the PR and QT Intervals easily.





Board Label	Pin Function	Arduino Connection
GND	Ground	GND
3.3v	3.3v Power Supply	3.3v
OUTPUT	Output Signal	A0
LO-	Leads-off Detect -	11
LO+	Leads-off Detect +	10
SDN	Shutdown	Not used

Cable Color	Signal
Black	RA (Right Arm)
Blue	LA (Left Arm)
Red	RL (Right Leg)



2. MAX30102 - integrated pulse oximetry and heart-rate monitor module.

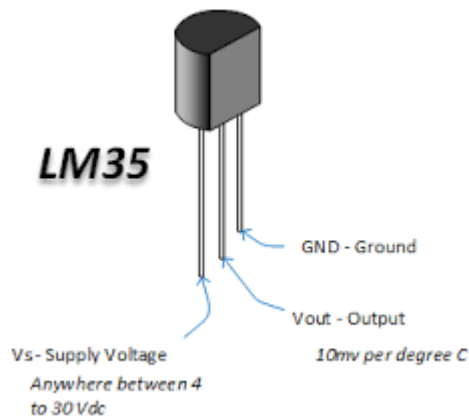


The MAX30105 Particle Sensor is a flexible, powerful sensor enabling sensing of distance, heart rate, particle detection and even the blinking of an eye. The MAX30105 has been equipped with three LEDs as well as a very sensitive photon detector. The idea is to pulse the different LEDs, then detect what shines back. Based on the reflected signature it's possible to detect different types of particles or materials (such as oxygenated blood or smoke from a fire).

The MAX30105 utilizes a red LED, a green LED, and an IR (Infrared) LED for presence sensing, heart-beat plotting and heart-rate monitoring among its multitude of uses, including Pulse Oximetry. The MAX30105 is designed to operate at 5V and can communicate with both 3.3V and 5V microcontrollers. We've also written an Arduino library for the MAX30105 Breakout which takes care of all of the I2C communication, bit shifting, register writing and sample reading.

Pin Label	Input/Output	Description
INT	Output	Interrupt, active low
GND	Supply Input	Ground (0V) supply
5V	Supply Input	Power supply
SDA	Bi-directional	I ² C bus clock line
SCL	Input	I ² C bus clock line

3. LM35 Body Temperature Sensor



Power Requirements

The device is powered anywhere from 4 to 40 Vdc. When used with your Arduino, you will want to use the 5V output.

Accuracy

According to the manufacturer, the accuracy is typical with 0.75 degrees C. The worse case accuracy is stated as +/- 1 degrees C.

The Range

The device has a range from -55 degrees C to +150 degree C (or -67 to 302 degrees F).

If you do need to measure below zero C, I recommend the TMP36. It's a hell of a lot easier to implement for lower temperatures.

4. MPU6050 Accelerometer Sensor



MPU-6050 Six-Axis (Gyro + Accelerometer) MEMS Motion Tracking

The MPU-6050™ parts are the world's first MotionTracking devices designed for the low power, low cost, and high-performance requirements of smartphones, tablets and wearable sensors.

The MPU-6050 incorporates InvenSense's MotionFusion™ and run-time calibration firmware that enables **manufacturers to eliminate the costly and complex selection, qualification, and system level integration of discrete devices** in motion-enabled products, guaranteeing that sensor fusion algorithms and calibration procedures deliver optimal performance for consumers.

5. Mini OLED display



Specification:

- High resolution: 128 * 64
- Viewing angle: > 160 degree
- Fully compatible with Arduino, 51 Series, MSP430 Series, STM32 / 2, CSR IC, etc.
- Ultra-low power consumption: full screen lit only 0.08W
- Voltage: DC 3V ~ 5V
- Working Temperature: -30°C ~ 70 °C
- I2C/IIC Interface, require 2 IO only.
- SSD1306 Driver IC
- Character Color: Blue/White/Bi-color(blue and yellow)
- I2c Address: 0x3

Pins Definition

- GND : Ground
- VCC : 2.2V-5.5V
- SCL : CLK (High Level 2.2V-5.5V)

- SDA : MOSI (High Level 2.2V-5.5V)

6.LiPo Battery



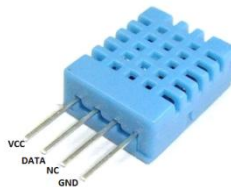
7.4V 610mAh 15C 4.5Wh Lipo Battery

7. Micro Buzzer and vibration motor



8.DHT11

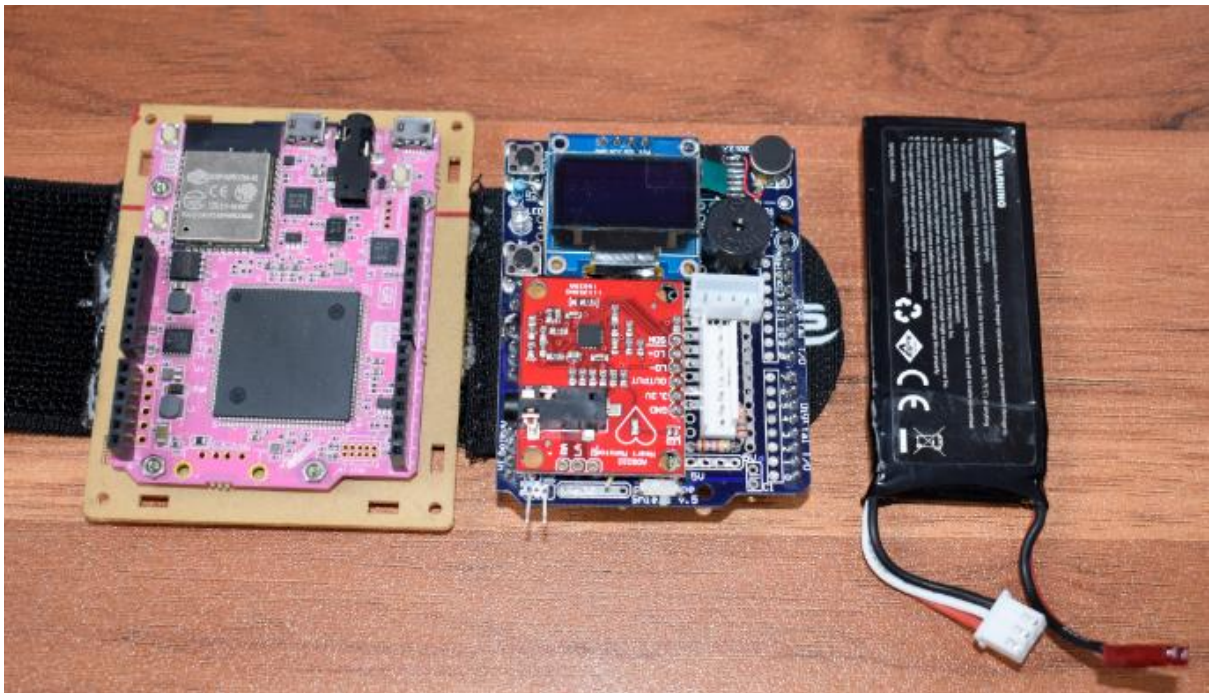
The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed).

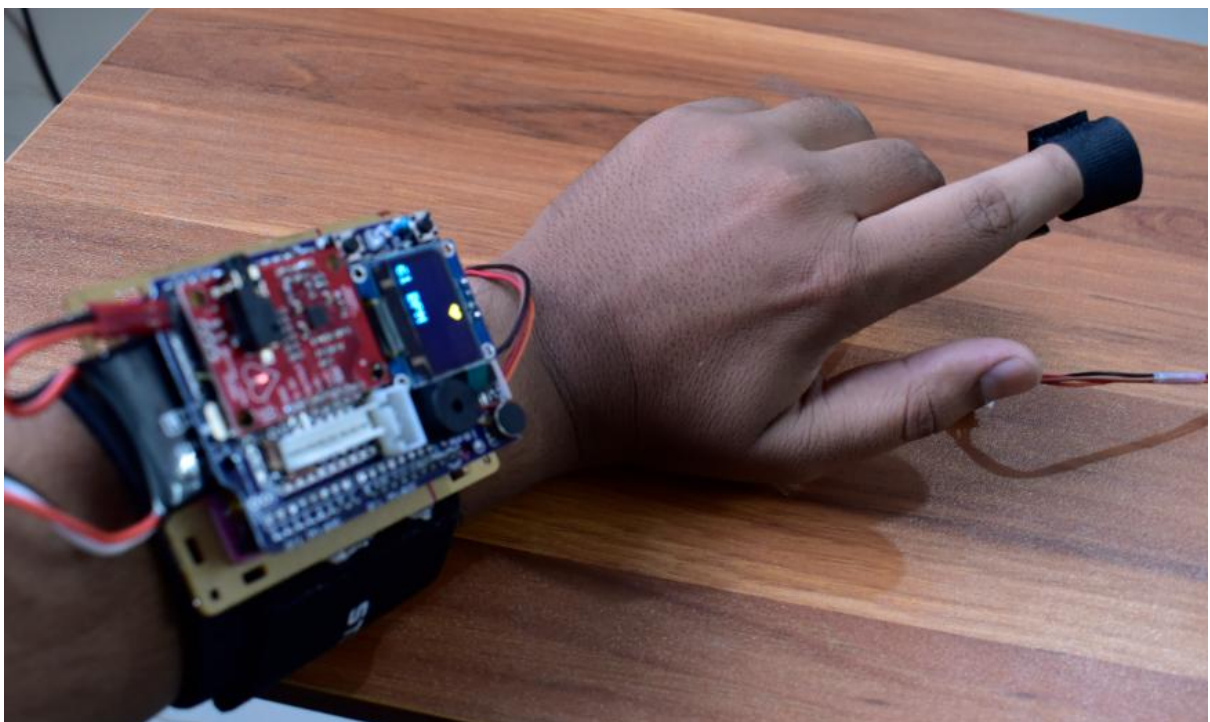
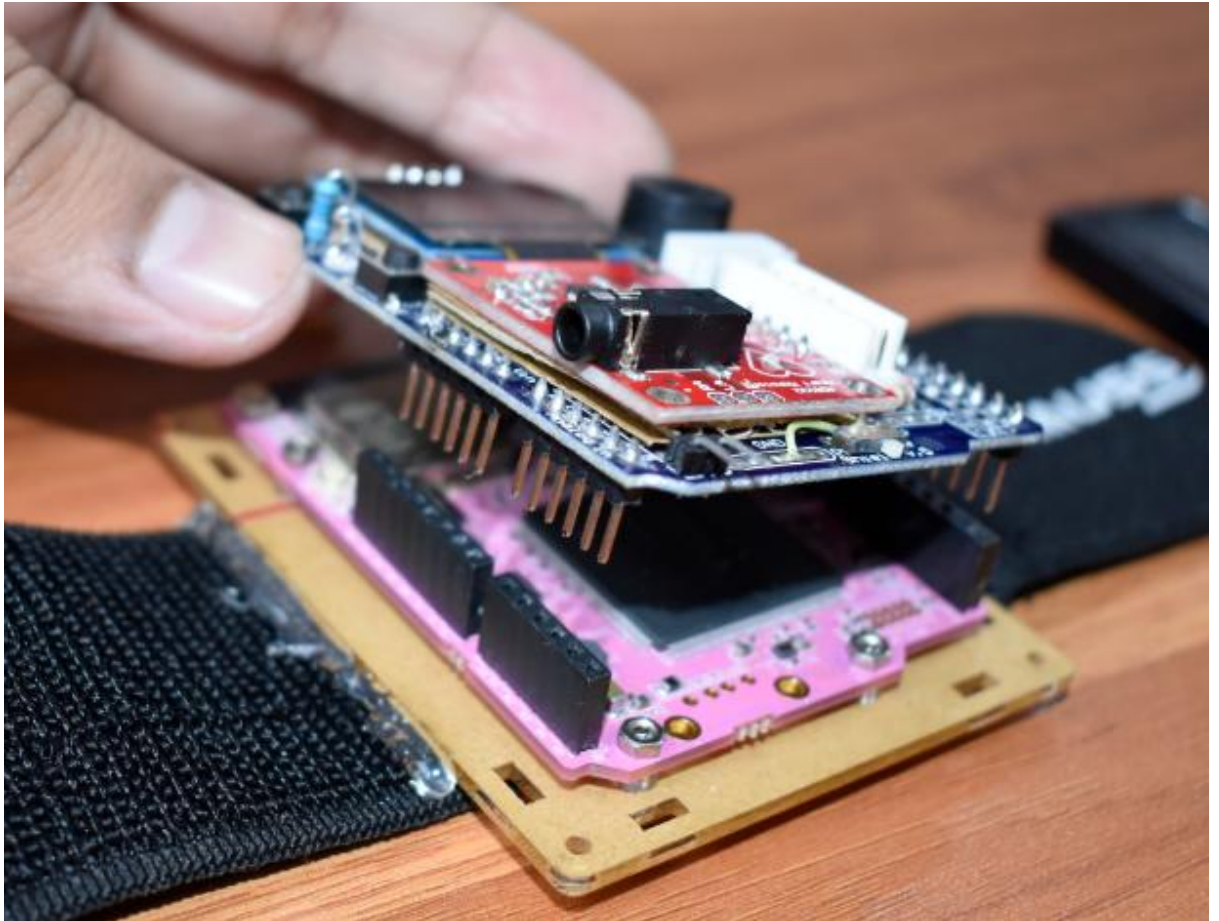


9.TGS822 - Gas Sensor for ACETONE gas detection



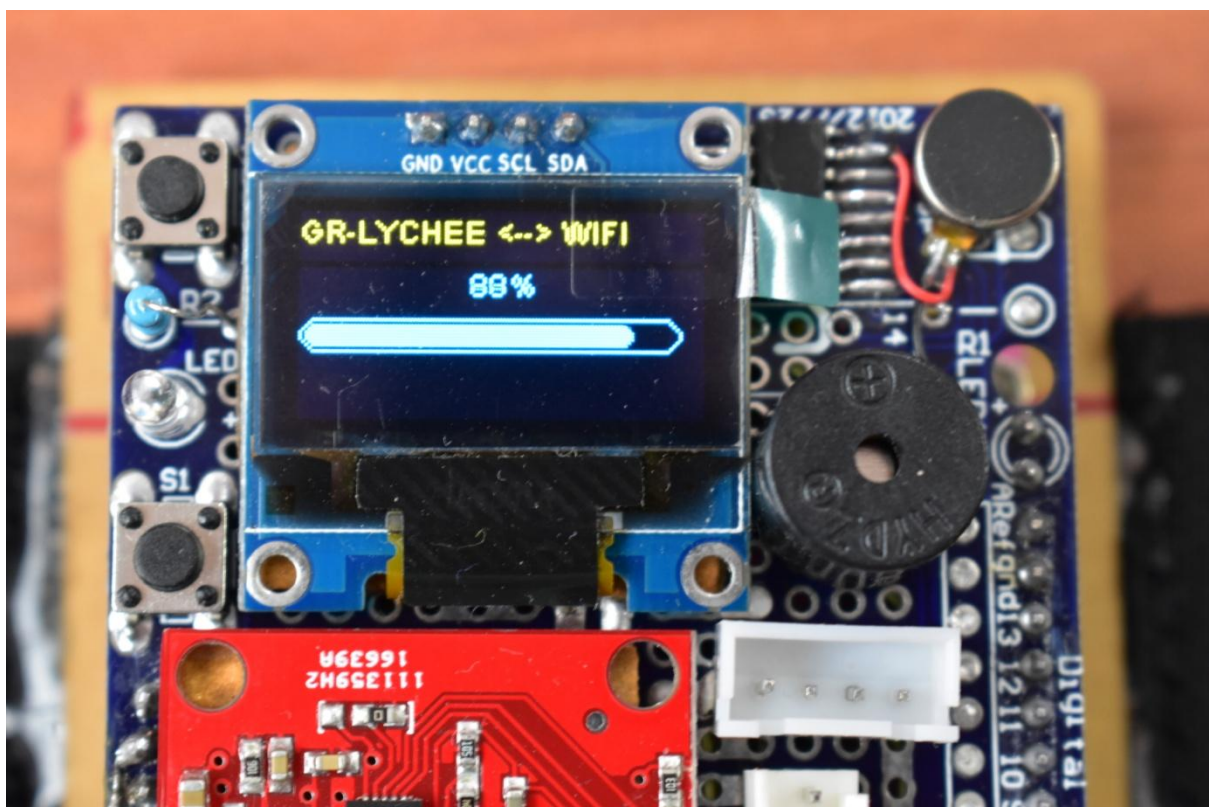
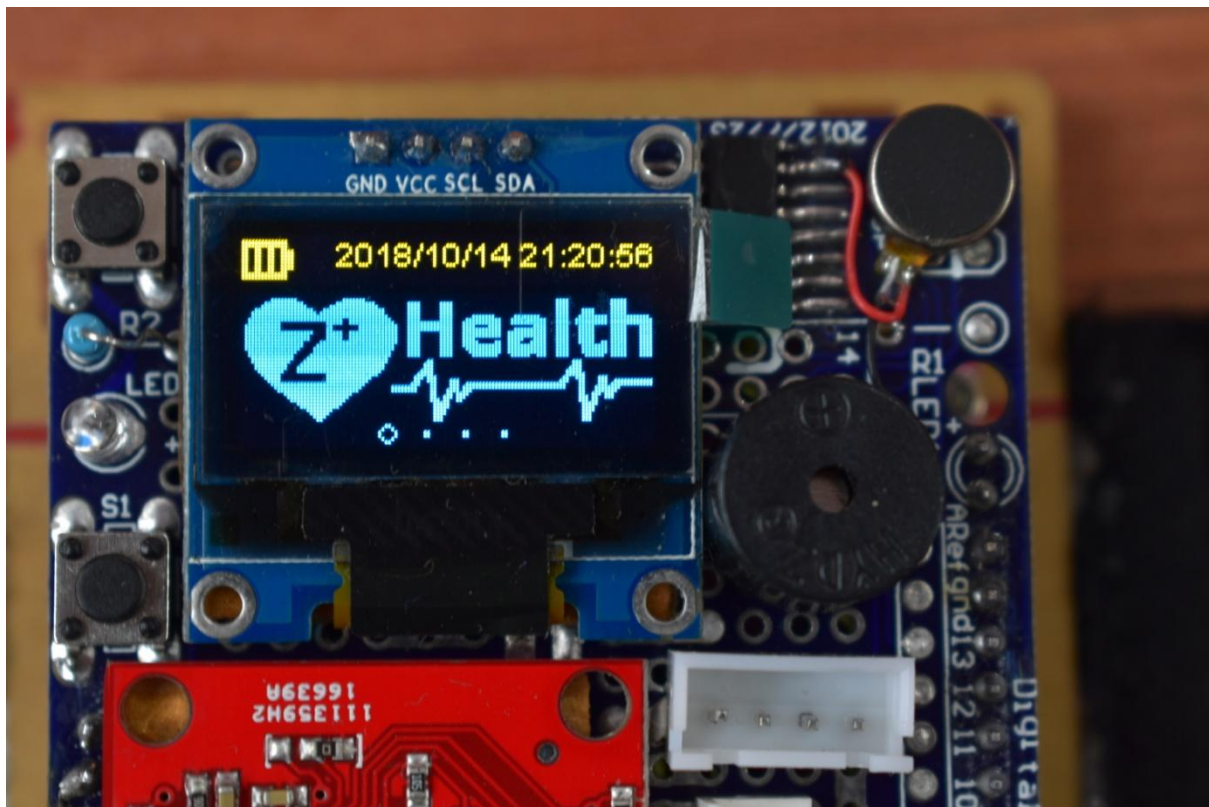
6. Hardware Design:

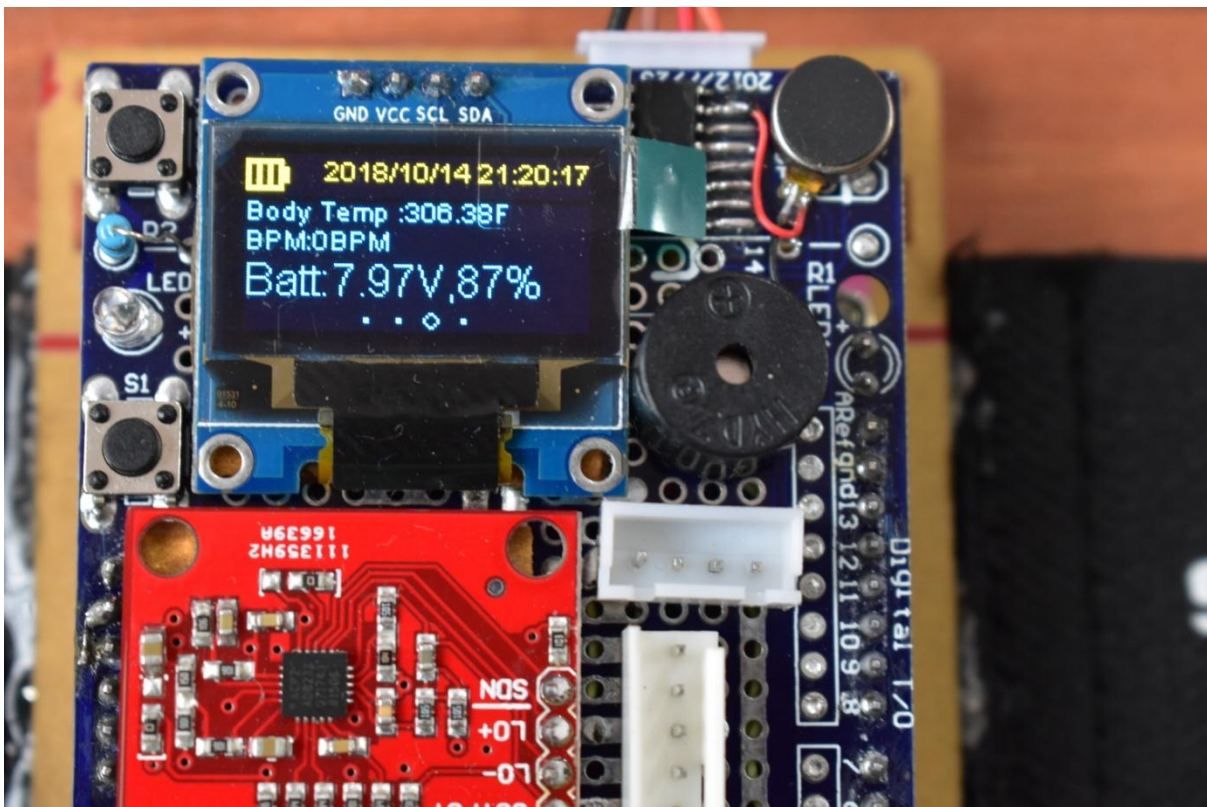
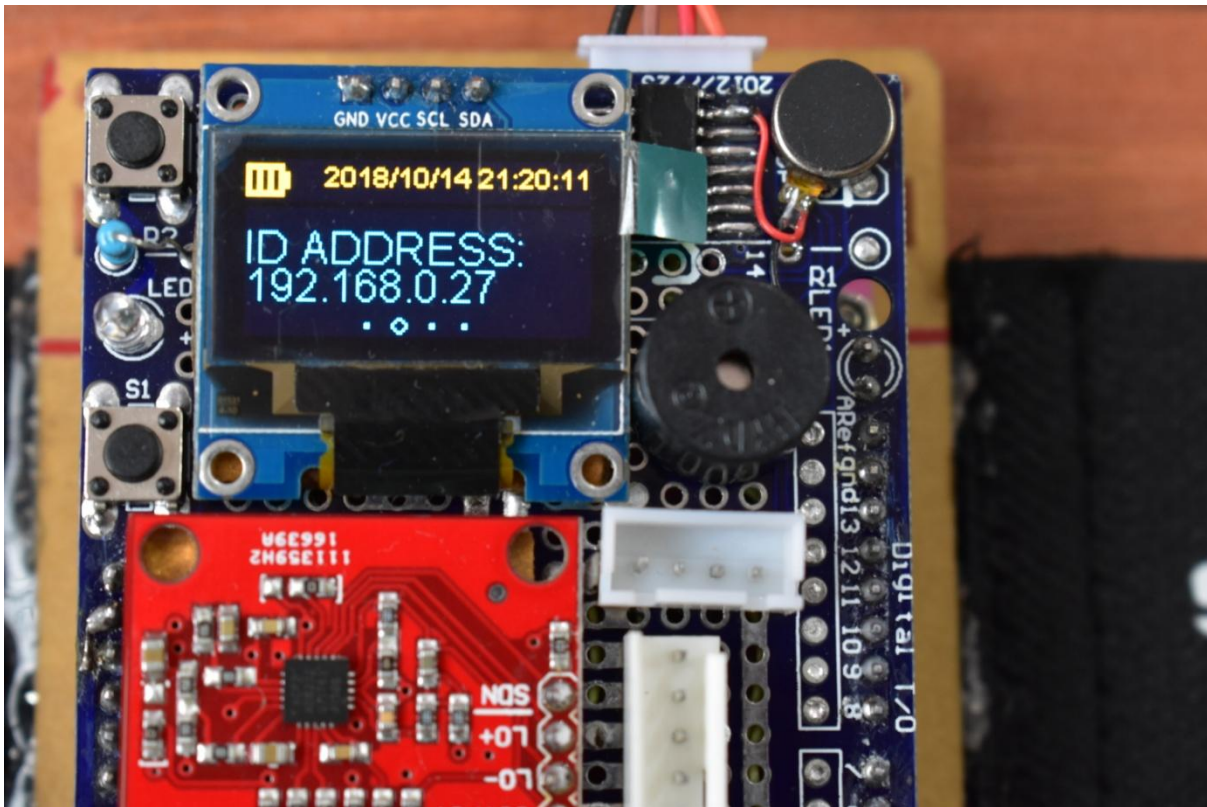


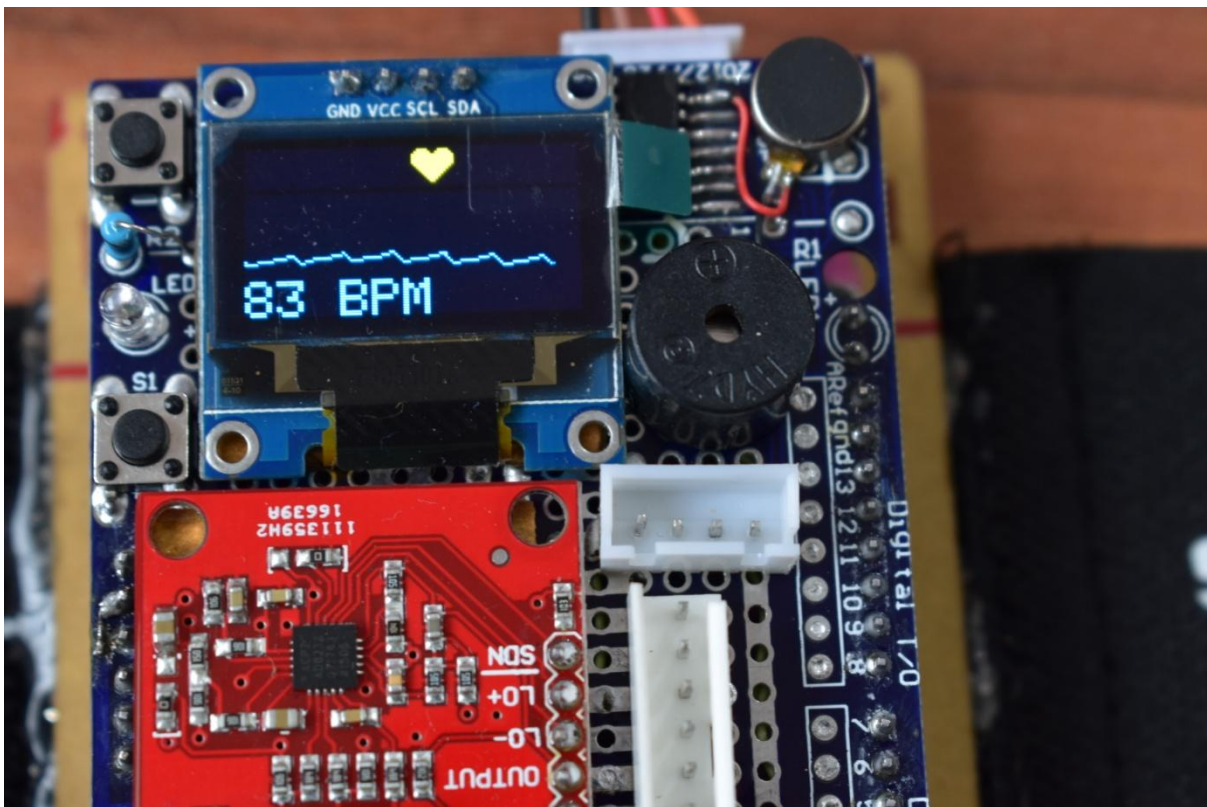
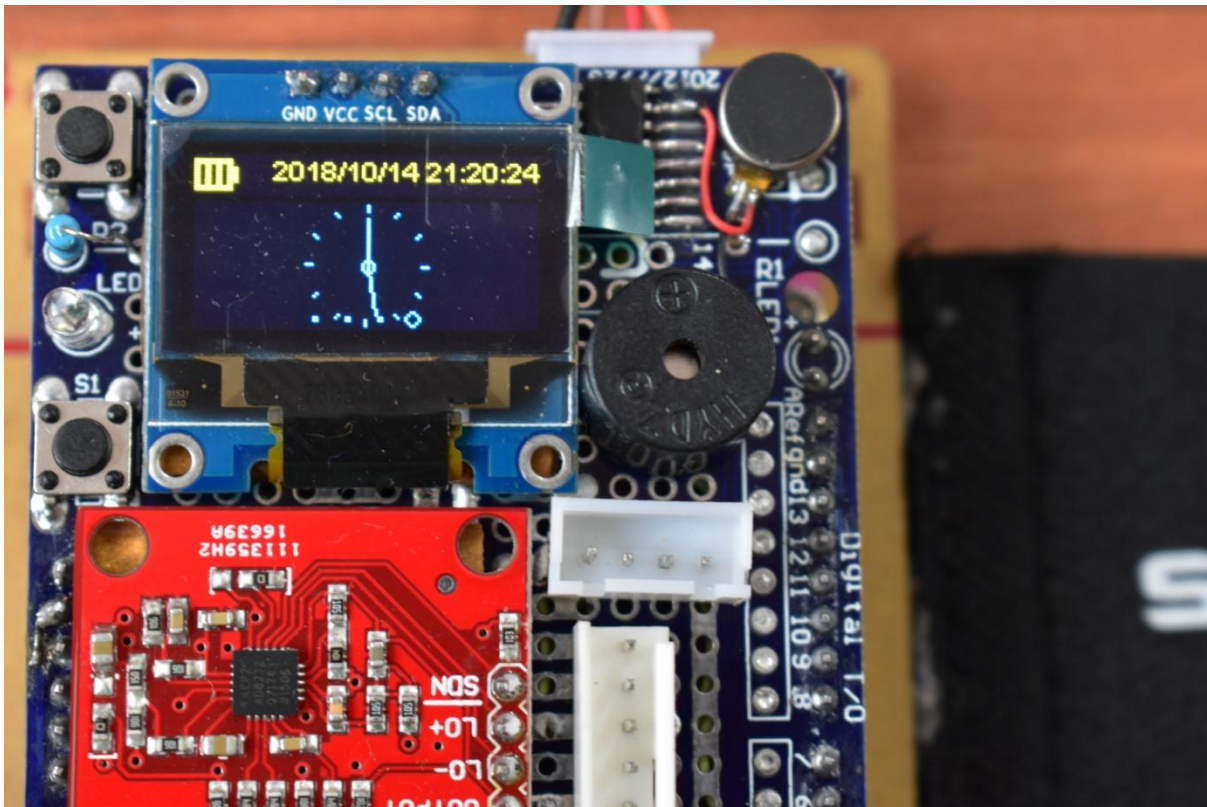




7. Software design (LCD UI)







8. Software Design:

GR-Lychee board support Arduino and Mbed environment so we used some readily available libraries with our board, only configuration part we have changed as per project requirement.

We have compiled complete project in renesas Web compiler.

9. Study and Reference

Body Parameter Measured:

1. Body Temperature

- Human body temperature
- Normal human body temperature, also known as normothermia or eutheria, is the typical temperature range found in humans. Wikipedia
- Normal: 36.5–37.5 °C (97.7–99.5 °F)
- Fever: >37.5 or 38.3 °C (99.5 or 100.9 °F)

1. Pulse Rate

The normal pulse for healthy adults ranges from 60 to 100 beats per minute. The pulse rate may fluctuate and increase with exercise, illness, injury, and emotions. Females ages 12 and older, in general, tend to have faster heart rates than do males.

Average heart rates by age		
Age in years	Average maximum heart rate in beats per minute	Target heart rate range in beats per minute
40	180	90 to 153
45	175	88 to 149
50	170	85 to 145
55	165	83 to 140
60	160	80 to 136
65	155	78 to 132
70	150	75 to 128
Source: American Heart Association.		

2. SPO2 Oxygen concentration in blood

Normal arterial oxygen is approximately 75 to 100 millimeters of mercury (mm Hg). Values under 60 mm Hg usually indicate the need for supplemental oxygen. Normal pulse oximeter readings usually range from 95 to 100 percent. Values under 90 percent are considered low

3. Perfusion Index

The distribution of the peripheral *perfusion index* was skewed and *values* ranged from 0.3 to 10.0, median 1.4 (inner quartile *range*, 0.7-3.0).

4. ECG Heart functioning

There is a recognised normal range for such 'intervals': PR interval (measured from the beginning of the P wave to the first deflection of the QRS complex). Normal range 120 – 200 ms (3 – 5 small squares on ECG paper).

5. Blood Pressure

Follow a healthy lifestyle to keep it at this level. More than 120 over 80 and less than 140 over 90 (120/80-140/90): You have a normal blood pressure reading but it is a little higher than it should be, and you should try to lower it. Make healthy changes to your lifestyle.

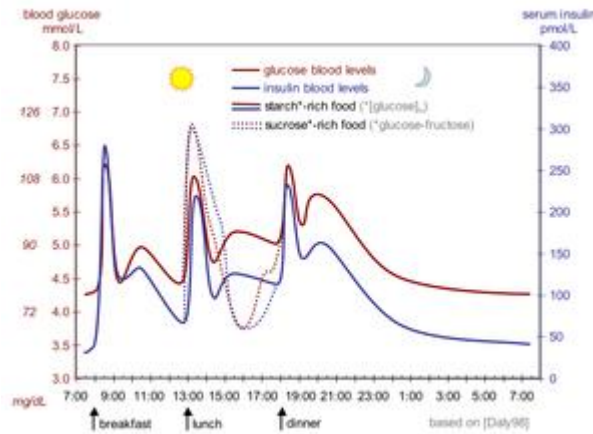
Blood Pressure Stages

Blood Pressure Category	Systolic mm Hg (upper #)		Diastolic mm Hg (lower #)
Normal	less than 120	and	less than 80
Elevated	120-129	and	less than 80
High Blood Pressure (Hypertension) Stage 1	130-139	or	80-89
High Blood Pressure (Hypertension) Stage 2	140 or higher	or	90 or higher
Hypertensive Crisis (Seek Emergency Care)	higher than 180	and/or	higher than 120

Source: American Heart Association

6. Glucose Status

The mean normal blood glucose level in humans is about 5.5 mmol/L (100 mg/dL); however, this level fluctuates throughout the day. Blood sugar levels for those without diabetes and who are not fasting should be below 6.9 mmol/L (125 mg/dL). ... The actual amount of glucose in the blood and body fluids is very small.

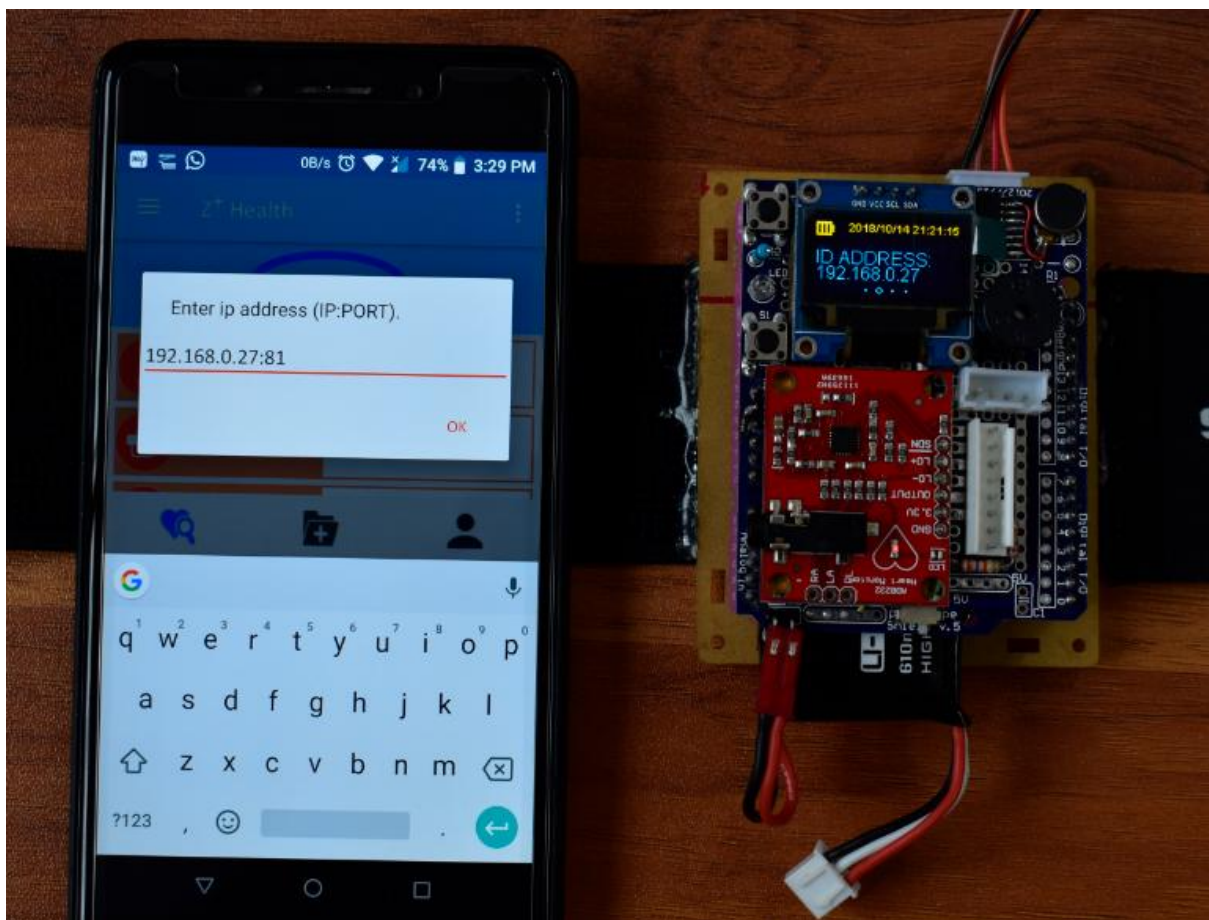


7. RRP Respiration Rate

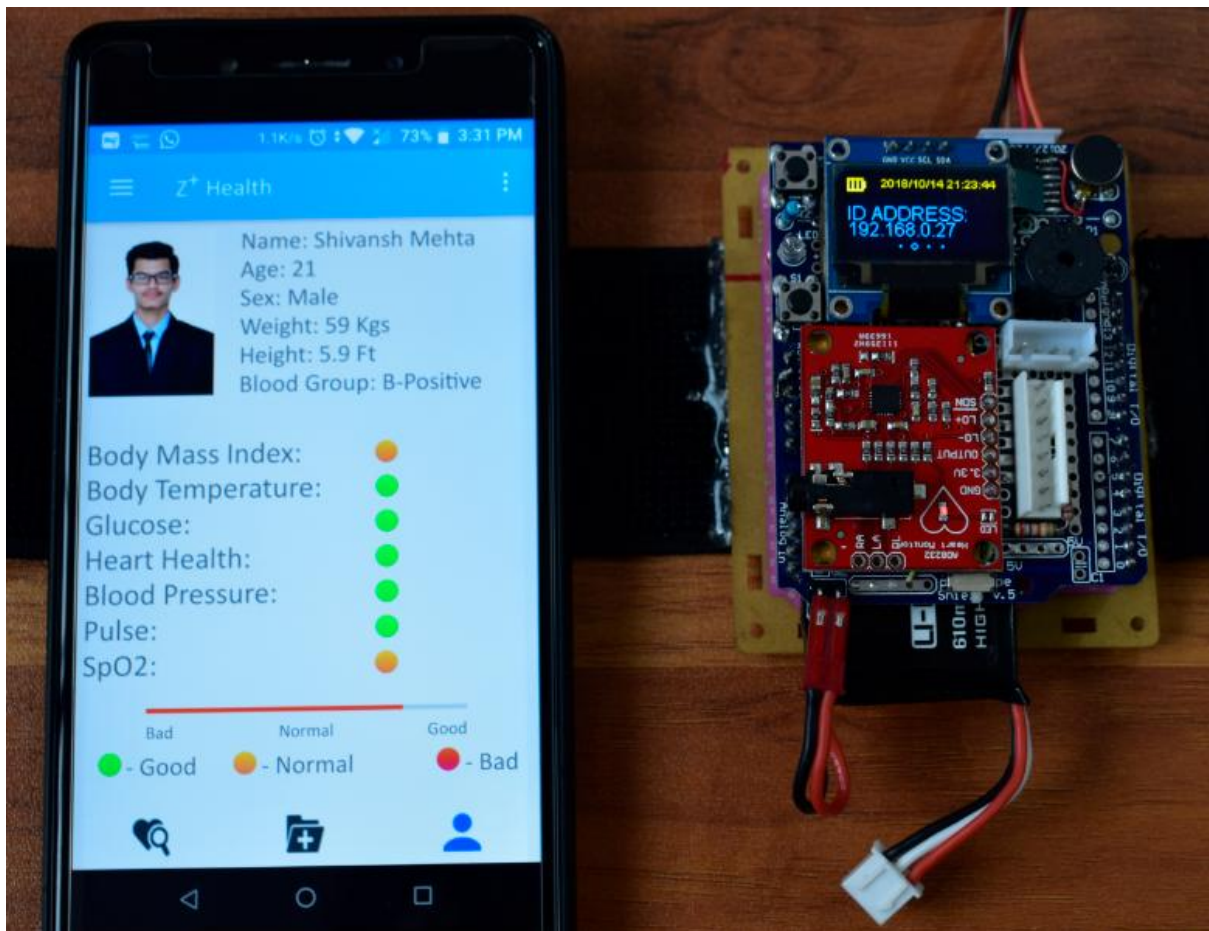
Respiratory rate: A person's respiratory rate is the number of breaths you take per minute. The normal respiration rate for an adult at rest is 12 to 20 breaths per minute. A respiration rate under 12 or over 25 breaths per minute while resting is considered abnormal.

10. Android APP

App name : Z+Health









References:

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