Design And Development Of Smart Hospital Management And Location Tracking System For People Using Internet Of Things

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Abstract

The nearest hospital for emergency patients can be found using our app. This yields quicker and more precise outcomes. Therefore, our primary objective is to create an Android app with "emergency medical." In day-to-day life, it is noticed that people are facing difficulties in locating the nearest hospital with the availability of doctors during emergencies or accidents. In those situations, people get frustrated in search of hospitals with the availability of doctors near them. To overcome this circumstance, we have designed and developed intelligent healthcare hospital management, such as cloud computing, the Internet of things (IoT), Global positioning system(GPS), and mobile applications. Our project helps the public to know doctors' availability near their locality. A mobile application that tracks the availability of doctors nearby the user's locality in times of emergency. After tracking the nearby hospital, if there is a need for an ambulance service, we can approach and track the ambulance through the proposed mobile application using IoT. We can send the patient's condition to the hospital management through text message before reaching the hospital using IoT so that the hospital can make the necessary arrangements. Our app also suggests a specific hospital for a specific ailment. Our mobile application receives data from biometrics available in hospitals for attendance. With the help of those data, users will receive information regarding the doctor's availability. In the absence of biometric information, we can track the availability with the help of text information given by the respective doctors regarding their presence. The primary motto of our project is to avoid people wasting time in search of hospitals with the availability of doctors.

Keywords— Internet of Things, GPS, Nearest hospital, Android App and Cloud.

I. Introduction

The goal is to create an effective health system for the user and to improve remote access to the system. On the other hand, the Internet of Things can be helpful in certain situations [1]. The Internet of Things (IoT) aims to connect every device to the Internet to ensure that it is possible to access these things from anywhere, at any time, and over any network [2]. Mobile phones, smart homes, smart appliances, digital health, intelligent vehicular, smart cities, and smart grids are just a few of the spectacular intelligent applications. The mission of Health for All is to ensure that everyone has access to high-quality, sufficient medical services. This is a substantial challenge for developing nations with sizable rural populations [3]. The nearby hospital emergency patients can be found using the app. This yields quick and more precise outcomes. Therefore, our primary aim is to establish an Android app for "medical emergencies" [4].

A strong, adaptable, and simple-to-use hospital administration system was created to give hospitals the best possible advantages. The hospital management system was created specifically for hospitals with various specialties. Our projects are therefore created for both urban and rural hospitals and clinics. Both urban dwellers and those in rural areas can access it. We often notice that people do not get proper treatment at the appropriate time. In rural areas, people will not search for multi-specialty hospitals for

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minor accidents or emergencies; they will always look for mini-clinics or small hospitals [5-7]. The doctors may not be present 24x7. They may be absent, or they might go for some other work. Without knowing this information, people wander in search of hospitals during times of emergency, and they get frustrated, and the patient's condition worsens. So to overcome this problem, we have developed an application with a number of features. They are

- Checks the availability of a Doctor.
- Suggest the nearest hospital.
- Suggest a specific hospital for a specific ailment.
- Tracks the ambulance.
- Sends the condition of the patient to the hospital before they arrive.

a. Problem Statement

"Nearly 27% of the total deaths in India happen with no medical attention at the time of death, according to the 2013 civil registration data released by the Census directorate." In daily life, people are facing difficulties locating the nearest hospitals with the availability of doctors during emergencies or accidents. In most situations, we can see people losing their loved ones due to the lack of information on whether the doctors are available or not in the nearby hospitals. People get stressed during such situations. Also, it is difficult for people to search the hospitals in emergency conditions which can worsen the patient's condition due to delays in admitting the patient [8-10].

B. Major Contributions

Our application tells the availability of doctors in the hospital at the time of emergencies. It can be used by people both in rural and urban areas. Our application suggests the nearest hospital with the presence of a doctor. Due to this feature, people can avoid wandering in search of hospitals with the availability of doctors. It also recommends the specific hospital for the specific ailment. In case there is a need for an ambulance, they can also track ambulances through our project. In addition, the information about the patient's condition can be sent to the hospital so that the hospital management can make necessary arrangements. We can even search for the availability of doctors in a particular hospital and book appointments with them. We can send patients' medical reports through our application so that the hospital management can make necessary arrangements for patients. Our application gives the details of doctors nearby so that people can reach the hospitals on time.

Ii. Literature Survey

In [11], presented the smart city's innovative ambulance management system. If the patient needs an ambulance, the operator will find the nearest ambulance and direct it to the patient. The system dynamically tracks the location of the ambulance, and the shortest route to the victim is calculated using the third-party service Google Maps. Once the patient is there, an expert (a doctor or nurse) looks into the circumstance and uses a recommendation system to locate the finest hospital.– It does not give information about the presence of a doctor, and it does not suit minor emergencies or accidents. In [12], the suggested solution does a domain-specific search of nearby hospitals and medical management systems to identify the most convenient hospital, get in touch with its emergency ambulance service, and identify any urgent patients who can significantly contribute to pre-hospital treatment. Use electronic health records to access. Through an EMS server that continuously updates information on hospital admissions; the system determines the proximity of the closest specialty hospital. – It does not give the details about the presence of doctors because doctors may not be available 24x7. So people wander to hospitals during times of small emergencies or minor accidents.

In [13], electronic medical services aim to meet patients' medical requirements better. Users can register as patients on our online healthcare system and record their medical information in our database. The system also includes qualified hospital doctors who may offer patients medical advice and prescribe essential prescriptions if an appointment is required. Online therapy is not always advised. In [14], three primary tasks are carried out by an IoT-Based Ambulance Tracking with a Patient Health Monitoring System employing GPS and GSM. Monitoring the patient's health is the first step; following the ambulance transporting the patient is the second, and sending the hospital or doctor with the above two information is the third. – Transforming all ambulances into smart ambulances consisting of sensors is relatively costlier. In [15], an IoT-based mobile health hub is a system that collects data on patients' health and vital signs and uploads it to cloud storage. This knowledge aids physicians in planning urgent medical care. – It does not tell about the availability of doctors. In [16], "Smart and secure IoT and AI integration framework for hospital environment -This system overcomes the drawbacks of the current system of hospital information such as inflexible modes of networking, fixed point of information, and so on – Doesn't intimate the presence of a doctor. In [17], Computer Vision on IOT Based Patient Preference Management System – The proposed system is simulated with different computer vision algorithms and analyzes its accuracy, time delay and drop rate to make a reliable patient preference management system – It doesn't locate the nearest hospital with the availability of Doctors. Also, various IoT protocols and algorithms have been implemented for real time application [18-24].

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The main motto of this project is to save a life. In case of an accident or emergency, one cannot search the hospitals or clinics one by one because we are not sure whether the medical center is available or not in this case. It is necessary to know the details of nearby hospitals or clinics as early as possible so that there is no delay in admitting patients in emergencies. Our proposed project will help people to find nearby hospitals with the availability of doctors so that patients can be admitted as soon as possible, and it also recommends the specific hospital for the specific illness. Additionally, our project helps the user locate and track an ambulance's location if there is a necessary need for ambulance service. In an emergency, People can quickly know the details of nearby medical services so that people can contact those services earlier. Also, we can send the patient's condition to the hospital management through our app. So that they can make necessary arrangements before the patient arrives. A clear flowchart is shown in figure 1.

Consider a situation if one of your family members suddenly fell sick or faced an accident. He/she should be taken to the nearby hospital as soon as possible. If no doctors are available in that particular situation, we will try to find another hospital. In those situations, we will get more frustrated. So to avoid this situation, we developed a solution that helps users instantly to find the location of hospitals or clinics near them with the availability of doctors. If there is a need for an ambulance, the user can also track the location of an ambulance at the nearby hospital. The user can also send the details of patients earlier before reaching the hospital through text message so that the necessary arrangements are made. Hence we can limit the hospital search time; also, there will be on-time consultation. Because Life is precious, every minute and every second is crucial to saving a life.

Iii. Proposed System

a. Architecture

In today's technological era, every hospital uses biometrics for attendance so we can store those data in the cloud and link those data with our application. With the help of those data, our application shows whether the doctor is available or not.
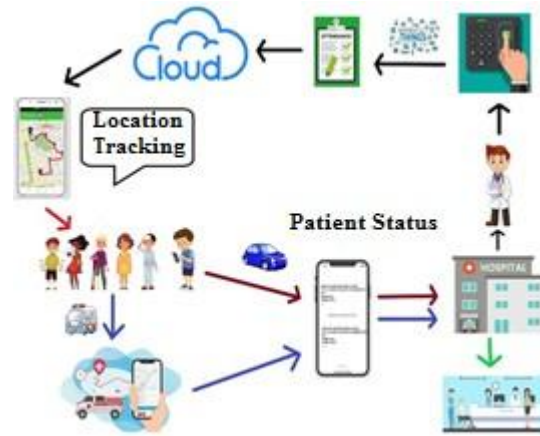

Figure 1: Proposed System

If the hospital does not have biometric attendance, we can use Radio Frequency Information (RFID) as shown in figure 3 (or) we can use toggle button response from where the doctors can give their response using the toggle button which can be stored and displayed in the user interface as shown in figure 4, So that we can share the data through IoT in our mobile application and update the application regularly. We also use GPS to track the ambulance. We also linked google maps to our application, which tracks the nearest hospital.

The Arduino IDE platform is used for programming. The algorithm's function is to detect the position of the vehicle unit and transmit the GPS coordinates through the GSM module as shown in figure 2. The nearby hospital location can be obtained by integrating google maps with our application.

Our application can be downloaded by any person irrespective of their location. With a single application, it is possible to check the availability of doctors, locate the nearest hospital, track the ambulance, and send the patient's condition to the hospital before the patient arrives so that the hospital can make necessary arrangements. The process of this intelligent hospital management system is shown in figure 1. The first activity allows the user to check the nearby hospitals through our application. This is achieved by Attendance response either by biometric or RFID, which is directly stored in the cloud and then displayed in the mobile interface. To communicate information between users and hospital management, ambulance services can also be tracked using GPS technology and send messages to hospital management via XMPP (Extensible Messaging and Presence Protocol) technology.

This module keeps track of the Nearest Hospital for the patients using the variables, which are based on:

- Type of Emergency (for example, Heart Attack, Paralysis, Accident)
- Physician availability
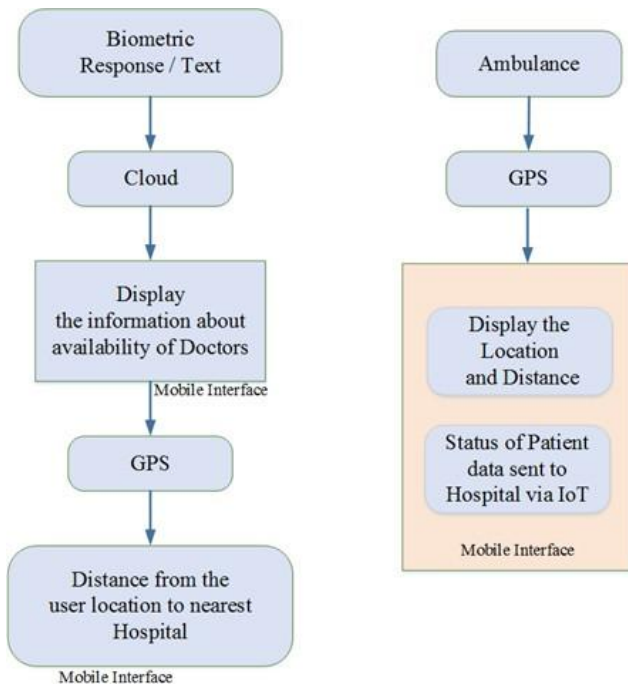- Distance from the patient.

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Figure 2: Flowchart of proposed System

The server searches for the nearest hospital based on various variables related to the emergency shown in the mathematical model. The server uses the database to find the nearest hospital. After searching for the nearest hospital, recommend a list to clients. Application; the shortest path of the proposed system aims to serve users by mining the shortest distance between source and destination.

Algorithm:

Mathematical Model

S= {EMS application}
System S = {S1, I, δ, O}
S1 = {GPS, Google Maps}
i = {V, SD}
delta = nearby Hospital Location
O = output
I1 = V -» variable.
I2 = SD-» Source and Destination Array
[1] I1 = {area, emergency type}
δ1 = I1→O1 O1 = {H1, H2, H3…., Hn}
H -» standard community hospital.
[2] I2 = {source; destination}
δ 2 -» Cal Cal = {source, destination}
R = {R1, R2, R3…., Rn}
R1 = {source, node 1, node 2, node 3...., node}
source = distance[source] + n
Σ Distance Between [source, Node i]
i=1
D = {D1, D2, D3, …………, Dn}
[R = route; D = distance]

MinDistance = Min (D1, D2, D3 .... , Dn)
O2 = {minimum distance}
[3] I3 = {OH1, OH2, OH3..,OHn}
OH-» Best Hospital
distance = order (OH1, OH2, OH3…., OHn)
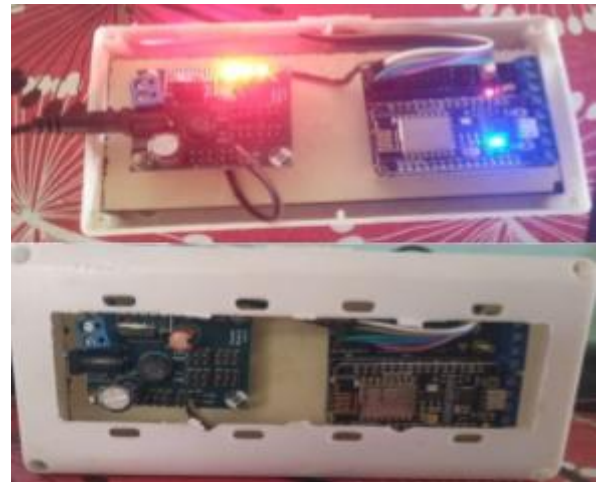O3 = {preferred hospital}

IV. RESULT ANALYSIS:

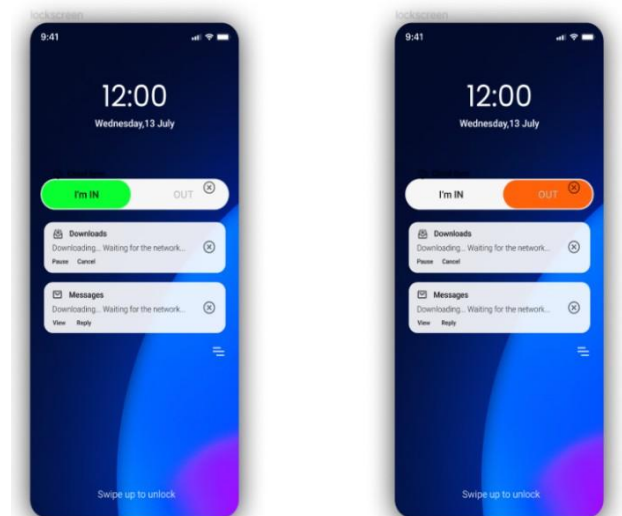Figure 3: Implementation of hardware

Figure 4: Doctors interface in their mobile after login to intimate their presence either by self or through assistants
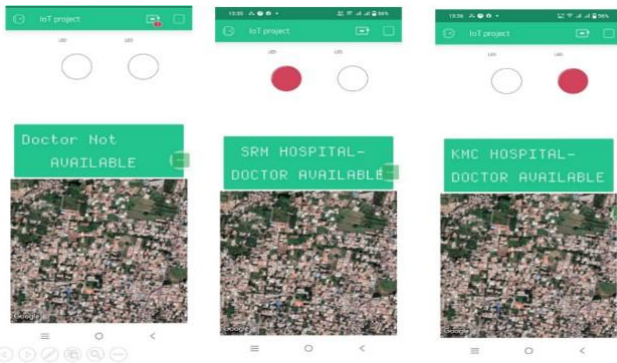
Figure 5 a: Shows the IoT Health Monitoring

Figure 5 b: Shows the availability and unavailability of doctor with user interface

While opening our application pops up as an emergency or availability in this work as shown in figure 4. In an emergency, Our application tracks the nearest hospital around the user with the availability of doctors, which is done by RFID response which displays the availability of Doctors, the red LED indicates the doctor is present and suggests the hospital. It will further ask whether we need an ambulance service or not. In case we need ambulance service, with the help of GPS where we can fix the GPS module in the ambulance vehicle so that we can track the location. Also, the patient's condition can be sent as a text message or Voice message to the hospital management as shown in figure 6, So that the hospital can make necessary arrangements before the patient arrives. In case we need to see the availability of a doctor in a particular position, Click on availability and search the hospital, and we can see the availability of a doctor. We can even book an appointment with the doctor, and the doctor gets the message that someone booked an appointment with them. The application development is done by using flutter SDK which is a cross-platform where a single code is used to develop applications for desktop, windows and mobile etc.
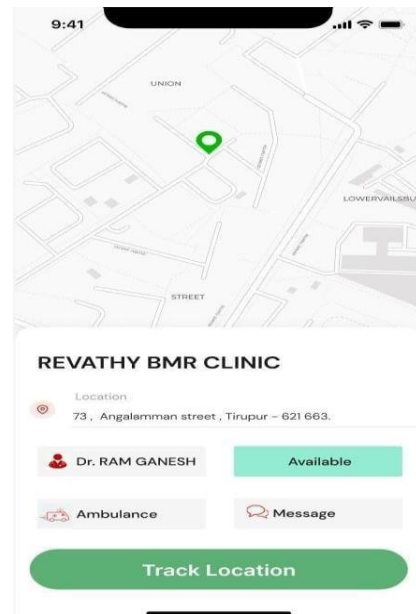

Figure 6: Shows the availability of doctors with ambulance tracking using IoT mobile app
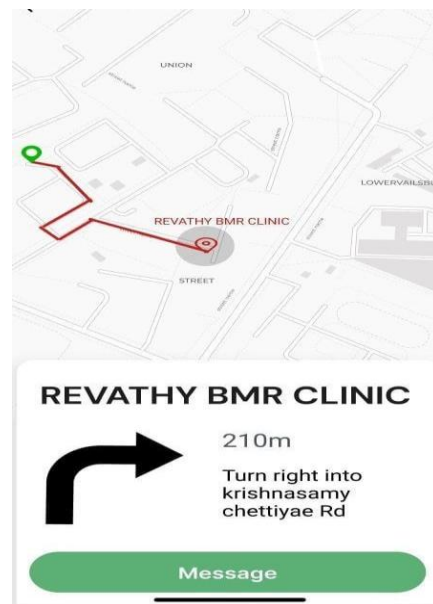

Figure 7: Shows the finding of the nearest hospital path

Figure 6 and 7 Shows the IoT mobile application for checking the doctor's availability and determining the nearest hospital location. This mobile application is used to find the hospital location and ambulance tracking. It is used to save people life

V. Conclusion

Our project helps people to locate hospitals quickly without any difficulty in times of emergency. This solution can avoid tension and save precious life lost due to delays in admission So that we can save the patient's lifetime during emergency times. The work reviews the present analysis

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done in the field and tries to develop a system appropriate for developing countries. We can check the availability of particular doctors in the hospital through our application. The location of the ambulance service can also be tracked. The details or condition of the patient can be sent as a text message to the hospital management before admitting the patient. It is more beneficial for people residing both in urban and rural environments. Thus our project acts as a lifesaver project. The developed solution will be useful for people residing in both rural and urban areas, the presence of doctors can be recorded either by toggle button response or by RFID which can be stored in the firebase and then the people can know the availability of Doctors in user Interface.

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