Department of Computer Science & Engineering
Shri Shankaracharya Institute of Professional Management & Technology
Raipur (C.G.)

A SEPM Project Report
on

NOTIFIER FOR ABNORMAL PULSE RATE

Submitted To

Chhattisgarh Swami Vivekanand Technical University Bhilai, India

For

The Partial Fulfillment of Degree

of

Bachelor of Technology

in

Computer Science & Engineering

By

Anjali Jha	**Sudhanshu Shukla**	**Simran Banarase**
Roll No.-303302219017	**Roll No.-303302219108**	**Roll No.-303302219103**
En. No.-BH3700	**En. No.-BH3791**	**En. No.-BH3786**
Semester 6th (CSE)	**Semester 6th (CSE)**	**Semester 6th (CSE)**

Under the Guidance of

Mrs. Preeti Tuli

Asst. Professor

Department of Computer Science & Engineering

S.S.I.P.M.T, Raipur

Department of Computer Science & Engineering
Shri Shankaracharya Institute of Professional Management & Technology Raipur (C.G.)

SESSION 2021-22

Department of Computer Science & Engineering
Shri Shankaracharya Institute of Professional Management & Technology
Raipur (C.G.)

NOTIFIER FOR ABNORMAL PULSE RATE

Department of Computer Science & Engineering
Shri Shankaracharya Institute of Professional Management & Technology
Raipur (C.G.)

DECLARATION BY THE CANDIDATE

We the undersigned solemnly declare that the report of the SEPM Project work entitled **Notifier for Abnormal Pulse Rate,** is based on my own work carried out during the course of my study under the supervision of Mrs. Preeti Tuli.

We assert that the statements made, and conclusions drawn are an outcome of the project work. We further declare that to the best of my knowledge and belief that the report does not contain any part of any work which has been submitted for the award of any other degree/diploma/certificate in this University/deemed University of India or any other country.

(Signature of Candidate 1)	**(Signature of Candidate 2)**	**(Signature of Candidate 3)**
Name: Anjali Jha	**Name: Sudhanshu Shukla**	**Name: Simran Banarase**
Roll No.:303302219017	Roll No.: 303302219108	Roll No.: 303302219103
En. No.: BH3700	En. No.: BH3791	En. No.: BH3786
Semester: 6th	Semester: 6th	Semester: 6th

Department of Computer Science & Engineering
Shri Shankaracharya Institute of Professional Management & Technology
Raipur (C.G.)

CERTIFICATE OF THE SUPERVISOR

This is to certify that the SEPM project report of entitled **Notifier for Abnormal Pulse Rate** is a record of bonafide research work/Project work carried out by **Anjali Jha** bearing Roll No.: **303302219017** & Enrollment No.: **BH3700, Sudhanshu Shukla** bearing Roll No.: **303302219108** & Enrollment No.: **BH3791, Simran Banarase** bearing Roll No.: **303302219103** & Enrollment No.: **BH3786** under my guidance and supervision for the partial fulfillment of Degree of Bachelor of Technology of Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.), India.

To the best of my knowledge and belief the thesis embodies the work of the candidate him/herself, Has duly been completed, Fulfils the requirement of the Ordinance relating to the B.Tech degree of the University .Is up to the desired standard both in respect of contents and language for being referred to the examiners.

_____	_____
(Signature of HOD)	(Signature of Supervisor)
Dr. J.P.Patra	**Mrs. Preeti Tuli**
HOD, Dept of CSE	Asst. Professor, Dept of CSE
S.S.I.P.M.T, Raipur, C.G	S.S.I.P.M.T, Raipur, C.G

Forwarded to
Chhattisgarh Swami Vivekanand Technical University, Bhilai

_____

(Signature of the Principal)
Dr. Alok Kumar Jain
S.S.I.P.M.T, Raipur, C.G

Department of Computer Science & Engineering
Shri Shankaracharya Institute of Professional Management & Technology
Raipur (C.G.)

CERTIFICATE BY THE EXAMINERS

The Thesis/Project entitled **Notifier for Abnormal Pulse Rate,** Submitted by**: Anjali Jha (Roll No.: 303302219017, Enrollment No.: BH3700), Sudhanshu Shukla (Roll No.: 303302219108, Enrollment No.: BH3791), Simran Banarase (Roll No.: 303302219103, Enrollment No.: BH3786)** has been examined by the undersigned as a part of the examination and is hereby recommended for the partial fulfillment of the degree of Bachelor of Technology of Chhattisgarh Swami Vivekanand Technical University, Bhilai.

Internal Examiner	**External Examiner**
Date:	**Date:**

ACKNOWLEDGEMENT

We thank the almighty for giving us the encourage and perseverance in completing **"Notifier for Abnormal Pulse Rate"**. This project itself is acknowledgements for all those people who have given us their heartfelt co-operation in making this project a grand success. We extend our sincere thanks to **Mr. Nishant Tripathi, Chairman of our college,** for providing sufficient infrastructure and good environment in the college to complete our course.

We are thankful to our **Principal, Dr. Alok Kumar Jain** for providing the necessary infrastructure and labs and also permitting to carry out this project. With extreme jubilance and deepest gratitude, we would like to thank **Head of the Computer Science and Engineering Department, Dr. J.P.Patra** for his constant encouragement.

We are thankful to our project coordinator **Mr. Anand Tamrakar, Assistant Professor, CSE Department,** for his support and valuable suggestions regarding project work. We are greatly indebted to project guide **Mrs. Preeti Tuli, Assistant Professor, CSE Department,** for providing valuable guidance and support at every stage of this project work. We are profoundly grateful towards the unmatched services rendered by him. Our special thanks to all the faculty of Computer Science and Engineering and peers for their valuable advises at every stage of this work.

(Signature of Candidate 1)	(Signature of Candidate 2)	(Signature of Candidate 3)
Name: Anjali Jha	**Name: Sudhanshu Shukla**	**Name: Simran Banarase**
Roll No.: 303302219017	Roll No.: 303302219108	Roll No.: 303302219103
En. No.: BH3700	En. No.: BH3791	En. No.: BH3786
Semester: 6th	Semester: 6th	Semester: 6th

LIST OF SYMBOLS

,	Comma
.	Full Stop
'	Inverted comma
( )	Parenthesis
:	Colon
-	Hyphen
" "	Double inverted comma
[ ]	Angle Bracket

LIST OF ABBREVIATIONS

SRS	System Requirement Specification
DFD	Data Flow Diagram
UML	Unified Modelling Language
ER	Entity Relationship
ER-D	Entity Relationship Diagram

LIST OF FIGURES

TABLE OF CONTENTS

CHAPTER-I

INTRODUCTION

1.1 Project Overview

In this system there are two segments the hardware which is used to calculate heartbeat and the other is to continuously monitor heartbeat data which is collected in the previous step. This sensor is then interfaced to an Arduino Mega 2560 microcontroller that permits checking of the heartbeat value and communicating them to the internet by using Bolt Wi-Fi module. The client can set a limit whenever the client's heartbeat exceeds the threshold limit then by using online API services like Telegram we send SMS to the doctor/client stating the patient's current heartbeat.

1.2 Introduction

Among the fatal problems which cause the death of humans is respiratory problems. On the off chance that checking our wellbeing consistently, at that point we can identify various sicknesses by recognizing them well in advance. Many individuals have lost their lives to coronary syndromes. Especially at this point time (Corona virus period) doctors cannot physically meet and treat the patients until and unless the situation is critical. Covid-19 pandemic has caused many problems to everyone and especially the most affected ones are the patients. Patients whose heart pulse needs to be monitored regularly by the concerned doctors are affected by this Covid19 outbreak. There has been a communication gap formed between these patients their concerned doctors/caretakers.So we have developed a system using Internet of Things to assist individuals and help them get immediate treatment. In this system we use a pulse sensor which when a finger is placed on it calculates the heartbeat of the person.

Due to the implementation of lockdown all over the world the situation got worse for the patients. This is where our idea flourished to help those section of patients whose heart pulse needs to be monitored regularly. So we have developed a system using Internet of Things to assist individuals and help them get immediate treatment. In this system we use a pulse sensor which when a finger is placed on it calculates the heartbeat of the person.

Our project "Notifier for Abnormal Pulse rate using Arduino" mainly focuses on the communication gap between the patients and their doctors. The main aim of our project is to establish a communication bridge between the patients and the concerned caretakers/Doctors.

We have used reliable components such as Arduino Mega 2560 Board, which is the brains of the system, heart pulse IR sensor, which detects the heart pulse of the body, and BOLT Wi-Fi module for establishing a connection to send data through internet. We have used VS Code to run the program(code) required to detect the abnormality present in the heart pulse. For the notification module, we have used Telegram (Call me bot) as our online API service which sends data to the concerned doctor whenever there is an abnormality present in the patient's heart pulse.

Overall in this system there are two segments the hardware which is used to calculate heartbeat and the other is to continuously monitor heartbeat data which is collected in the previous step. This sensor is then interfaced to an Arduino Mega 2560 microcontroller that permits checking of the heartbeat value and communicating them to the internet by using Bolt Wi-Fi module. The client can set a limit whenever the client's heartbeat exceeds the threshold limit then by using online API services like Telegram we send SMS to the doctor/client stating the patient's current heartbeat.

CHAPTER-II

LITERATURE REVIEW & PROBLEM IDENTIFICATION

2.1 Literature Review

This paper centers on heart rate monitoring and alert which can screen the heartbeat rate condition of the patient. The framework decides the heartbeat rate per minute and afterward sends an SMS alert to the cell phone. It is a proficient framework and simple to deal with and in this way gives extraordinary flexibility and serves as an incredible improvement over other conventional monitoring an alert systems. In this paper design it is consistently observing the human heartbeat rate. It receives a signal from the body and sends SMS to the specialist and they're relative so at the time of cardiovascular failure, treatment can be given within time. Life is valuable to numerous individuals among us misfortune their life to respiratory failure. By utilizing this framework and checking our wellbeing at regular intervals it is possible to reduce the chance of coronary attack. This system is used to screen physical parameters like heart pulse-rates and send the purposeful data clearly to authority through a Web application. This System includes an IR base heartbeat sensor, Arduino Mega Board. This evaluation's heartbeat from a child to a senior person. The negligible exertion of the contraption will give fitting order post-effective checking structure." Heart Rate watching system using Heart rate Sensor and Arduino". With the progression of development, in this endeavor, we can identify heartbeat cautiously using Arduino. This paper depends on the observation of the patient that is done by the specialist constantly without actually visiting the patient. In this paper, IoT is turning into a significant stage for some administrations and applications. The pulse of the patient can be checked by the specialist or by the guardian without really visiting the patient. Subsequently, specialists can give quick services from the remote place or on the off chance that checked by the guardian. The framework is actualized utilizing pulse rate sensor, Arduino Mega and Bolt wi-fi. This framework is utilized to monitor physical parameter like heart beat and send the deliberate information legitimately to a specialist through SMS. The framework comprises an IR base heart beat sensor, Arduino Mega and Wi-fi module. This gadget will have the option to quantify heart beat from a newborn child to senior individual. The ease of the gadget will give proper command post successful checking framework.

However, a few difficulties happen for heartbeat measurements with the described method restricting it to specific applications. This strategy shows promising outcomes and is additionally useful for imaging systems. The primary target of this paper is to plan and build

up a framework that remotely screens the pulse and to play music relying upon the tune of heartbeat to commend practice systems. A heartbeat sensor circuit is intended to get the heartbeat per minute (bpm). The yield of the sensor is sent to the Arduino Ethernet shield's web server. Individuals can screen physical status of the patent remotely from the web. The pulse is gotten from the pulse sensor. This paper examines into a remote monitoring system for observing the unusual electro cardio signals and transmitting information naturally through cell phone messages. Such a framework uses the Bolt Wi-fi module to achieve information transmission, bringing about an extraordinary decrease in costs for observing and alert, a smaller volume of monitoring device just as convenient and reliable operation.

2.2 Problem Identification

Ventilator patients who generally needs health monitoring and at this point time (Corona virus period) doctors cannot physically meet and treat the patients until and unless the situation is critical. So we have developed a system using Internet of Things to assist individuals and help them get immediate treatment.

2.3 System Requirement Analysis

The SRS is a specification for a specific software product, program, or set of applications that perform particular functions in a specific environment.

2.3.1 Software Requirements

- **Arduino IDE**

  It contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

- **VS Code**

  Visual Studio Code is a streamlined code editor with support for development operations like debugging, task running, and version control. It aims to provide just the tools a developer needs for a quick code-build-debug cycle and leaves more complexworkflows to fuller featured IDEs, such as Visual Studio IDE.

- **Python**

  Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built-in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together.

2.3.2 Hardware Requirements

- Arduino Mega 2560 Board
- Wi-fi Module
- Heart Beat Sensor

2.4 Data Flow Diagram

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It can be manual, automated, or a combination of both. It shows how data enters and leaves the system, what changes the information, and where data is stored.

The objective of a DFD is to show the scope and boundaries of a system as a whole. It may be used as a communication tool between a system analyst and any person who plays a part in the order that acts as a starting point for redesigning a system. The DFD is also called as a data flow graph or bubble chart.

The Data Flow Diagram has 4 components:

- Process:

  Input to output transformation in a system takes place because of process function. The symbols of a process are rectangular with rounded corners, oval, rectangle or a circle.

- Data Flow:

  Data flow describes the information transferring between different parts of the systems. The arrow symbol is the symbol of data flow. A relatable name should be given to the flow to determine the information which is being moved. Data flow also represents material along with information that is being moved.

- Warehouse:

  The data is stored in the warehouse for later use. Two horizontal lines represent the symbol of the store. The warehouse is simply not restricted to being a data file rather it can be anything like a folder with documents, an optical disc, a filing cabinet.

- Terminator:

  The Terminator is an external entity that stands outside of the system and

communicates with the system.

A data flow diagram can dive into progressively more detail by using levels and layers, zeroing in on a particular piece. DFD levels are numbered 0, 1 or 2, and occasionally go to even Level 3 or beyond. The necessary level of detail depends on the scope of what you are trying to accomplish.

- **DFD level** 0 is also known as fundamental system model, or context diagram represents the entire software requirement as a single bubble with input and output data denoted by incoming and outgoing arrows. Then the system is decomposed and described as a DFD with multiple bubbles. Parts of the system represented by each of these bubbles are then decomposed and documented as more and more detailed DFDs. This process may be repeated at as many levels as necessary until the program at hand is well understood. It is essential to preserve the number of inputs and outputsbetween levels, this concept is called leveling by DeMacro. Thus, if bubble "A" has two inputs x 1 and x2 and one output y, then the expanded DFD, that represents "A" should have exactly two external inputs and one external output.

- **DFD Level** 1 provides a more detailed breakout of pieces of the Context Level Diagram. You will highlight the main functions carried out by the system, as you break down the high-level process of the Context Diagram into its subprocesses.

- **DFD Level** 2 then goes one step deeper into parts of Level 1. It may require more text to reach the necessary level of detail about the system's functioning.

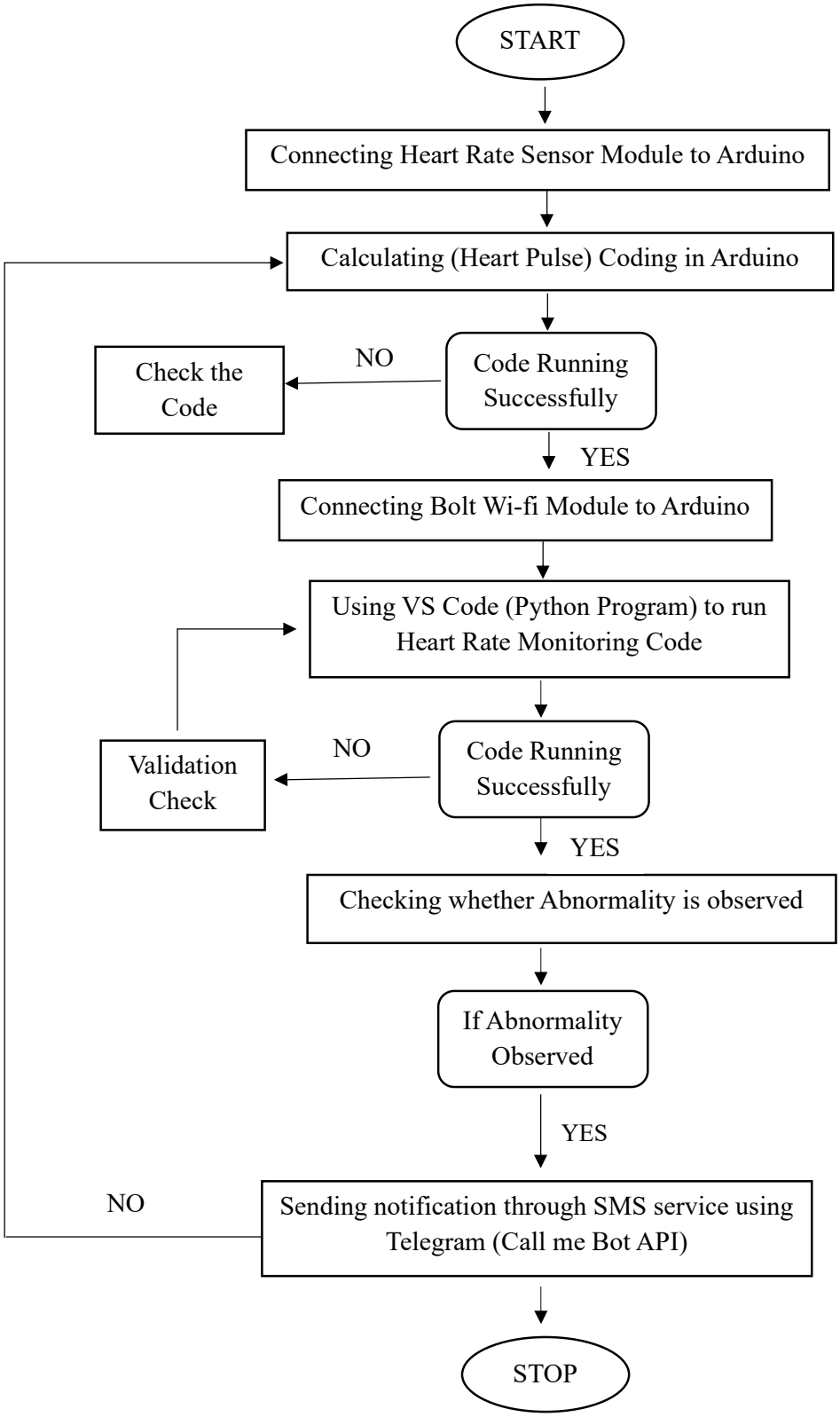

Fig. 2.4 Data Flow Diagram

CHAPTER-III
SYSTEM ANALYSIS

3.1 Workflow Diagram

A workflow diagram (also known as a workflow) provides a graphic overview of the business process. Using standardized symbols and shapes, the workflow shows step by step how your work is completed from start to finish. It also shows who is responsible for work at what point in the process.

Designing a workflow involves first conducting a thorough workflow analysis, which can expose potential weaknesses. A workflow analysis can help you define, standardize and identify critical areas of your process.

A workflow chart is commonly used for documentation and implementation purposes since it provides a general overview of a business process. It's often the foundation for other documentation including flowcharts, data flow diagram, projects and more.

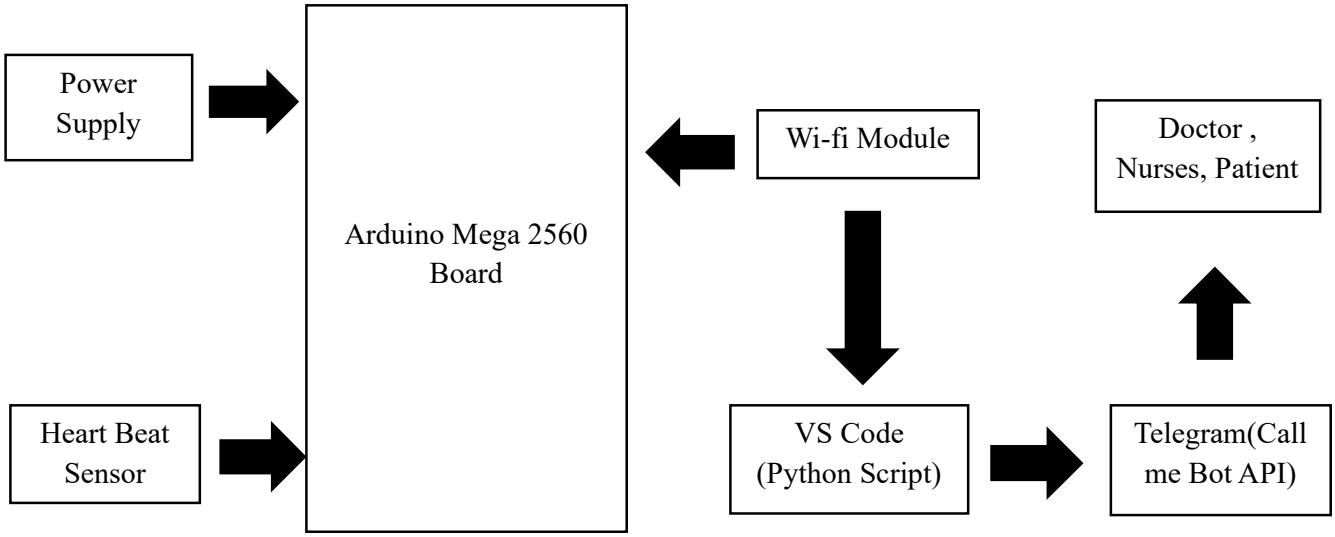

Fig. 3.1 Workflow Diagram

3.2 E-R Diagram

ERD stands for entity relationship diagram. People also call these types of diagrams ER diagrams and Entity Relationship Models. An ERD visualizes the relationships between entities like people, things, or concepts in a database. An ERD will also often visualize the attributes of these entities.

By defining the entities, their attributes, and showing the relationships between them, an ER diagram can illustrate the logical structure of databases. This is useful for engineers hoping to either document a database as it exists or sketch out a design of a new database.

An ER diagram can help businesses document existing databases and thereby troubleshoot logic or deployment problems or spot inefficiencies and help improve processes when a business wants to undertake business process re-engineering. ERDs can also be used to design and model new databases and make sure that engineers can identify any logic or designflaws before they're implemented in production.

- Document an existing database structure
- Debug, troubleshoot, and analyze
- Design a new database
- Gather design requirements
- Business process re-engineering **(BPR)**

When documenting a system or process, looking at the system in multiple ways increases the understanding of that system. ERD diagrams are commonly used in conjunction with a data flow diagram to display the contents of a data store. They help us to visualize how data is connected in a general way, and are particularly useful for constructing a relational database.

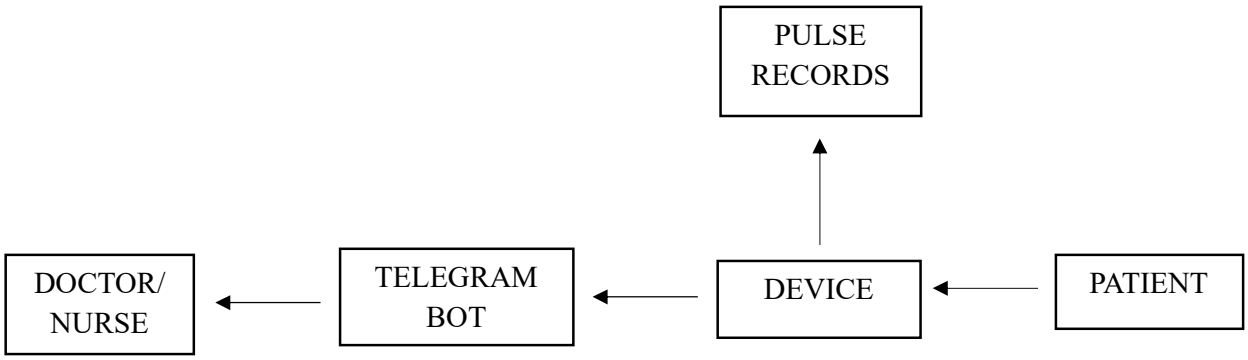

Fig. 3.2 E-R Diagram

3.3 Use Case Diagram

In the Unified Modeling Language (UML), a use case diagram can summarize the details of your system's users (also known as actors) and their interactions with the system. To build one, you'll use a set of specialized symbols and connectors.

A use case diagram doesn't go into a lot of detail—for example, don't expect it to model the order in which steps are performed. Instead, a proper use case diagram depicts a high-level overview of the relationship between use cases, actors, and systems. Experts recommend that use case diagrams be used to supplement a more descriptive textual use case.

UML is the modeling toolkit that you can use to build your diagrams. Use cases are represented with a labeled oval shape. Stick figures represent actors in the process, and the actor's participation in the system is modeled with a line between the actor and use case. To depict the system boundary, draw a box around the use case itself.

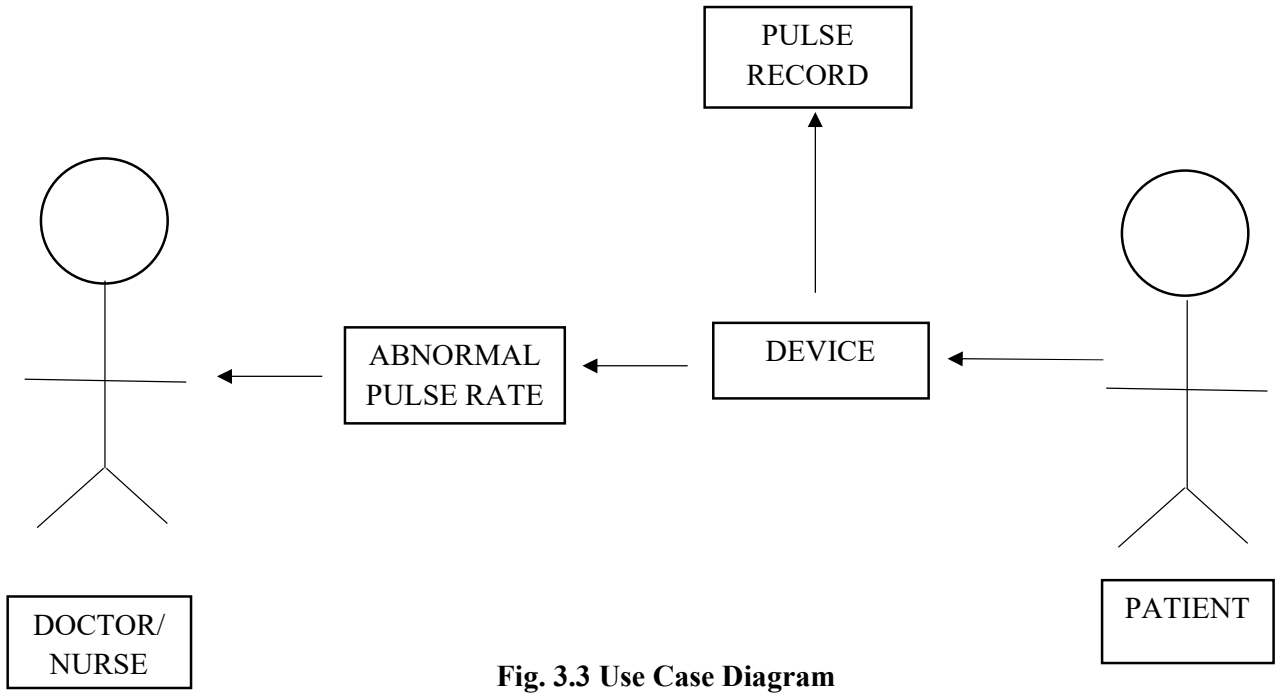

Fig. 3.3 Use Case Diagram

3.4 Sequence & Activity Diagram

A sequence diagram is a type of interaction diagram because it describes how and in what order group of objects works together. These diagrams are used by software developers and business professionals to understand requirements for a new system or to document an existing process. Sequence diagrams are sometimes known as event diagrams or event scenarios.

Sequence diagrams can be useful references for businesses and other organizations. Try drawing a sequence diagram to:

- Represent the details of a UML use case.
- Model the logic of a sophisticated procedure, function, or operation.
- See how objects and components interact with each other to complete a process.
- Plan and understand the detailed functionality of an existing or future scenario

The following scenarios are ideal for using a sequence diagram:

- Usage scenario: A usage scenario is a diagram of how your system could potentially be used. It's a great way to make sure that you have worked through the logic of every usage scenario for the system.
- Method logic: Just as you might use a UML sequence diagram to explore the logic of a use case, you can use it to explore the logic of any function, procedure, or complex process.
- Service logic: If you consider a service to be a high-level method used by different clients, a sequence diagram is an ideal way to map that out.

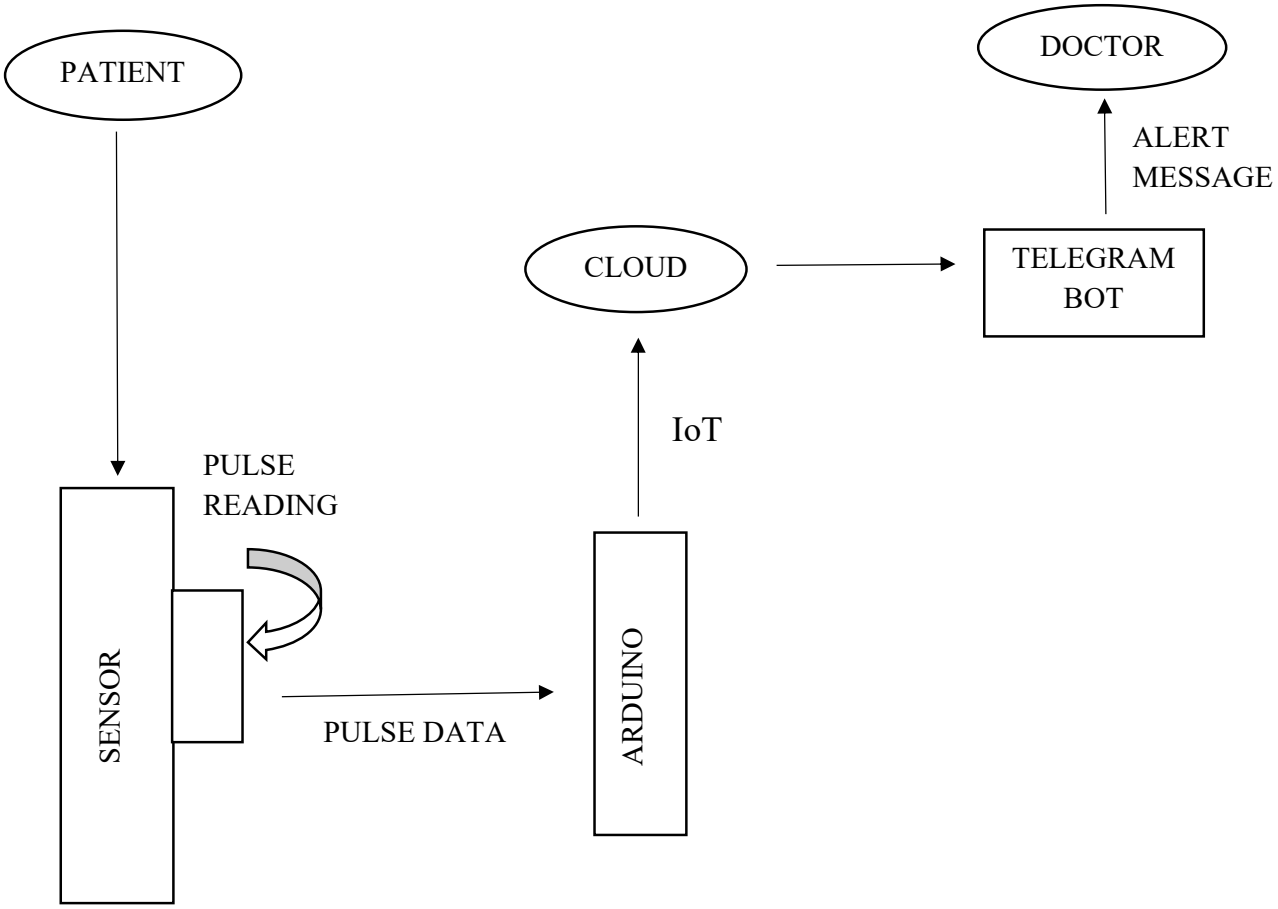

Fig. 3.4 Sequence & Activity Diagram

3.5 Collaboration & Class Diagram

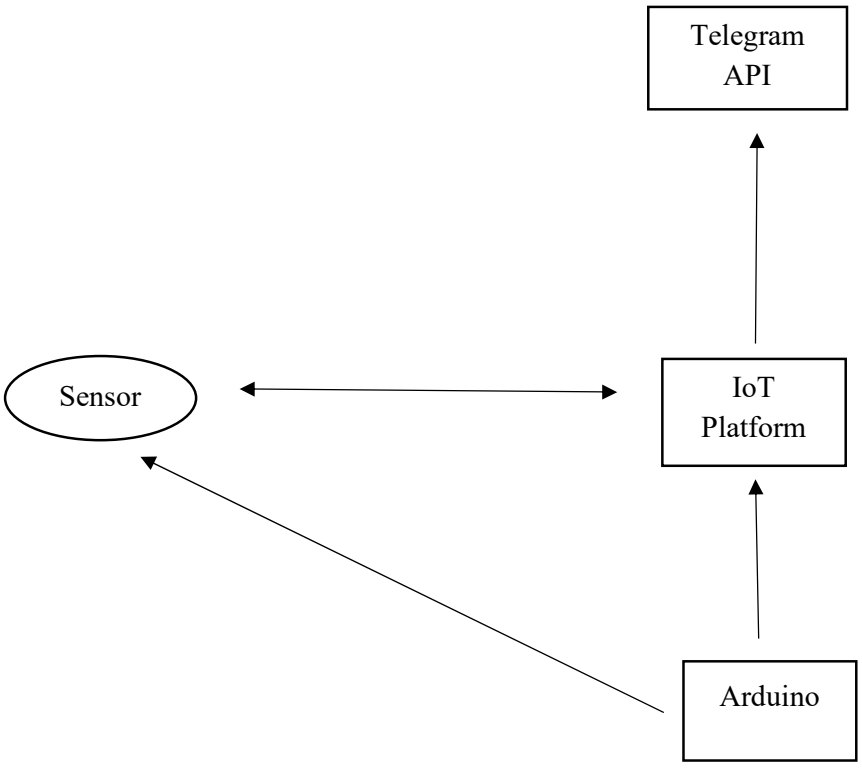

Fig. 3.5 Collaboration & Class Diagram

CHAPTER-IV

SNAPSHOT

4. Snapshots

Step 1: Connecting Heart Rate sensor module to Arduino

Step 2: Coding in Arduino

```
#define samp_siz 4
#define rise_threshold 5
// Pulse Monitor Test Script
int sensorPin = 0;
void setup() {
  Serial.begin(9600);
}
void loop ()
{
  float reads[samp_siz], sum;
  long int now, ptr;
  float last, reader, start;
  float first, second, third, before, print_va
  bool rising;
  int rise_count;
  int n;
  long int last_beat;
  for (int i = 0; i < samp_siz; i++)
    reads[i] = 0;
  sum = 0;
  ptr = 0;
  while(1)
  {
    n = 0;
    start = millis();
    reader = 0.;
    do
    {
      reader += analogRead (sensorPin);
      n++;
      now = millis();
    }
    while (now < start + 20);
    reader /= n;  // we got an average
    sum -= reads[ptr];
    sum += reader;
    reads[ptr] = reader;
    last = sum / samp_siz;
    // now last holds the average of the values in the array
    // check for a rising curve (= a heart beat)
    if (last > before)
    {
      rise_count++;
      if (!rising && rise_count > rise_threshold)
      {
        // Ok, we have detected a rising curve, which implies
        // Record the time since last beat, keep track of the
        // times (first, second, third) to get a weighed avera
        // The rising flag prevents us from detecting the same
        // more than once.
        rising = true;
        first = millis() - last_beat;
        last_beat = millis();
        // Calculate the weighed average of heartbeat rate
        // according to the three last beats
        print_value = 60000. / (0.4 * first + 0.3 * second + 0.3 * third);

        Serial.print(print_value);
        Serial.print('\n');
        // Ok, we have detected a rising curve, which implies a heartbeat.
        // Record the time since last beat, keep track of the two previous
        // times (first, second, third) to get a weighed average.
        // The rising flag prevents us from detecting the same rise
        // more than once.
        rising = true;
        first = millis() - last_beat;
        last_beat = millis();
        // Calculate the weighed average of heartbeat rate
        // according to the three last beats
        print_value = 60000. / (0.4 * first + 0.3 * second + 0.3 * third);

        Serial.print(print_value);
        Serial.print('\n');

        third = second;
        second = first;
      }
    }
    else
    {
      // Ok, the curve is falling
      rising = false;
      rise_count = 0;
    }
    before = last;
    ptr++;
    ptr %= samp_siz;
  }
```

Fig. 4.1 Arduino Code

Step 3: Connecting BOLT Wi-fi Module to Arduino

Step 4: Setting up SMS service using Telegram (Call me bot API)

Step 5: Using VS Code (Python Program) to run Heart Rate Monitoring Code

```python
import urllib3
import conf
import json
#import time
from time import sleep
from boltiot import Bolt
URL = "http://api.callmebot.com/text.php?user=anshu_2106&text=Alert! The Current Heart Rate is - "
http = urllib3.PoolManager()
minimum_limit = 57 #the minimum threshold of heart rate
maximum_limit = 100 #the maximum threshold of heart rate
mybolt = Bolt(conf.API_KEY, conf.DEVICE_ID)
#sms = Sms(conf.SID, conf.AUTH_TOKEN, conf.TO_NUMBER, conf.FROM_NUMBER)//
while True:
   response = mybolt.serialRead(0)
   data = json.loads(response)

   sensor_value = data['value']

   try:
      sensor_values = data['value'].split('\n')
      for sensor_value in sensor_values:
       if sensor_value != '':

          if float(sensor_value) > maximum_limit or float(sensor_value) < minimum_limit:
          #response = sms.send_sms("Alert! The Current Heart Rate is " +str(sensor_value))
              r = http.request('GET', URL +str(sensor_value))

              sleep(60)
         #print(r)
   except Exception as e:
      print(e)
```

Fig. 4.2 Python programming (VS Code)

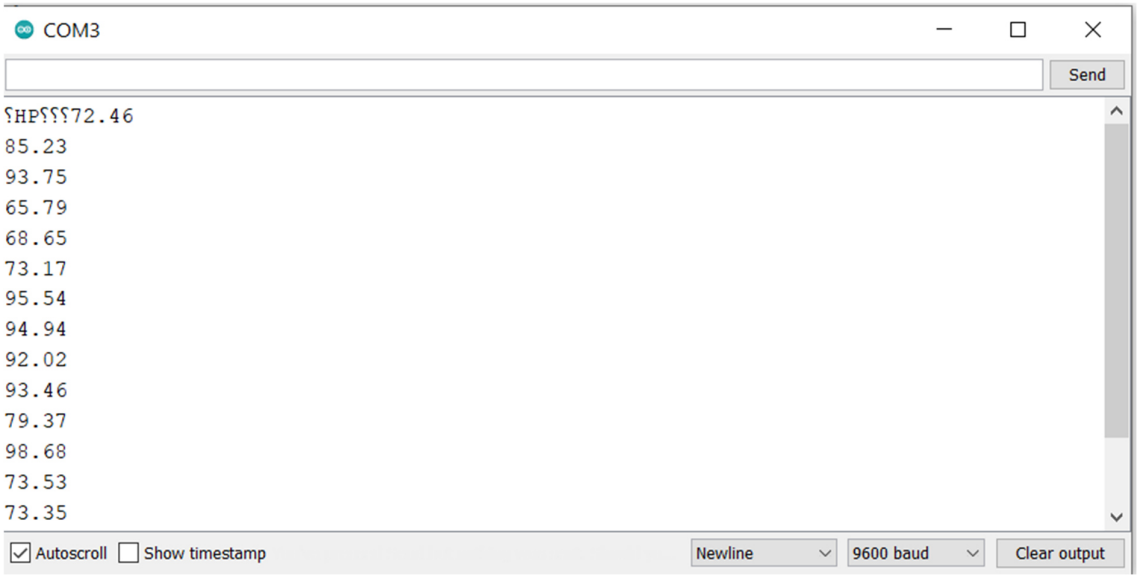

Fig. 4.3 Pulse Rate

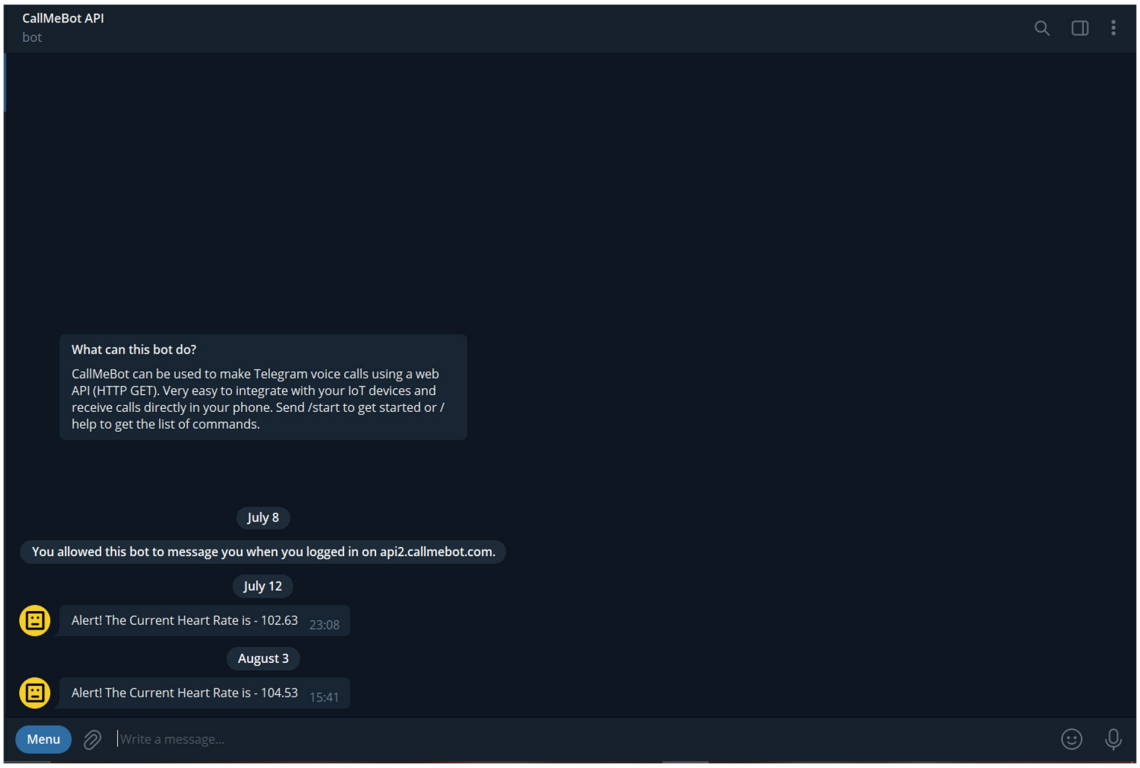

Fig. 4.4 Telegram Alert Message

CHAPTER -V

CONCLUSION

5. Conclusion

The main aim of our project is to establish a communication bridge between the patients and the concerned well takers/doctors. It enhance fulfillment of patient toward healthcare services.

Patient in turn, need to avoid frequent phone calls and unscheduled visits to their doctors, as a sign of respect of their time.

Patients whose heart pulse needs to be monitored regularly by the concerned doctors is somewhere affected especially in pandemic situation. There has been a communication gap formed between these patients and their concerned doctors/caretakers.

This is where our idea flourished to help those section of patients whose heart pulse needs to be monitored regularly.

CHAPTER-VI

FUTURE SCOPE

6. Future Scope

- The future scope of our project is to help the doctors by expanding our project through gathering the data (heartbeat readings) of the patients and assisting the concerned doctors/caretakers with foreseeing the irregularity in not so distant future.
- We will co-relate the sensor data with the real patients data which will help us to compare the real scenario. In future we will add some other features to develop the system and make it easy to user through smart application. This system can be incorporated with cloud computing and enriched the prototype system. This noble system can be used for disabled or patient to aware about their present situation.
- Data can be used for further treatment .
- These data can also be used for showing post medical conditions.

Reference

Text Book

Remote Patients Monitoring System(Heartbeat and Temperature) using Arduino,Ruaa Shallal Abbas Anooz, Methodology -using IoT, IJSER, Volume 9, ISSN 2229-5518, August 2018.

Web Resources

https://create.arduino.cc/projecthub/aghoshbprasad100/get-notified-by-sms-when-your-pulse-is-abnormal-737cf5