

A Synopsis on

# **IoT based Healthcare Kit**

Submitted in partial fulfillment of the requirements  
of the degree of

**Bachelor of Engineering**

in

**Information Technology**

by

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## CERTIFICATE

This is to certify that the project Synopsis entitled “*IoT based Healthcare Kit*” Submitted by “*Purvika Gaikar (15104027), Shreya Bhutada (17104019), Akshata Singh (17104033)*” for the partial fulfillment of the requirement for award of a degree *Bachelor of Engineering* in *Information Technology*, to the University of Mumbai, is a bonafide work carried out during academic year 2019-2020

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# Abstract

The project presents the design and implementation of an IoT-based health monitoring system for emergency medical services. Its main goal is to collect data, integrate it, and interoperate IoT data flexibly which can provide support to medical services. The proposed model enables users to improve health-related risks and reduce healthcare costs by collecting, recording, analyzing and sharing large data streams in real time and efficiently. The idea of this project originated with the intention to reduce the need for patients to visit a doctor every time he/she needed to check their overall health. This kit will facilitate cost and time savings for both patients and doctors and will also allow doctors to give more time for emergency cases. It will help the disabled and old people who cannot come to hospitals independently for their regular checkups. The proposed outcome of the project is to give proper and efficient medical services to patients by connecting and collecting data information through health status monitors which would include patient's heart rate, blood pressure and ECG. This kit also sends an emergency alert to patient's doctor in case there is some adverse deterioration in the patient's current health status with full medical information. In addition to this, to bridge the vocabulary gap between the doctors and patients, we are providing with an health consultation chat bot that will provide with instant replies to the questions asked by patients. This bot proposes a conversational Healthcare bot that is designed to suggest and help the patients to self-assess the mild symptoms

# Introduction

Many rural areas don't have enough hospitals and other health care resources to provide quality care. Long waiting times and other challenges can prevent health care professionals from providing the best care possible in remote locations. Also there are applications which are just limited to making appointments with doctors and very minimal interaction related to disease condition of the patients. This project aims at providing an IoT based remote Health care kit and AI Chat bot which provides healthcare tips to patients, and effectively, reducing the cost of customer service and providing a vital communication link between doctors and patients. The proposed system is portable, low cost, light weighted and low power electronic health care system that records and monitors health parameters. This system facilitates continuous real time analysis of various patient parameters such as ECG, heart rate and temperature by using various sensors respectively and the collected data is sent to the cloud using IoT. The distinguishing characteristic of the healthcare system is the constant monitoring of a patient through checking various parameters and also infers a good result from the history of such constant monitoring. On the other hand, chat bot is a complete new concept additional to the kit which assists medical queries, symptom check and provide referral for major issues. This Health bot intends to provide a personalized health and therapy information to patients as well as suggest basic healthcare tips based on patient symptoms. Moreover because of the feasibility of chat bot, the visit to doctors for minor issues will also decrease thus saving time and expenditure. With automated assistance stepping in, the work of medical professionals has reduced manifold. They can now better concentrate on physical patient care while the chat bot assists with: medical queries, symptom check and health care tips for mild issues.

# Objectives

The objective is to develop an absolute, portable and cheap system which incorporates Arduino that will be 24/7 available. It will help the disabled and old people who cannot come to hospitals independently for their regular checkups. It emphasises on time efficiency, little to no expenditure, scalability and reliability. The healthcare system can enable constant monitoring of a patient through checking various parameters such as temperature, blood pressure and heart rate. It provides with real-time medical information about a patient via IoT and processes the information gathered about the patient. In addition to this, the chatbot will assist medical queries, symptom check, provide referral for major issues and will try to analyze the cause of illness according to the information given by the patient and provide adequate health care tips for the identified issue. With such feasibility of chatbot, it will help decrease time and expenditure of patients.

## Literature Review

- Paper Title: An e-Health tele-media application for patient management
  - \* Authors: Collins Mwesigwa
  - \* Findings: The app includes Speech Recognition, IVR, SMS and web applications in the health sector that will provide patients (especially out-patients) with real-time management of illnesses, reactions or side effects to prescribed medication, update patients on scheduled doctor patient appointments and make prescription reminders, provide survey data for medical research, facilitate access diagnosis from a physician and general medical assistance using a combination of a web services, speech recognition, IVR and SMS.
  - \* Advantages: Notifications of Disease Outbreak Chat box is made available
  - \* Disadvantages: For patients who don't know how to use chat box it costs the patients as well as doctors time. No AI bot feature
  
- Paper Title: Studying the Effect of Online Medical Applications on Patients Healing Time and Doctors Utilization Using Discrete Event Simulation
  - \* Authors: Arsineh Boodaghian Asl ; Michel Gokan Khan
  - \* Publication details: 2019 IEEE E-Health and Bio engineering Conference (EHB)
  - \* Findings: In this paper, a Discrete Event Simulation (DES) model is developed to study the effects of using Online Medical Applications (OMA) on the patients healing time and doctors utilization by comparing it with the same process in healthcare centers. Additionally, patients average queue size, maximum number of patients in the queue, and total number of healed patients are compared in this study.
  - \* Advantages: Understanding how time and money is saved in OMA.
  - \* Disadvantages: No implementation of web application No AI Chatbot feature

## Problem Definition

Many rural areas don't have enough physicians, hospitals and other health care resources to provide quality care for the whole population. Long waiting times, long duration between visits and a wide range of other challenges can prevent health care professional from providing the best care possible. In addition to this, there are applications which are just limited to making appointments with doctors and very minimal interaction related to disease condition of the patients. This project aims at providing an IoT based remote Health care kit and AI Chat bot which provides healthcare tips to patients, and effectively, reducing the cost of customer service and providing a vital communication link between doctors and patients

## Proposed System Architecture/Working

The IoT healthcare kit is one of the vital elements of the IoT in health care. It supports access to the IoT backbone, facilitates the transmission and reception of medical data, and enables the use of healthcare-tailored communications.

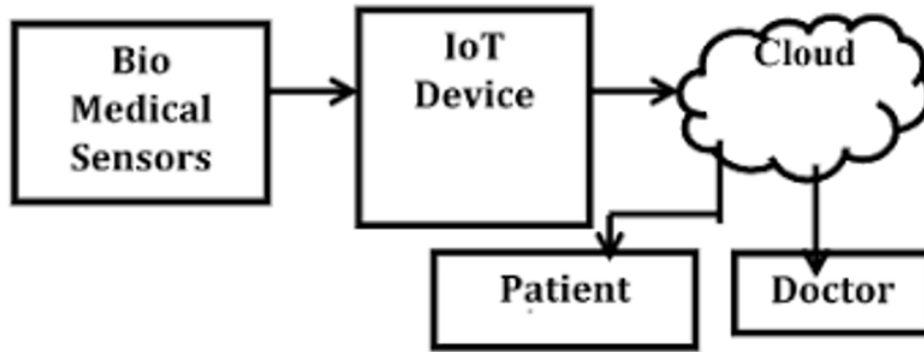


Figure 1: Basic Flow of Healthcare Kit

The Technology behind this project is IoT (Internet of Things). The above fig. 1 shows basic block diagram showing working of Internet of Things based systems where hardware system contains sensor measure the respective parameters, controllers, required modules which further processed and upload the collected data to the cloud. In the second part, cloud service provider is selected which give us a service to store our data and access it over mobile application/website. In the third part, uploaded data is fetched on an android application which provides a friendly graphical user interface help the person to access his/her monitored health data.

- Measure and Monitor : IoT based sensors lets you to automatically record the medical data and lets your medical health experts to remotely access this data.

- Engage: Different data including the profile of patient, his health vitals, his medication and medication history are collected and on that basis health tips are provided in order to improve health management.
- Fulfilment: The data collected so is also used to create dynamic profile of the patient according to his current health condition so that on further analysis this profile can be used by other medical experts

The Health Consultation Chat bot system focuses on the messages that the user provides while initiating the conversation. The idea behind this is to detect the preliminary symptoms and the problems that the user may be experiencing. After the Chat bot has collected enough keywords from the initial messages, it now starts leading the conversation by asking questions to the user and trying to shortlist few diseases that the user may be suffering through. After the Chat bot has shortlisted the possible diseases that the user may have, now it gives some remedies to soothe the pain.

The Health Consultation System will consist of Login/registration where the patients history will be saved. Following is the prototype for the creation of the profile of the patient.

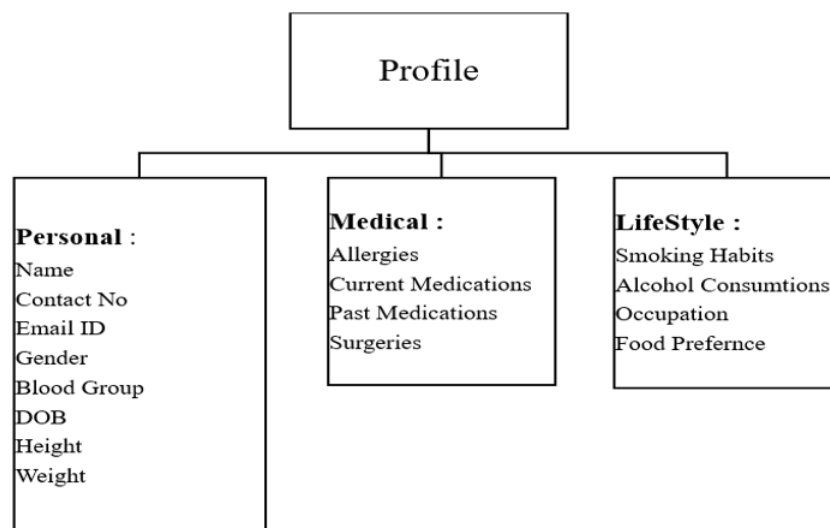


Figure 2: Patient Profile

The final model will be well equipped with the features where doctor can examine his patient from anywhere and anytime. Emergency scenario to send an emergency mail or message to the doctor with patient's current status and full medical information can also be worked on. The proposed model can also incorporated chat bot so that the model becomes more mobile and easy to access anywhere across the globe.

The following prototype is for end user using the application:

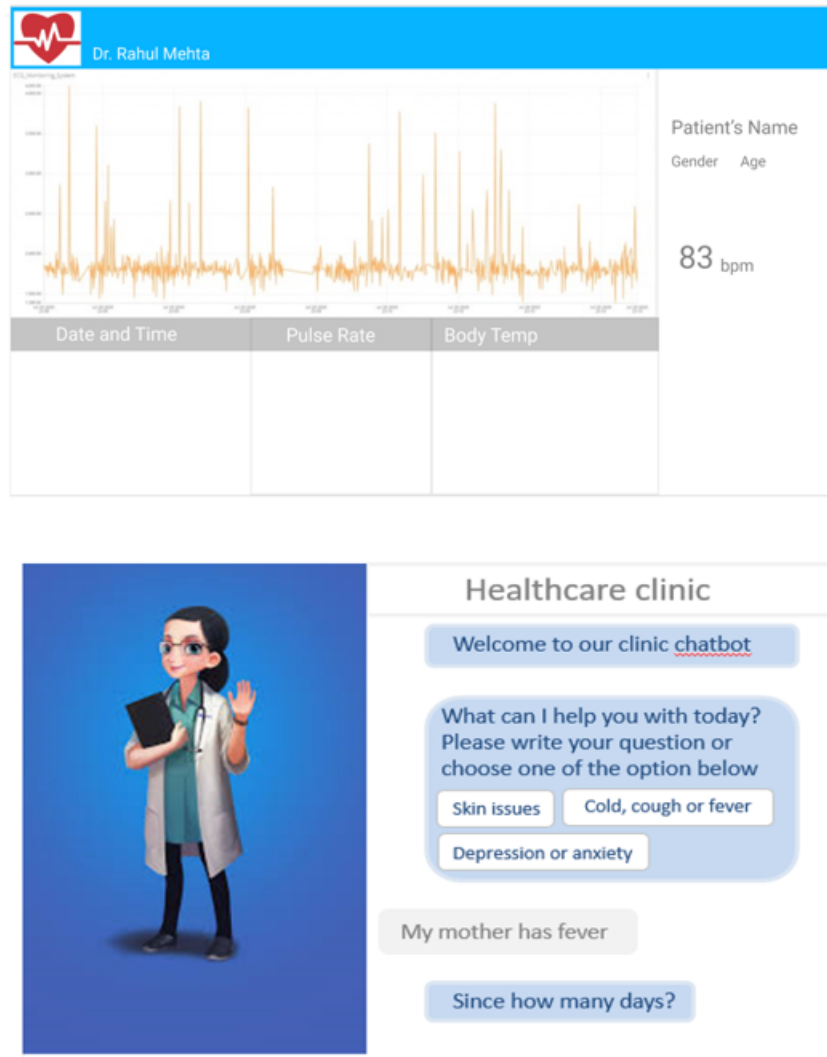


Figure 3: End side interface for patient and doctor



# Design and Implementation

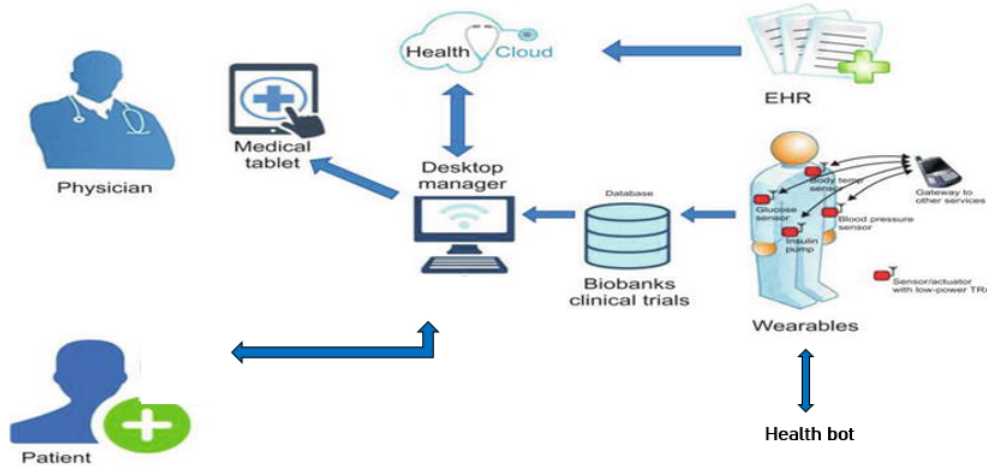


Figure 4: Patient Profile

Fig. 4 visualizes a scenario in which a patient's health profile and vitals are captured using portable medical devices and sensors attached to his or her body. Captured data are then analyzed and stored, and stored data from various sensors and machines become useful for aggregation. The Electronic History Record of the patient is collected from the patient and stored in cloud for future usage. Based on analyses and aggregation, caregivers can monitor patients from any location and respond accordingly.

For the chatbot, we have developed the back end using Python and Rasa. A Chatbot needs to be natural at responding to the user messages and therefore it needs to have a sustainable back-end logic to process user inputs and parameters to generate results. When a user starts interacting with the Chatbot, the Chatbot engine gets activated and captures every messages provided by the user. The engine accepts initial symptoms and extracts the option chosen from the data. Using the keywords extracted from the symptom, our Chatbot engine shortlists some of the most likely illnesses that the user may be suffering through by matching the keywords with the disease tags. Once the engine has shortlisted diseases that the user may have it would then provide the user with all the Medication and Remedies it has found during the session.

The following prototype is the back-end for chat bot application:

```
Your input -> hello
Hi! How may I help you? Are you facing any of these problems: Headache | Stomache | Flu | Vision
Your input -> head
Since when are you experiencing the pain? less than 24 hours | more than 24 hours
Your input -> m
Are you facing any stomach problems like acid reflux? Yes | No
Your input -> no
Which area of the head does it hurt the most? Whole | Sides | Crown | Around the eye
Your input -> whole
This often indicates Stress, Daily Routine Change or Acidity.
Following are some remedies for the same :
Stress - 1. Meditate and do breathing exercises 2. Soothe the pain with cold compress 3. Take steams
Daily Routine Change - 1. Get Adequate Sleep 2. Avoid direct exposure to sun 3. Stay Hydrated
Acidity - 1. Avoid acidic food 2. Increase fibre intake 3. Have Regular meals
I hope that this helps you.
If you wish to continue please select which problem: Headache | Stomach-ache | Flu | Vision.
Else you can exit
Your input -> head
Since when are you experiencing the pain? less than 24 hours | more than 24 hours
Your input -> 1
Are you facing any stomach problems like acid reflux? Yes | No
Your input -> yes
1. Drink buttermilk 2. Drink Lukewarm water with Lemon 3. Consume apple cider vinegar
I hope that this helps you.
If you wish to continue please select which problem: Headache | Stomach-ache | Flu | Vision.
Else you can exit

Your input -> flu
Since when are you experiencing the pain? less than 24 hours | more than 24 hours
Your input -> more
This often is caused by high fever, headache, muscle aches, cough, runny nose or vomiting sensation.
Following are some remedies for the same :
1. Get lots of rest 2. Stay hydrated 3. Gargle with salt water for sore throat 4. Wash your hands often with soap and water
I hope that this helps you.
If you wish to continue please select which problem: Headache | Stomach-ache | Flu | Vision
Else you can exit

Your input -> i have stomach ache
Since when are you experiencing the pain? less than 24 hours | more than 24 hours
Your input -> more than 24 hours
Are you facing any of the following issues: Bloating, Constipation, Gas? Yes | No
Your input -> no
Following are the remedies for some other causes of Stomach-ache :
Lower Abdomen Pain - 1. Use a Heating bag, 2.Reduce your intake of coffee, tea and alcohol as these can make the pain worse. 3.Get plenty of rest.
Vomiting - 1.Eat light, bland foods 2.Avoid fried, greasy, or sweet foods. 3.Eat slowly and eat smaller, more frequent meals.
Loose Motions - 1.Drink ginger juice, 2. Drink lemon and salt water 3. Eat pomegranate
I hope that this helps you.
If you wish to continue please select which problem: Headache | Stomach-ache | Flu | Vision
Else you can exit
```

Figure 5: Back end of chat bot using Python and Rasa

## Summary

The main idea of the proposed system is to provide better and efficient health services to the patients by implementing a networked information cloud so that the experts and doctors could make use of this data and provide a fast and an efficient solution. The final model will be well equipped with the features where doctor can examine his patient from anywhere and anytime. The proposed model can also be deployed as a mobile app so that the model becomes more mobile and easy to access anywhere across the globe. Our Medical Chat bot will have a great impact on the life of its users. It would give them the freedom to consult a doctor 24/7. This can be a most popular tool for people with busy schedule as they won't have to hamper their schedule to consult a doctor for minor health queries. It applied various Machine Learning algorithm in background for effective text analysis and also performed Intent and entities based analysis for implementing smooth chat bot conversation. In conclusion, the healthcare bot is

able to understand user/patients healthcare related queries and lead the conversation to final diagnosis by an effective. text based diagnostic technique.

## References

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