



SAARTHI: A Healthcare Ecosystem



MEET OUR TEAM



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INTRODUCTION

Measuring blood pressure traditionally involves a nurse or the doctor placing an inflatable handcuff to somewhere above your elbow, asking you to breathe in and out. They then use a stethoscope to understand the timing of the measure. Cuff less BP measurement has always been a challenge. There are a wide variety of studies where several methods were developed for cuff-free BP measurement and one among them which showed great potential is PTT or Pulse Transit Time, which acts as an indicator of Blood Pressure. Pulse Transit Time in simple words is the time taken by a pulse wave to propagate from heart to the point where reading is taken, in our case the finger tip



PROBLEM STATEMENT

To overcome traditional and improved method to check blood pressure and create a initial therapy kit for immediate action in emergency.



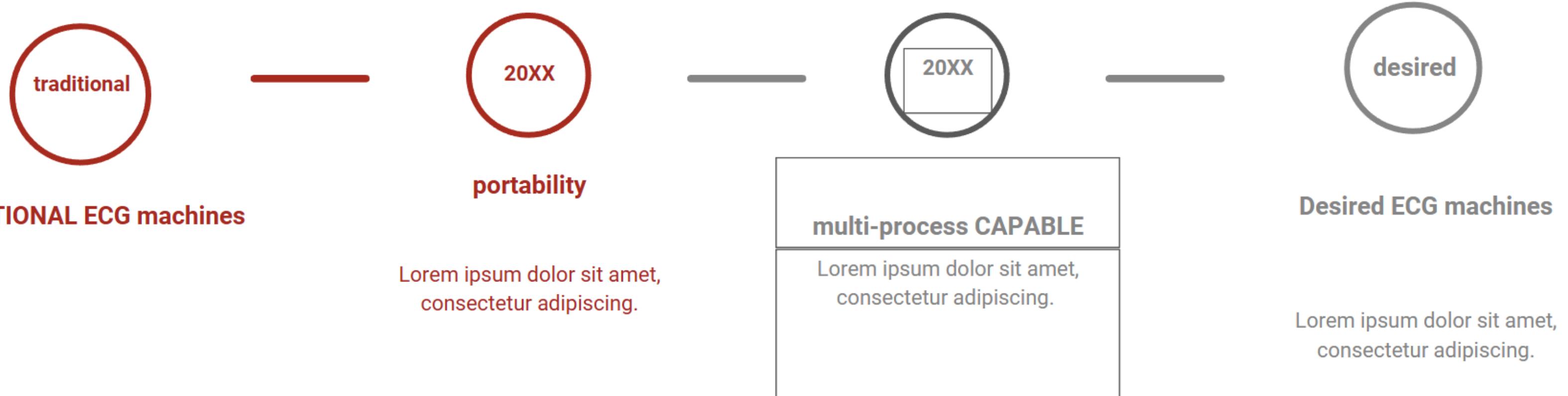
NOVELTY

- ***AFFORDABLE VITAL CHECKUP***
- ***TIME EFFICIENT***
- ***PEACE OF MIND***
- ***ONE TIME INVESTMENT***

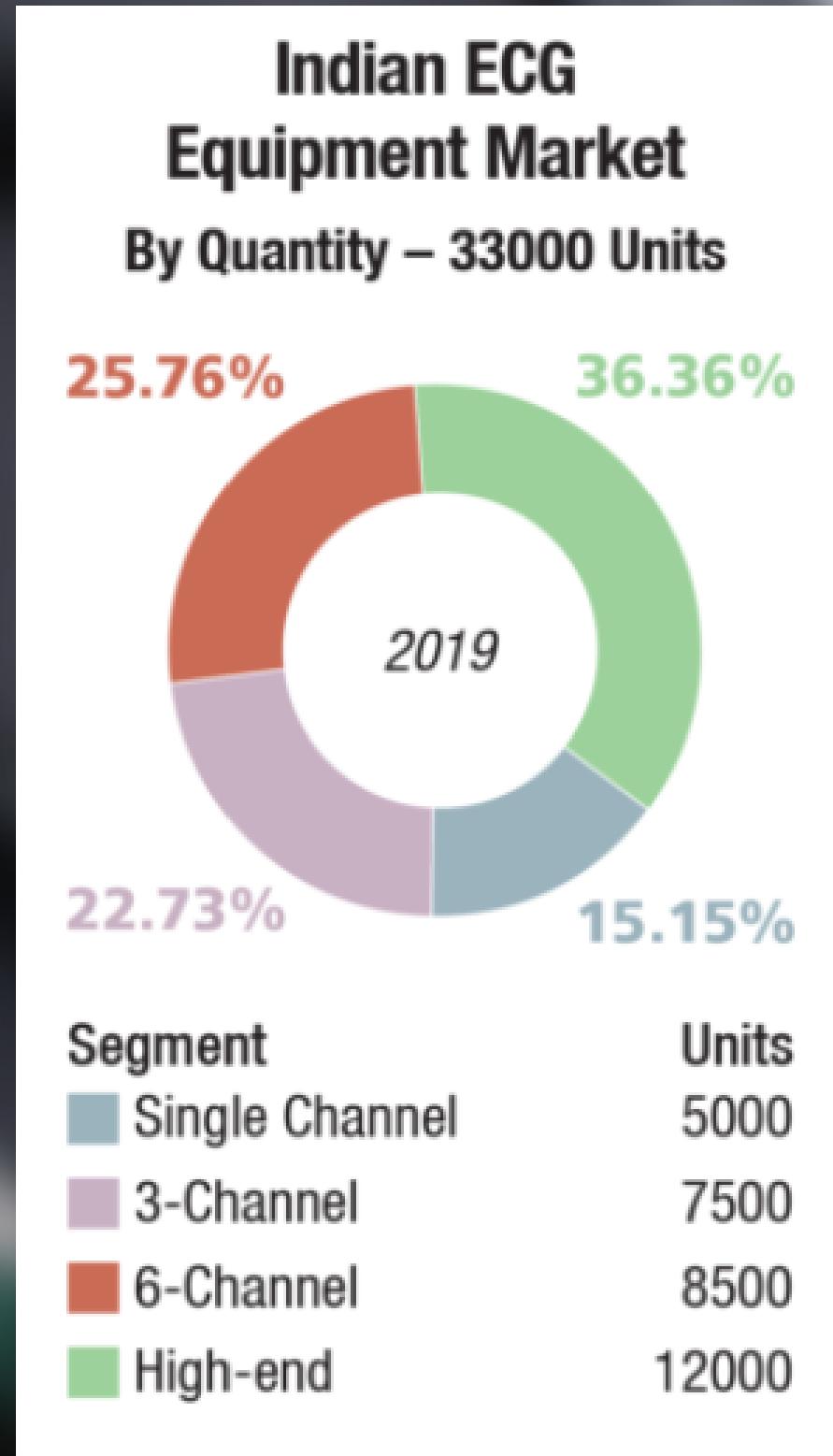
LITERATURE SURVEY

Sr No	Topic name	Author	Summary
1	A Comparative Study on Instantaneous and Mean Pulse Arrival Time for Cuffless Blood Pressure Estimation	W S Wan Zaki, R Correia, S Korposh, B R Hayes-Gill and S P Morgan	In the literature, the PAT was determined based on a mean at a certain number of heartbeats or a certain period, but none of them deployed a single pulse wave for PAT calculation. Hence one of the contributions of this work is comparing the instantaneous PAT and the mean PAT with BP measurement. A linear regression model was applied to mean/instantaneous PAT-BP data, and the absolute correlation coefficient, $ r $, was determined on each volunteer. The results show that the PAT is well correlated with systolic BP but shows a weak correlation between PAT and diastolic BP. The statistical analysis shows no significant difference between a mean \pm SD of 15 pulses and instantaneous PAT with BP. Thus, there will be insignificant changes of the calibration equation using a mean of 15 pulses or instantaneous PAT in BP estimation for each volunteer.
2	A Comparison of Cuff-less Blood Pressure Estimation Between Pulse Arrival Time and Pulse Transit Time Using Photoplethysmography	Tipnirin Vajanarat , Apiwat Lck-uthai	The author had constructed the cuff-less BP measurement system by a single-channel ECG and two channel PPG. We compared the SBP estimation accuracy between PAT and PTT using IEEE std 1708™-2014 as a guideline. The results showed that PAT is more accurate in SBP estimation, while PTT is an unreliable parameter. We had improved the methodological accuracy by increasing the sampling rate of 2 kHz, raising times of PAT and PTT measurement in the calibration process to 7 points for each subject. We used MAD as evaluation criteria according to the IEEE std. PAT showed an excellent relation for SBP estimation and possible clinical diagnostic applications in the future with improvements. Further work is required to develop the methods and emphasis on PAT and PEP measurement for unerring cuff-less BP monitoring

RESEARCH GAP ANALYSIS



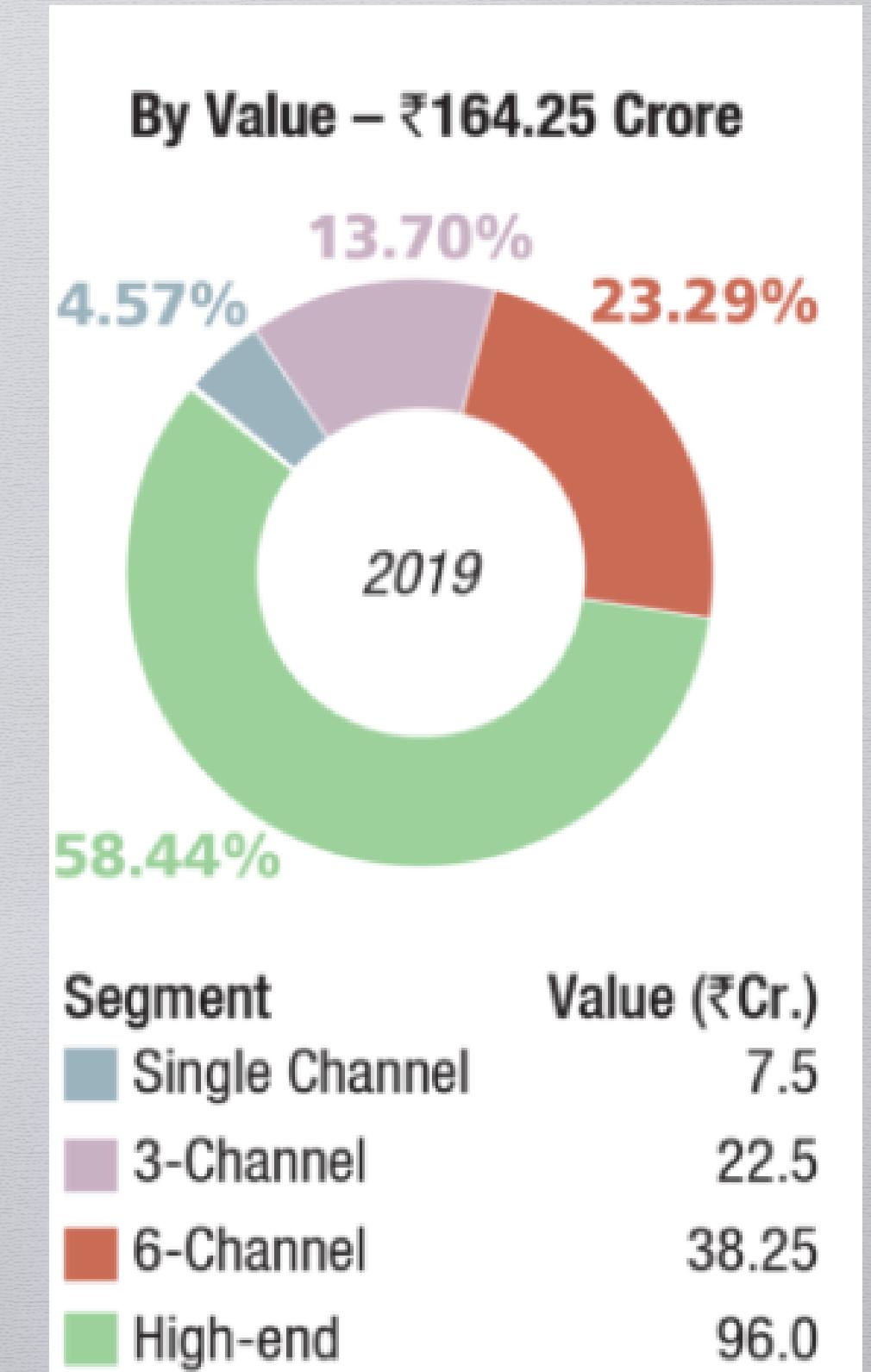
MARKET ANALYSIS



OPPORTUNITIES AND FORECAST, 2020 - 2030

Electrocardiograph (ecg) market is expected to reach **\$18.4 Billion** in 2030

Growing at a **CAGR of 8.3%**
(2021-2030)



OUR SOLUTION

- **We aim to address the issue of limited access to accurate and reliable vital sign monitoring for patients who are in need of continuous monitoring outside of a clinical setting. Our device will provide a portable, non-invasive solution for measuring and recording BP, SpO₂, temperature, and ECG values, enabling real-time monitoring and analysis of the data, which will help healthcare professionals to identify potential health issues and make more informed decisions about patient care.**
- **Health monitoring is done by using our proposed work in the form of a small kit and a web application for the same. The processed data is then transmitted via wireless data. The signals from the sensors are processed in the Arduino and the data is transmitted to the website using a Wi-Fi module.**
- **The temperature is calculated similarly by using a temperature calculating sensor and the selective temperature is displayed at the display panel. All these components are activated and functioning with the help of Arduino. The complete circuit is bound to a glove except for the parts that clamp to the body for ECG inspection. This makes the whole project easily portable and convenient for the consumer/customer. So in this way our project overcomes the mentioned problems like machine size, weight and portability and only measuring one parameter at a time.**

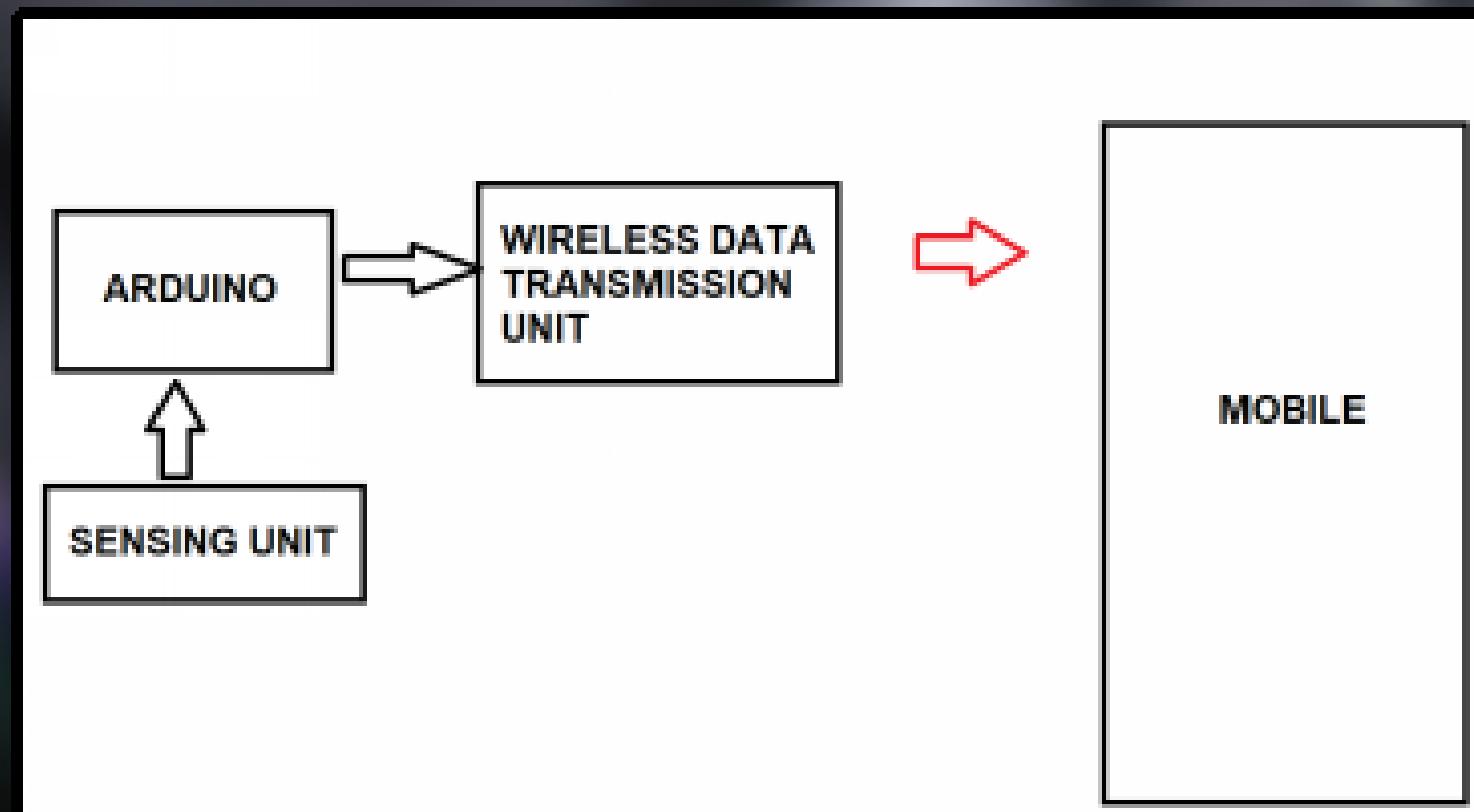
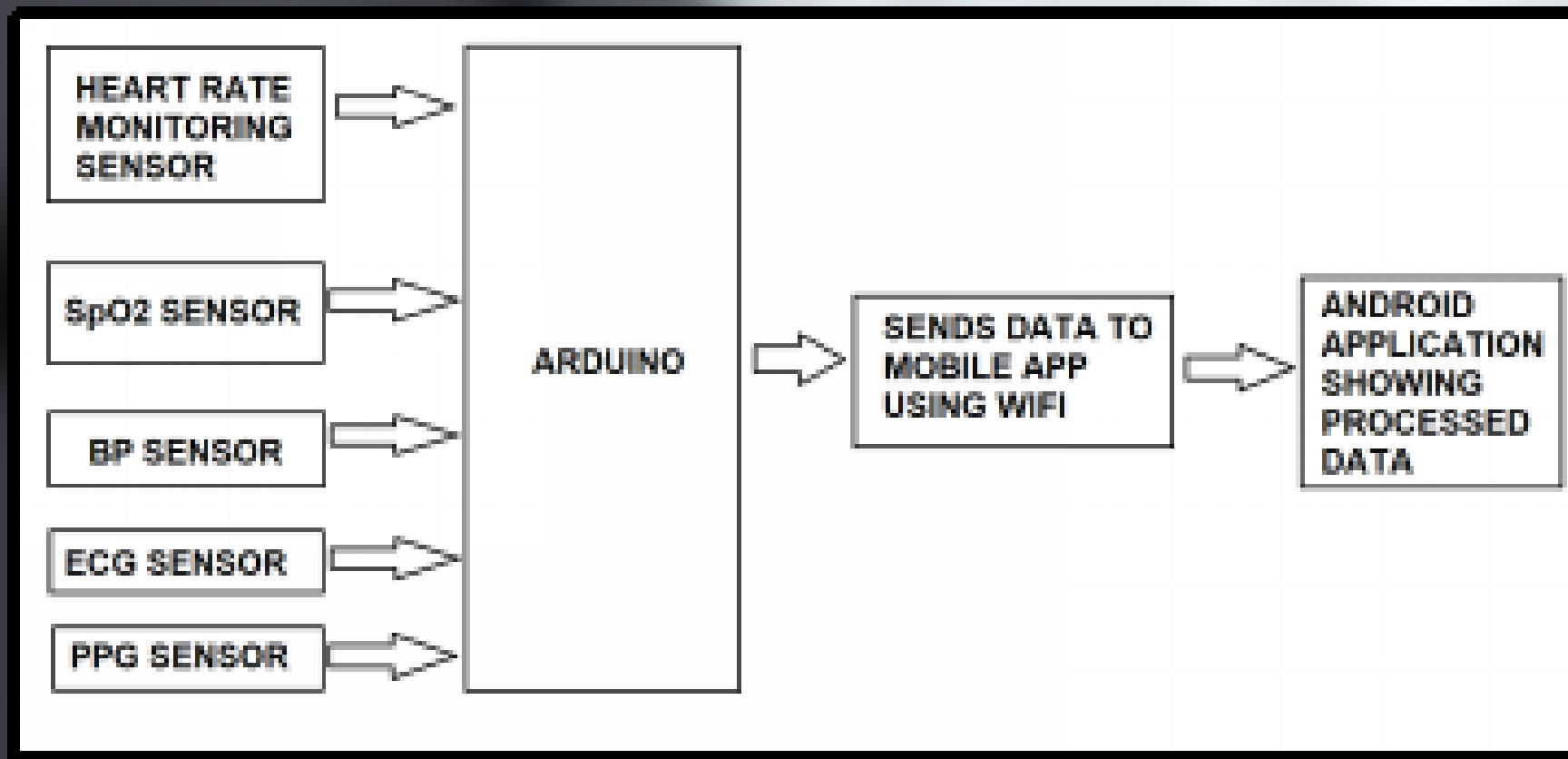
OUR SOLUTION: TECHNOLOGY

- ***Unlike traditional computer-based systems, IoT devices are “embedded” within other devices in order to provide enhanced functionality without exposing the user to the complexities of a computer.***
- ***The users interact with the device in a natural way, similar to their interactions with any other objects in the world.***

Main components used in IoT:

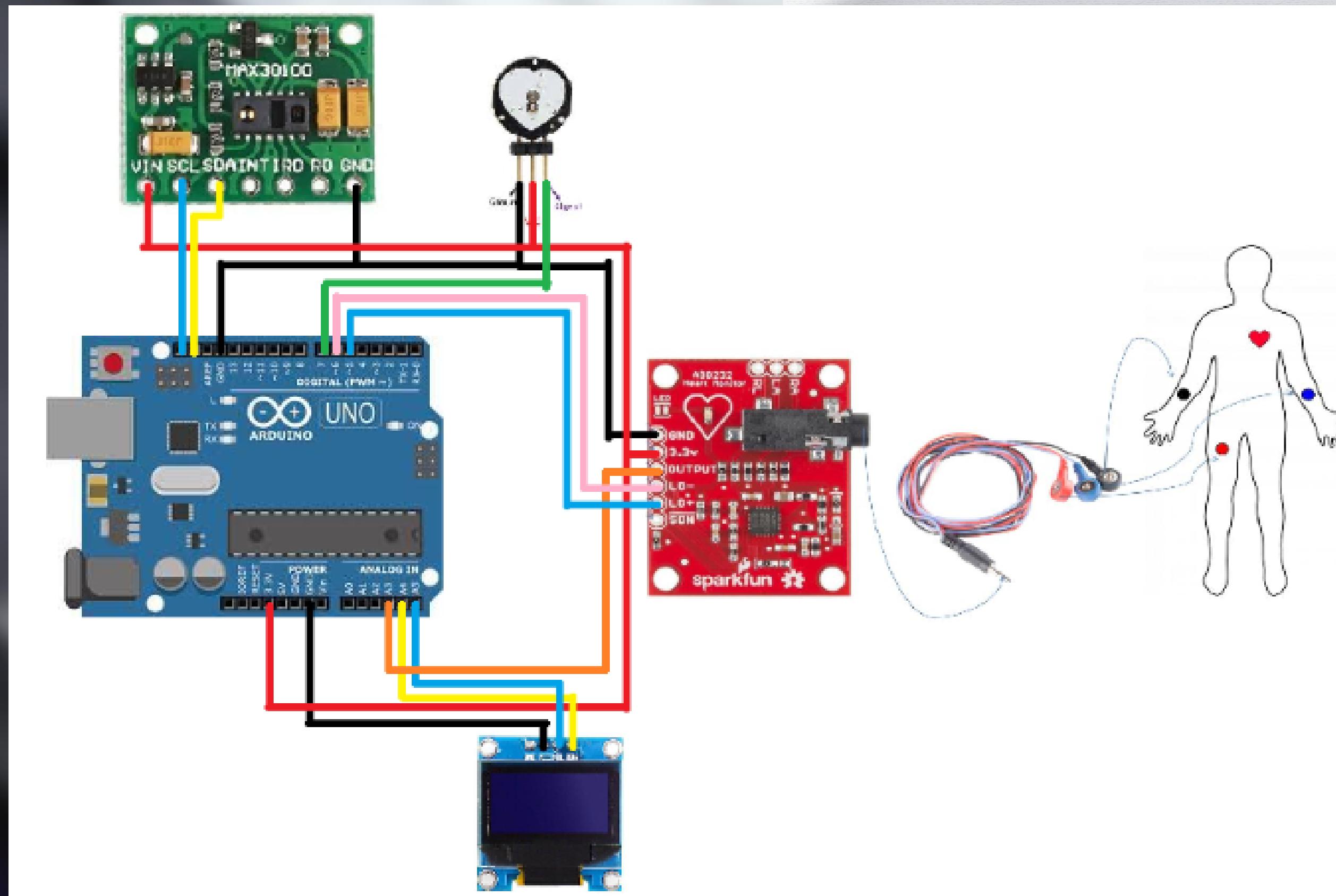
- ***Low-power embedded systems: Less battery consumption, high performance are the inverse factors that play a significant role during the design of electronic systems.***
- ***Sensors : Sensors are the major part of any IoT applications. It is a physical device that measures and detect certain physical quantity and convert it into signal which can be provide as an input to processing or control unit for analysis purpose.***

METHODOLOGY

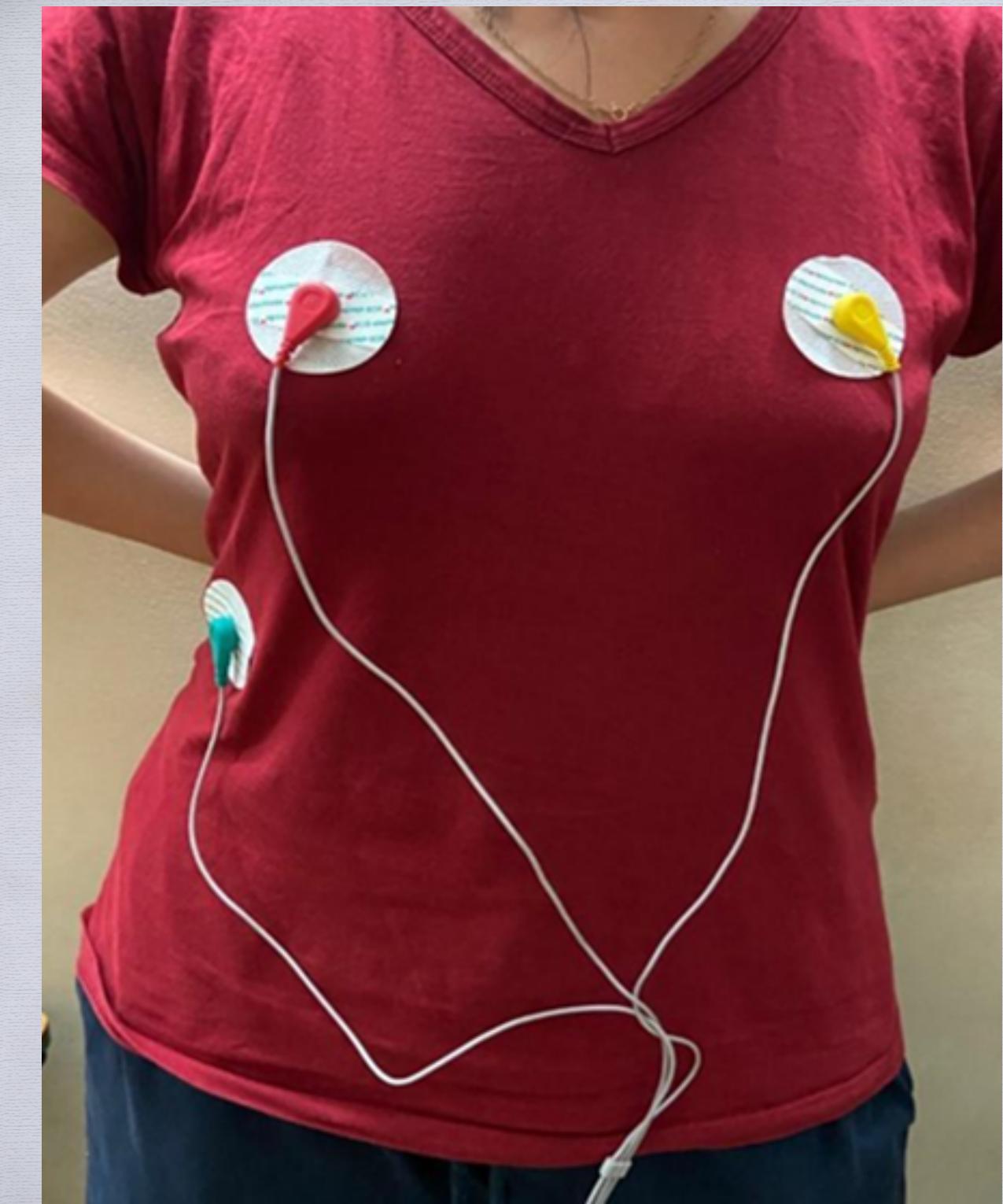
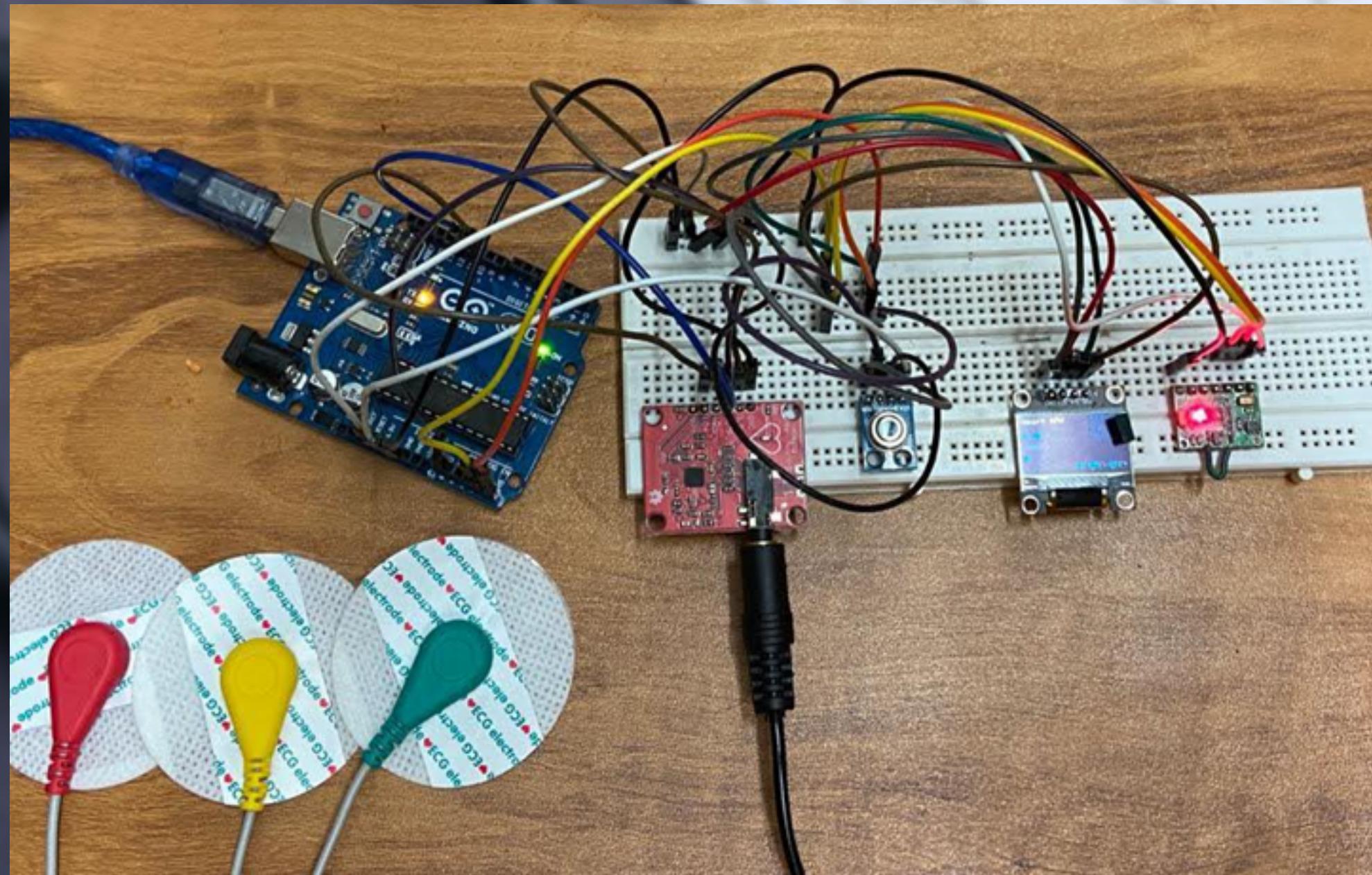


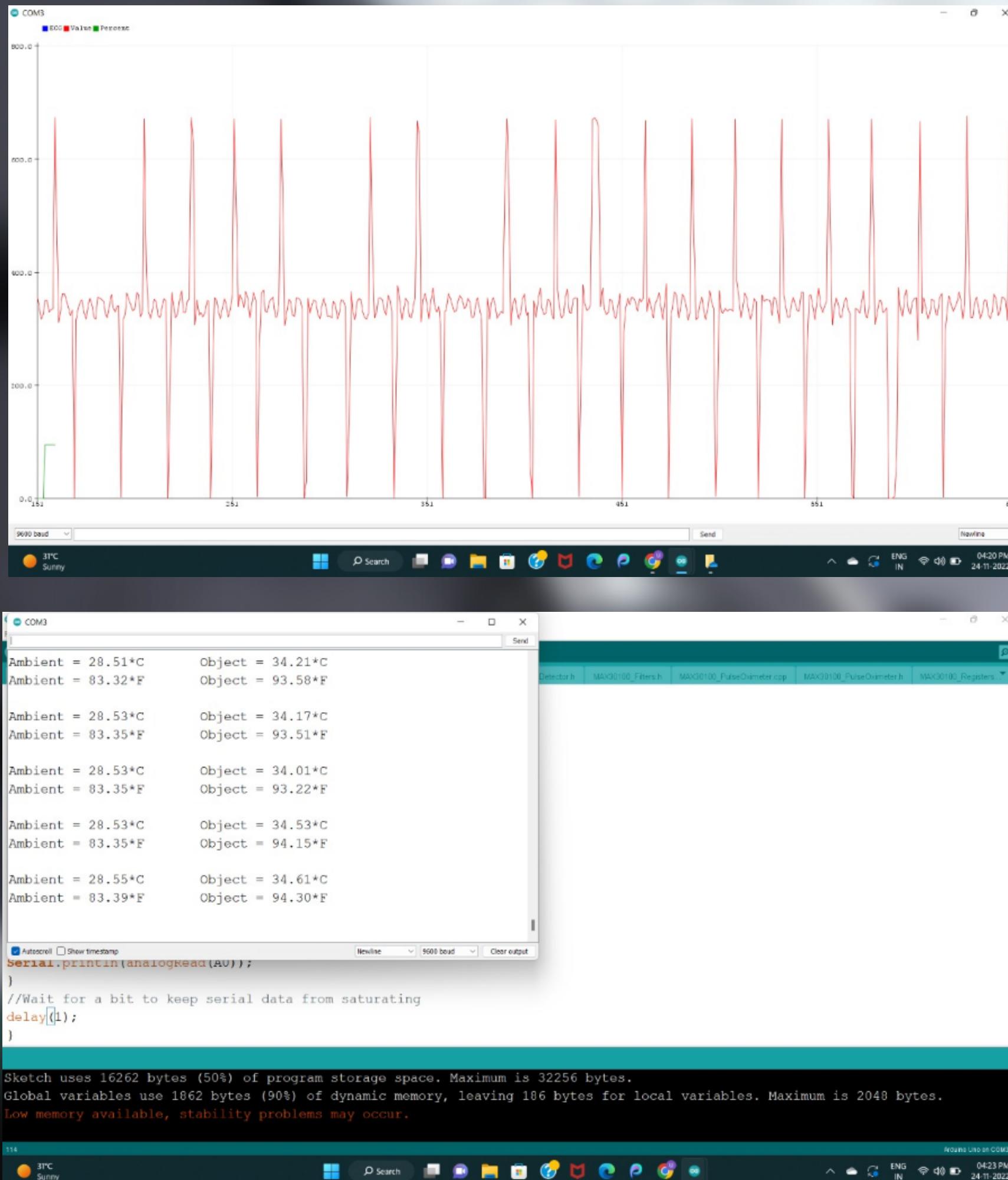
- 1. The patient would place his/her finger on the sensing unit.**
- 2. The sensors would sense the heartbeat and the vitals with body temperature.**
- 3. ECG and BP sensors will be situated on chest and arm.**
- 4. The sensed data rates are sent to Arduino Uno in the form of signals.**
- 5. The Arduino processes the same data and would transmit the data to the Wi-Fi module.**
- 6. The Wi-Fi module would then retransmit the data to the smartphone application.**
- 7. Processing Data through Arduino UNO**

CIRCUIT DIAGRAM



PROTOTYPE



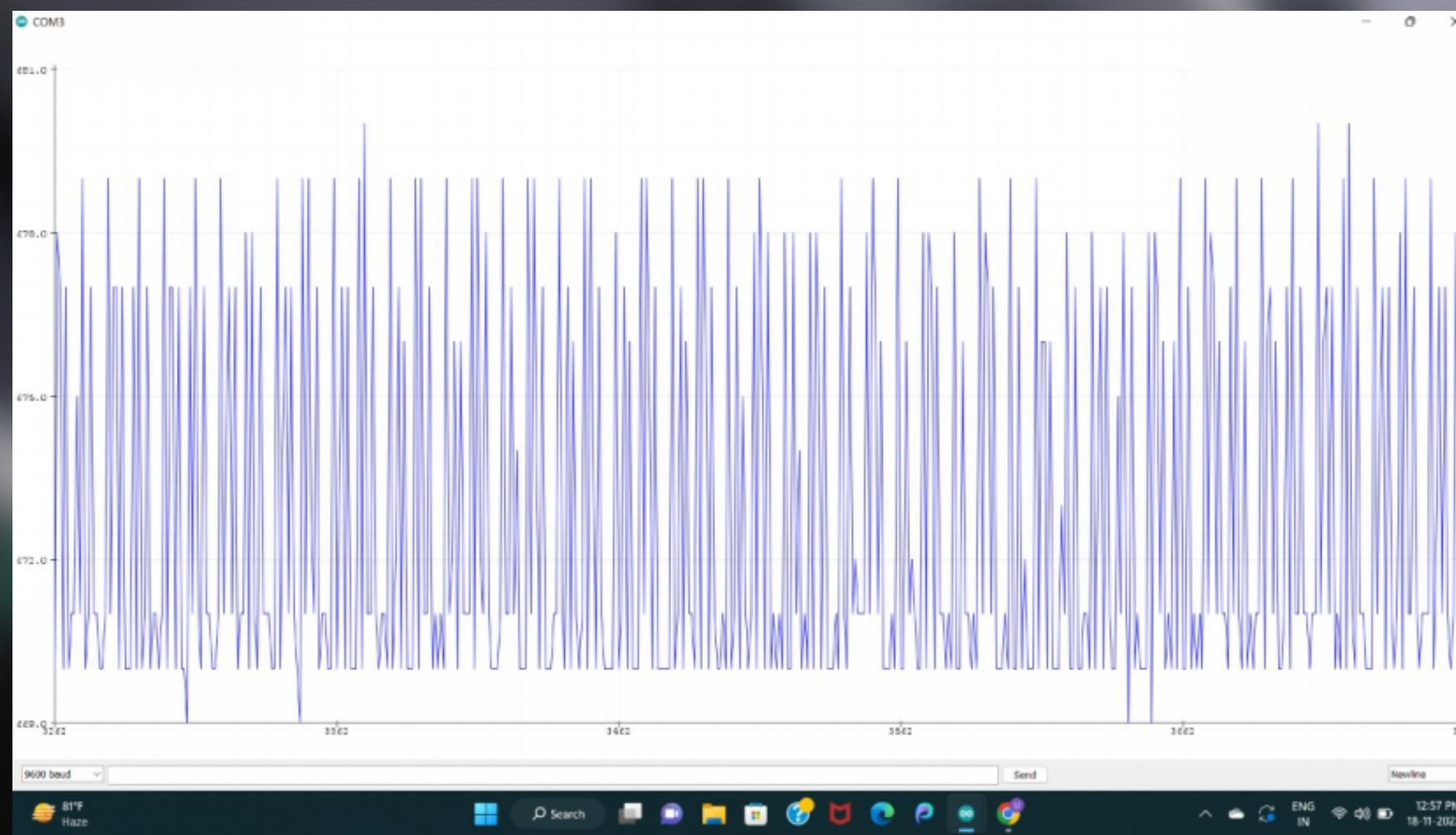


RESULTS & DISCUSSIONS

- Once finger is placed on the sensor the expected output is shown on serial monitor and serial plotter**
- The patient can see its Spo₂ level with that his or her BPM, Temperature.**
- For Heart patients ECG values are checked twice or thrice a week, hence our proposed model shows ECG values and graph on serial plotter and Serial monitor.**

```
COM3
ECG Value:672
ECG Value:671
ECG Value:672
ECG Value:673
Beat!
ECG Value:672
ECG Value:677
ECG Value:672
ECG Value:671
ECG Value:672
ECG Value:672
Heart BPM:83.02----Oxygen Percent:94

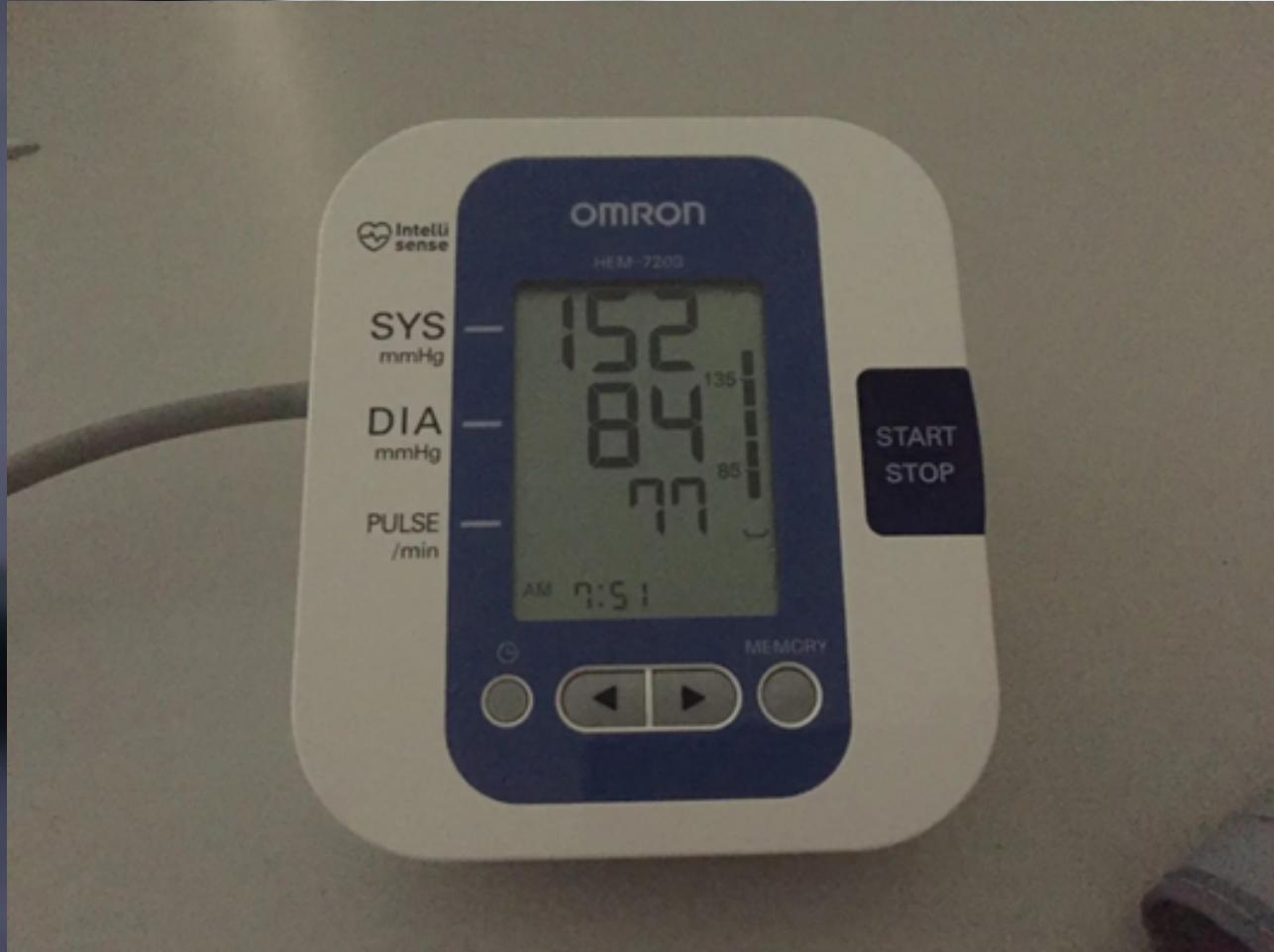
ECG Value:671
ECG Value:671
ECG Value:671
ECG Value:672
ECG Value:673
ECG Value:672
ECG Value:676
ECG Value:676
ECG Value:671
ECG Value:677
ECG Value:675
ECG Value:671
Beat!
ECG Value:676
ECG Value:671
 Autoselect  Show timestamp
Newline 9600 baud Clear output
81°F Haze
```





CALIBRATION

- **Calibrated our model by comparing the output values obtained by the model vs the values obtained from the traditional method.**
- **Here as expected we can see the diastolic blood pressure value in traditional sphygmomanometer comes out to be 84 whereas the value obtained from the proposed model by just placing the finger on the sensor is 84.06 which accurately matches with the traditional one.**



```
Send
ECG Value:386
ECG Value:164
ECG Value:276
ECG Value:326
ECG Value:335
ECG Value:335
ECG Value:345
ECG Value:359
ECG Value:390
ECG Value:430
ECG Value:420
Heart BPM:84.06-----Oxygen Percent:95

ECG Value:306
Beat!
ECG Value:324
 Autoscroll  Show timestamp
Newline 9600 baud Clear output
```



```
ECG Value:386  
ECG Value:164  
ECG Value:276  
ECG Value:326  
ECG Value:335  
ECG Value:335  
ECG Value:345  
ECG Value:359  
ECG Value:390  
ECG Value:430  
ECG Value:420  
Heart BPM:84.06----Oxygen Percent:95  
  
ECG Value:306  
Beat!  
ECG Value:324
```

Autoscroll Show timestamp Newline 9600 baud Clear output

CALIBRATION

On the left is the normal pulse oximeter, when tested it showed 95% oxygen level. After using the traditional method the user switched to our proposed model where it is again observed to be 95% in front of the Oxygen percent shown in the right image.



CONCLUSION

- *Proposed model is with the functionality of checking a human body's vitals.*
- *The vitals calculated with the guidance of this project are ECG, oxygen level, body temperature and blood pressure rate.*
- *The prospect of these novelties is to free the average citizen from the heavy burden of the hospital bills.*
- *It enables the patients to get a quick heads up to the normal vitals at home in comfort.*



FUTURE SCOPE

- ***Interface Glucose Sensor and heart attack detector(PPG Value) to add more features to the kit***
- ***Also we can add a speech recognition for the people who are illiterate or are unable to operate the system .***
- ***It will help them to operate the kit as per instructions prompted.***



OBSTACLES

- ***The calibration of sensors.***
- ***Error calculation and fixation.***
- ***Design and Prototype manufacturing***
- ***Sensor shouldering for proper functioning.***

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Thank
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