Smart Ambulance Management Application Using Cloud

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ABSTRACT

India's population is increasing as each day is passing. The increase in population puts a lot of strain and management of resources from medical, government services and many more. The strain on the resources results in citizens not getting proper help in the time of need. The main example of this process is ambulance management system which is the first line of help process in time of need. If a patient or a victim does not get an ambulance in time then the patient's life is surely at risk. So there needs to be proper mechanism to handle this important resource and help patients in time. Latest technologies such as cloud computing, cryptography and mobile computing can be used to improve the ambulance management and emergency help services. So, in our project the admin will first register emergency help services who will handle ambulance services such as hospitals, police, fire brigade and volunteers. Then the user side will have a mobile app where he can register and then use the service. The user can send a help request at the time of need to get an ambulance help. The request will send location data of the patient or victim in the form of latitude and longitude of the location. With the location data it will also send an alert to all the concerned authorities automatically. The alert will be received by the monitoring system of the admin which will then find the closest emergency services in the vicinity of the patient or victim and alert them for help. The emergency service personnel will have a mobile app who will then authenticate himself and see the victim data on the Google Map of his mobile app. Then the victim will also see the where abouts of the emergency helper. The admin will then track both the victim and patient on his screen. All the data transfer will be handled using Google cloud platform and cryptography algorithm AES will be used to secure the data. Thus, our system will help manage ambulance, emergency service personnel and help saving lot of lives.

Keywords: Ambulance Management, Google Map, Patient Management, Emergency Helper, GCP, AES, Cloud Computing,Mobile Computing.

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1. INTRODUCTION

As the India's population increase rapidly a large set of young population is entering the working space. As the population goes out for work it also causes many mishaps like accident, fire etc. Thus, lot of emergency services are needed daily like ambulance, hospitals, police, fire brigade and volunteers. This services or people help the concerned citizen in need and happens to save a lot of lives daily. But due to increase in population this emergency services are in a lot of stress and needs to be properly managed. For e.g., if a patient or a victim does not get an ambulance in time then his life will be in danger as he will not be able to reach the hospital in time. So, this emergency services needs to be handled and managed properly to help the general population. Technology sector is developing rapidly since 2000's and has been playing a important part of daily life of the general citizens of India. The people are using the technology in all parts of one's daily life such as communication, shopping, banking, emergency services etc. Thus, if technology is used wisely and efficiently in life it will make the daily processes easy and help in development of a country. Today mobile are used widely and can be used to access the information at the click of a button on the mobile phone. The cloud computing use has also rapidly and this service can be put to good use ion creating better and fast applications which will make the life of a citizen easy and safe. So, the main motivation of our project is to:

- To develop a better and secured automatic ambulance or emergency management services.
- To use cloud computing, mobile computing and cryptography technologies together.
- To keep the services simple and easy to use.

- To make the system operatable 24x7 without any failures.
- To help save lives in need with prompt ambulance management which is the first line of help system.
- To send alerts to all the concerned emergency services at the click of a button.

Thus, the rest of the paper is structured as follows:

- Section 2. explains literature survey which help us in designing a ambulance management system using studies published by other researchers.
- Section 3. explains problem definition with goals of the new ambulance management using cloud framework, methodology i.e., mathematical model and algorithms to be used by the system and explains proposed system with block diagram or system architecture and working of the system.
- Section 4. shows the discussion with charts of how much time will the framework take to send a request for help and how much it will take for response.

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2. LITERATURE REVIEW

This section describes the fundamentals of various techniques that can be used in designing a smart ambulance management application using cloud system using AES algorithm to secure data on the cloud. It helps in understanding various ideas put forward by other researchers and how the drawback in their system can be overcome to design a better and reliable weather forecasting framework. Some of the ideas with technique and drawbacks are mentioned below:

In 2020 Akca et al. [1] put forward a paper which mainly emphasises on "IoT based ambulance deployment" technique to manage ambulance and emergency services. This research is efficient to cover all the things needed to develop a smart ambulance management framework but lacks to explain how the system can work in real time with a combination of mobile computing, cloud computing and standalone application together.

In 2020 Kyriacou et al. [2] put forward a paper which mainly emphasises on "call-based ambulance management" technique to manage ambulance and emergency services. This research is efficient to cover all the things needed to develop a smart ambulance management framework but lacks to explain how the system can work in real time with a combination of mobile computing, cloud computing and standalone application together.

In 2020 Axak et al. [3] put forward a paper which mainly emphasises on "remote medical services using cloud" technique to manage ambulance and emergency services. This research is efficient to cover all the things needed to develop a smart ambulance management framework but lacks to explain how the system can work in real time with a combination of mobile computing, cloud computing and standalone application together.

In 2020 Devigayathri P. et al. [4] put forward a paper which mainly emphasises on "ambulance service provider using Android application" technique to manage ambulance and emergency services. This research is efficient to cover all the things needed to develop a smart ambulance management framework but lacks to explain how the system can work in real time with a combination of mobile computing, cloud computing and standalone application together.

In 2021 Ganesh et al. [5] put forward a paper which mainly emphasises on "health machine to handle covid-19 related health emergencies" technique to manage ambulance and emergency services. This research is efficient to cover all the things needed to develop a smart ambulance management framework but lacks to explain how the system can work in real time with a combination of mobile computing, cloud computing and standalone application together.

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3. PROJECT DESIGN

This section describes all the issues which we can face while designing an ambulance management system using AES algorithm and how to resolve it using a methodology to solve the problem and design a successful system.

3.1 PROBLEM STATEMENT

As the rapid growth in India's population a lot of mishaps like accidents, fire etc. has increased. The increase in mishaps is putting lot of pressure in handline the services like ambulance management. If the timely help is not there it will result in patient or a victim losing his life. Thus, there is need of emergency helper system with the latest technology which will ease pressure on the emergency service and help manage these services properly. So, the latest technological growth such as mobile computing,

cloud computing and security can be put together and an emergency helper mechanism needs to be designed which will help a victim or a patient get help in time. This helper mechanism can also be secured using latest and strong cryptographic algorithms such as AES. So, our major goals and objectives to solve this problem is stated as follows:

- To use mobile computing technology to create an app for user from he can call for help and receive it.
- To use mobile computing technology to create an app for emergency helper personnel or services from he or they can help.
- To use desktop software to coordinate between a victim and emergency helper personnel or services.
- To use AES algorithm to secure the data generated by the system.
- To use Google Cloud Platform (GCP) as our cloud provider.

3.2 METHODOLOGY

This section will study the mathematical conditions and algorithms to be used for designing a smart ambulance management system. These are explained as follows:

3.2.1 MATHEMATICAL MODEL

Our ambulance management system framework can be explained in two sets with probability, success and failure conditions.

- Victim Module:

  Set (V)= {V0, V1, V2, V3, V4, V5}

  V0V = Register and authenticate patient.

  V1V = Press alert button.

  V2V = Get current location latitude and longitude.

  V3V = View location on Google map.

  V4V = Send help alert with location data.

  V5V = View help alert response.

- Emergency Helper Module:

  Set (E)= {E0, E1, V3, E2, E3, E4}

  E0E = Register and authenticate emergency helper.

  E1E = Get alert with location data.

  V3E = View location on Google map.

  E2E = Send help alert response.

  E3E = Get acknowledgement.

  E4E = Track patient on Google map.

So, by studying the sets we come to notice that many elements are common in both modules and used in coordination in both sets so they be placed as

$$xV \cap E \text{ if } xV \text{ and } Xe \quad …(1)$$

Thus, the probability of intersection of elements in both modules can be given as

$$P(V \cap W) = P(V)+P(E) …(2)$$

So, intersection of common elements can be shown as

$$V \cap E = \{V3\} \quad \dots (3)$$

The conditional probability of both modules using the same element can be shown as

$$P(V \mid E) = \frac{P(V \cap E)}{P(E)} \quad \dots (4)$$

Thus, we conclude that our project "Smart ambulance management system using cloud" success and failure will depend upon the internet as our help alert data is sent to cloud, i.e., if the internet connection is not good or not present the help alert data will not sent or fetched and the project won't work, thus this is a case of failure, so our framework supports NP-Hard and not NP-Complete.

3.2.2 ALGORITHMS USED

The project will use cryptography algorithm AES for successful implementation of the weather forecasting framework.

- AES:

This algorithm will be used to secure the smart ambulance management system on the cloud. This algorithm is used to encrypt the hash code in the final phase of the blockchain creation. 128-bit AES algorithm will be used to encrypt using a symmetric key. Advanced Encryptio Standard (AES) is a cryptographic algorithm used to secure a text using same key which has to be used both during encryption and decryption. It converts a text in to a complicated string which can be read only by using the key.

3.3 PROPOSED SYSTEM

This section is mainly divided in five main modules with other sub modules in them. The modules and submodules are explained using a block diagram or system architecture as shown in Figure.1. to illustrate them. The working of the framework or its blocks can be explained as:

- **Application medium:**

This block in system architecture shows howthe system will use computer and Android mobile as medium to send and track ambulance and other emergency services.

- **User Mobile App:**

This block in system architecture shows how a patient or any other victim who needs help will send alert and get help using an Android application. First the user will register and then authenticate. He will press help button and send an alert which will have his current location latitude and longitude which can be tracked by emergency helper.
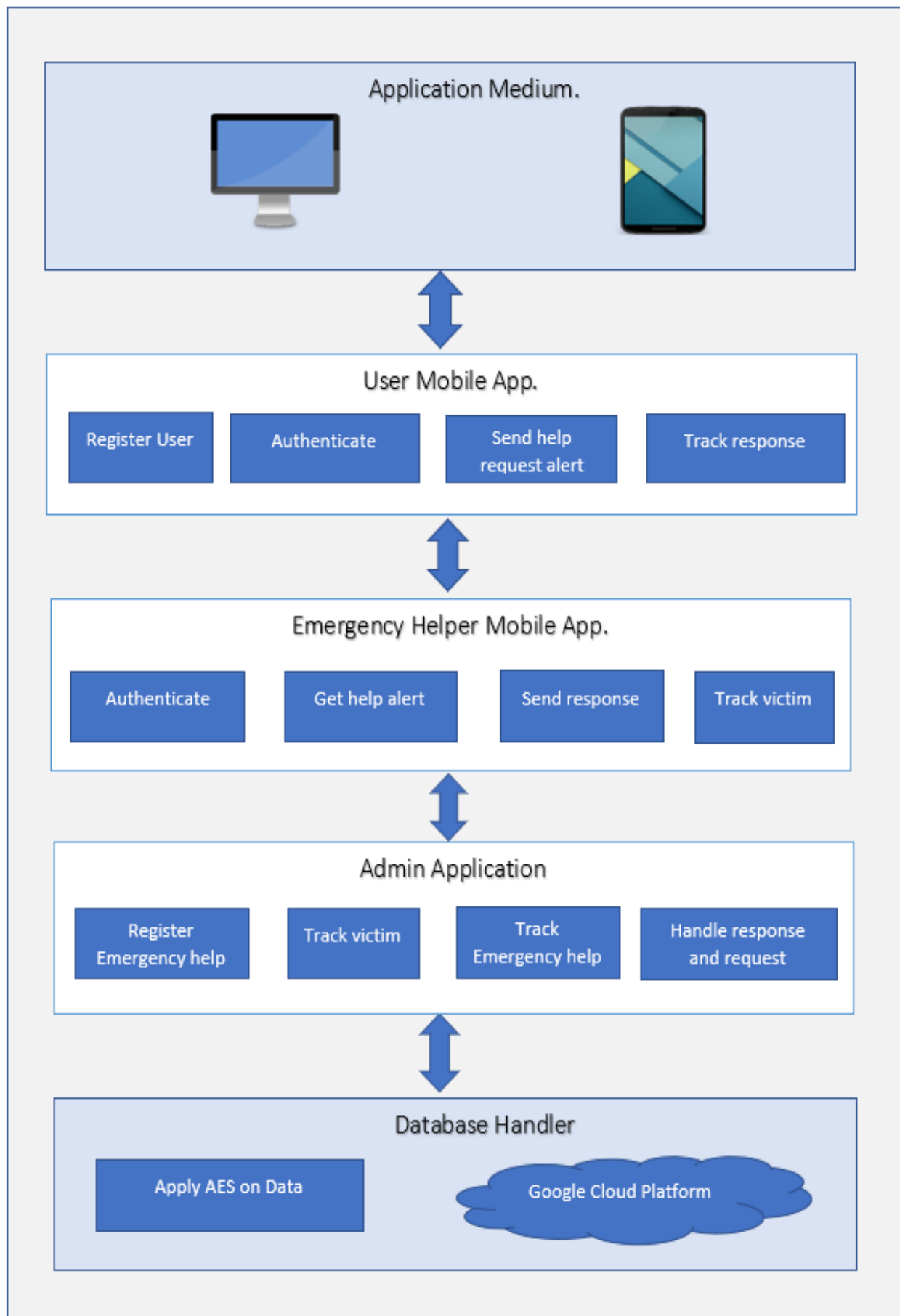
- **Emergency Helper Mobile App:**

This block in system architecture shows how a emergency helper will help a victim after getting help alert using an Android application. First the emergency helper will authenticate himself using the credentials provided to him by the admin. He will then get help alert and if he is close to the location of the victim will send a help response and track the victim on his mobile app.

- **Admin Application:**

This block in system architecture will be a standalone application. Using this the admin will first register all emergency helpers such as ambulance or any other emergency services. He will keep track of both victim and helper on his Google map.

- **Database Handler:**

This block in system architecture will use Google cloud platform as the cloud provider. The communication between victim and helper is handled by using Google sheets. The data will be encrypted and decrypted by cryptography algorithm AES to make it secure.

Application Medium.

User Mobile App.

| Register User | Authenticate | Send help request alert | Track response |

Emergency Helper Mobile App.

| Authenticate | Get help alert | Send response | Track victim |

Admin Application

| Register Emergency help | Track victim | Track Emergency help | Handle response and request |

Database Handler

| Apply AES on Data | Google Cloud Platform |

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4. RESULTS AND DISCUSSION

In this section we are presenting two charts which mainly focuses on the time taken to send a help alert and get a help response.

Figure 2: Pre-process Data Time

The chart in Figure 2. explains how much time is taken to authenticate, get location data, send alert and view help response on Google map. The chart shows that it takes more time to view the location data on Google map as it is a heavy process which uses multiple services of the Android mobile at a time.
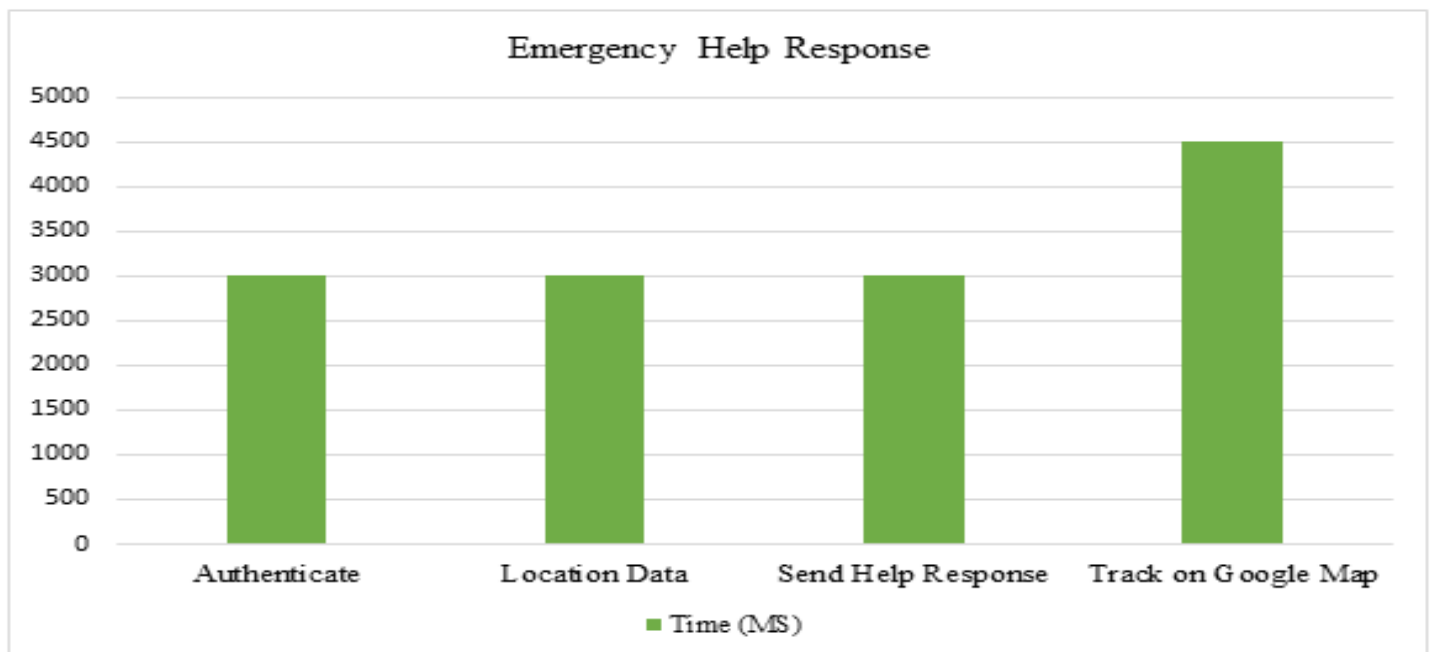

Figure 3: CNN Results Time Chart

The chart in Figure 3. explains how much time is taken to authenticate, get location data, send help response and track victim on Google map. The chart shows that it takes more time to view the location data on Google map as it is a heavy process which uses multiple services of the Android mobile at a time.

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5. CONCLUSIONS

In this paper, we have presented how we are going to design a smart ambulance management system by combining various technologies such as mobile computing, cloud computing and cryptography together to design a real time emergency help management system. The basic idea of this study is to get a victim with timely help like ambulance services and help avoid the complications. We studied and tried to study drawbacks of various researches [1][2][3][4][5] and decide how to improve our new smart ambulance management framework. We are using GPS device of an Android mobile to get real time location data that can be sent to emergency helper for tracking and helping. We are using Google cloud platform (GCP) as our cloud provider. We are using cryptography algorithm AES to secure the communication data saved on cloud. Thus, we conclude that the new ambulance management framework will help in providing timely help to a victim and save his life.

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