**Chapter 1**

**IOT Based Patient Health Monitoring System**

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**1. Project Overview:**

Health monitoring is a major issue in today's world. Due to a lack of proper health monitoring, the patient suffers from serious health problems. There are lots of IoT sensors monitor the health of patient. We use Arduino Uno in the proposed method. Here we use a temperature sensor, an ECG sensor, a heartbeat sensor, a GPS module, a GSM module, attach with Arduino Uno. The temperature sensor is used to detect the temperature of the patient, the ECG sensor is used to record electrical activity of the heart over a period of time and the heart beat sensor is used to measure the pulse rate. GPS module is use to get location of patient, which is use by doctor in case of patient health emergency. GSM module is use for internet, through internet data is transfer from IOT device to cloud and show on web panel and mobile app, Doctor see patient health condition and advise him through message from android app or web panel. Doctor can see patient real time health status in graph on both android app and web panel. Our goal is to build a smart health monitoring system in which elderly people benefit from continuous monitoring with the help of IoT and sensors. If a person's health is critical, a message will be sent to the doctor on android app and other family members with the help of GSM module. Also patient or other family member can see patient health condition.

**2. Project Aim:**

Our purpose is to build a Smart Health Monitoring System where in the patient are benefitted through their continuous monitoring with the help of IoT and sensors. If a patient’s health condition is critical, message is sent to doctor on android app and other family members with the help of GSM module. These help to simplify the monitoring process as a doctor or family member does not need to wait close to the patient for each and every check-up. Doctor can prescribe medicine by seeing current health condition. Any critical condition of the patient is notified. While life risks cannot be completely eliminated, the purpose of this project is to reduce certain health risks at a certain point.

**3. Project Objectives:**

Our objective is patient are benefitted through their continuous monitoring with the help of IoT and sensors.

Some Others object as follows:

* Get alert from IOT device if a patient’s health condition is critical.
* Track Location of patient
* Communication between Patient and Doctor.
* Complete Web panel for Managing and Monitoring patient health condition.

**4. Project Scope:**

1. **IOT Based gadget**
   1. System will send Heartbeat , ECG, Temperature, GPS location data to cloud database.
   2. Device will send data continuously means real time working.
   3. send alert if health data values goes beyond limit.
2. **Patient App**
   1. Patient can login and logout.
   2. Patient can send message to his doctor.
   3. Patient can see his health data like heartbeat, ECG, temperature and also personal information.
   4. Get alert if health data values goes beyond limit.
   5. Patient can see his health data on graph.
   6. See current medicine list prescribe by doctor.
3. **Doctor App**
   1. Doctor can login and logout.
   2. Doctor can send message to his patient.
   3. Doctor can see patient health data like heartbeat, ECG, temperature
   4. Get alert if patient health data values goes beyond limit.
   5. Doctor can see patient health data on graph.
   6. Doctor can see patient location in case of emergency.
   7. Doctor can prescribe medicine by seeing current health condition.
   8. Add new patient in his patient list
   9. Doctor can see his personal information.
4. **Web panel**
   1. Admin can login, logout from web panel..
   2. Admin can add doctor, delete, search, view doctor personal information.
   3. Admin can add patient, delete, search, view patient heath and personal information.
   4. Admin can assign patient to doctor
   5. Get alert if patient health data values goes beyond limit.
   6. Admin can view patient categorised by disease, doctor.
   7. Admin can see patient health data on graph.

**5. Problem Statement:**

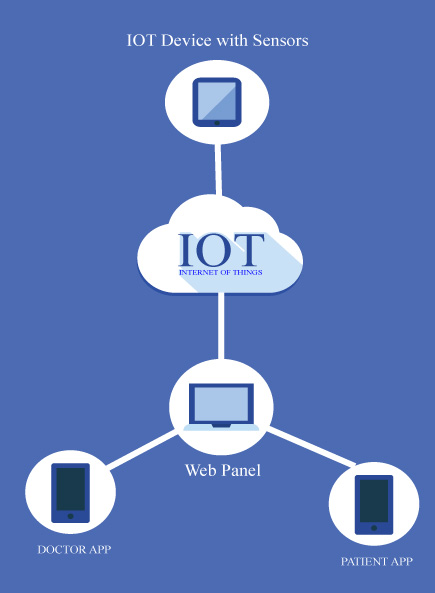
IOT is growing technology now days. There are a number of IoT systems available today to track the health of patients but if a person’s health condition is critical then there is no proper IOT based system is present that used to communicate with his doctor. In existing systems security of IOT device is main concern.

**7. Proposed Solution:**

In our model, the sensors used are inexpensive. The data is directly stored in our database, which decreases man's control. We use Arduino, which is cheaper than raspberry pi.

We handle man in middle attack problem of security through asymmetric cryptography We are creating a professional web-based management panel and an android app for physicians and patients with UX / UI GUI design.

**Our System Consist of :**



**8. Proposed System Components**

1- Web panel

2- Patient Android app

2- Doctor Android app

3- IOT Based Gadget

**9. Proposed System Output**

1. Get alert from IOT device if a patient’s health condition is critical.
2. Track Location of patient
3. Communication between Patient and Doctor.
4. Complete Web panel for Managing and Monitoring patient health condition.

**10. Methodology:**

Our system requirements changing dynamically and risky due new technology

for to this reason we use Xtreme Programming Model for developing our system.

**11- Project life cycle**

1. Requirements Analysis (4 weeks )
2. Design (4 weeks )
3. Development (12 weeks )
4. Testing (2 weeks )

**12- Software/Tools Requirement:**

1. Android Studio for Android App
2. Sublime for Web panel
3. Microsoft Visio for Design
4. Arduino studio IOT based Gadget

**13- Language/Database**

1. Kotlin
2. Node Js and Angular
3. Python
4. Firebase
5. MongoDB

**14- Hardware:**

1. Temperature Sensor
2. Heart Beat Sensor
3. ECG Sensor
4. Arduino board
5. Battery
6. GSM Module
7. GPS Module
8. Android Mobile

**15- Deliverable**

1. Complete Documentation
2. Android Apps
3. Web panel
4. IOT Device

**16**- **Literature Review**

1. **Internet of Things(IoT)Based Smart Healthcare System(2018)**

The entire system is connected using ESP8266 Wi-Fi module. The details regarding the medicines should be entered through the application. The working of the medicine box starts once the details have been entered by the user including the timing and the slot from which the medicine has to be consumed. The microcontroller will receive information through the application and will function according to the data provided by the user. According to the activity of the patient the medicine box will then generate data and this data will be sent to the application through internet. This information will be displayed on the app in the form of notifications. [1]

1. **IOT Patient Health Monitoring System(2017).**

This system uses fall detection and sleep pattern analysis. The sensors utilized as a part of this project are Accelerometer and Gyroscope (MPU6050), Heart beat sensor, Body temperature sensor, and blood oxygen level (MAX30100), and Proximity sensor (KY032). These sensors work autonomously of each other. The measured reading from the sensor is broke down for the patient and is made accessible to the specialist or to any concerned individual in the type of the web or smart phones. s. The interfacing between the equipment and the product part is done on the stage of AWS IoT. [2]

1. **Healthcare Monitoring System and transforming Monitored data into Real time Clinical Feedback based on IoT using Raspberry Pi(2019)**

In this system MLX90614 contactless sensor is used for temperature monitoring, A0813 is used for monitoring pulse rate while AD8232 helps in monitoring ECG of patients. Whole data is sensed and collected by Arduino board which then fed to Raspberry pi and transferred to server through Wi-Fi dongle. The dynamic webpage is updating every two minutes after receiving data from server. Doctor can diagnose patients’ condition by analysing data shown on app. [3]

1. **Challenges Facing Health Monitoring IoT in 2019**

There are vast possibilities for the use of IoT devices in health care related to vulnerabilities. As IOT device use increases, so does the number of ways hackers could infiltrate the system and mine for the most valuable data. Once a new risk has been identified, hackers could learn how the connected medical device operates by entering the system and reading its error logs. Knowledge gained by hackers could make it easier to break into a hospital network or make devices publish incorrect readings that influence patient care.[4]

**17- Critical Analysis from Literature Review**

In existing system there are major problem is security. Patient cannot communicate with doctor and doctor cannot prescribe medicine to patient. In our system we are using asymmetric cryptography for security between IOT device and server. We build a complete web panel and android app for doctor and patient with new tools and language. Through android app doctor and patient can communicate in secure network. Doctor can monitor patient health and prescribe medicine.

**18- Project Summary**

Our purpose is to build a Smart Health Monitoring System where in the patient are benefitted through their continuous monitoring with the help of IoT and sensors. If a patient’s health condition is critical, message is sent to doctor on android app and other family members with the help of GSM module. These help to simplify the monitoring process as a doctor or family member does not need to wait close to the patient for each and every check-up. Doctor can prescribe medicine by seeing current health condition. Any critical condition of the patient is notified. While life risks cannot be completely eliminated, the purpose of this project is to reduce certain health risks at a certain point.

**References :**

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4. <https://www.iotforall.com/5-challenges-facing-iot-healthcare-2019/>