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VIRTUAL ASSISTANT FOR MEDICAL EMERGENCY

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Abstract - *Medical emergencies cannot be predicted but their consequences can be mitigated by planning and preparedness. Numerous studies have shown the importance of early medical assistance to the victim in the golden hour of emergency increases the chances of survival. In cases of emergency the victims can't speak for themselves and have to depend on others even to reach the hospital. Even the victim's medical history isn't available to the doctors. In such situations, a dedicated device that can call the ambulance if needed and also provide the victim's medical history can be very useful. The IOT based 'Virtual Assistant for Medical Emergency' is held responsible for providing the victim's medical history and current situation to the ER doctors , so thus enabling the doctors to treat accordingly. It also informs the ambulance if the situation is critical and simultaneously alerts the family members. The individual can be tracked with the help of the device and it's software application.*

Key Words: IOT, Medical history, Golden hour, Security, Tracking.

I.INTRODUCTION

IOT is a network in which all physical objects are connected to the internet through network devices or routers and exchange data. IOT allows objects to be controlled remotely across existing network infrastructure. IOT is a very good and intelligent technique which reduces human effort as well as easy access to physical devices. This technique also has autonomous control feature by which any device can control without any human interaction.

The first hour following a traumatic injury during which there is the highest likelihood that prompt medical and surgical treatment will prevent death accident or medical emergency is called the golden hour because that is when life-saving techniques are most effective. Reducing this time between accident/emergency and treatment has been the focus of bio-medical researchers and medical authorities to provide the desired treatment to the patient.

The Internet of Medical Things (also called the internet of health things) is an application of the IOT for medical and health related purposes, data collection and analysis for research, and monitoring. IOT devices can be used to enable remote health monitoring and emergency notification systems. These health monitoring devices can range from blood pressure and heart rate monitors to advanced devices capable of monitoring specialized implants, such as Pace makers, Fitbit electronic wristbands, or advanced hearing aids. Medical emergencies are unpredictable but their consequences can be lowered by planning and preparedness.

Internet-connected devices are being been introduced to patients in various forms. Whether data comes from fetal monitors, electrocardiograms, temperature monitors or blood glucose levels, tracking health information is vital for some patients. Many of these measures require follow-up interaction with a health care professional. This creates an opening for smart devices to send more valuable data, decreasing the need for direct patient-physician interaction. Some hospitals have started implementation of digital smart beds that can detect when they are occupied and ideal. A bed can also adjust itself to ensure appropriate pressure and support is applied to the patient without any manual interaction. Another area where smart technology could be an asset is coupled with home medication dispensers to automatically upload data to the cloud when medication isn't taken or any other indicators for which the care team should be alerted.

Roads accidents are very common these days. Whether it is due to carelessness of the driver or due to bad traffic conditions, accurately detecting an emergency situation using vital health symptoms and communicating the same to medical health centers for getting required immediate help, can go a long way in saving lives and ensuring right treatment is available.

In a world with an accelerated population aging, there is an increasingly interest in developing solutions for the elderly living assistance. The Internet of Things is a new reality that is completely changing our everyday life, and promises to revolutionize

modern healthcare by enabling a more personalized, preventive and collaborative form of care. Aiming to combine these two important topics, this work presents an IOT-ready solution for the elderly living assistance which is able to monitor and register patients' vital information as well as to provide mechanisms to trigger alarms in emergency situations. Its effective low-power/low-cost and wireless characteristics turns this solution suitable to be used anywhere and by anyone, in a discrete and comfortable wristband.

II. Literature Survey

This system is based on an android application & a wireless network which will be used for monitoring patients' health report in real time. This system is developed in such a way that it would be more useful in emergency conditions. With this system it will be possible to analyze patient using tele-monitoring sensors will be used to monitor patients' health continuously and it will be updated on server. The patients' medical history is being stored on cloud for global access.

There is a new e-health platform incorporating humanoid robots to support an emerging multidimensional care approach for the treatment of diabetics through IOT. The researchers try to represent some useful ideas about how to integrate and apply IOT devices in the health care field with emergency and operational services. However in order for IOT to develop and expand towards fulfilling existing health care shortcomings, we need to develop consistent, suitable, safe, flexible and power- efficient systems that a fit for medical needs. ...

Now a days it has become important to focus on healthcare awareness and also the growth of wireless mobile technologies. For this reason ubiquitous health care solutions has become important as it provides services at anytime and anywhere. To complete our needs android smart phone device has put forth mobile monitoring terminal to observe and analyze ECS [electrocardiography] waveforms from wearable ECG devices in real time under the coverage of wireless sensor network. Due to use of wireless sensor network in a healthcare we are able to reduce complications of wire networks and we can move a healthcare from one location to another desired location without any chaos. Mobile phones are used as barcode decoder in order to keep the entire process wireless and handy for medicinal care as an extension to monitoring schemes. In order to provide better and more comprehensive healthcare services we can use barcode decoder to verify and assist out patient in the medication administration process.

III. Key Challenges in handling medical emergency

For providing the best IOT based solution, it is very important to provide a robust, secure, portable and low infrastructure based solution to make it practical and widely acceptable to the target audience and system integrators.

Accuracy of detecting vital signals correctly is one of the highest priority to prevent false alarm and ensure that right diagnosis and treatment could be done. Below mentioned are key measures and challenges deploying a workable model

1) Detects critical condition: It detects critical conditions by monitoring the health condition at regular interval of time, when the values are in the critical range it alerts the user in severe conditions it directly alerts the ambulance.
2) Detects airway clarity: It detects airway clarity through a voice message which interacts with the user and if the user responds to it within the stipulated time then the airway is assumed to be clear if it isn't so then it is assumed to be blocked.
3) Size of the architecture: The size of the architecture is compact as it is a wearable device i.e, a wristband.
4) Accurate transmission of data: The transmission of data is accurate from the device to the mobile application.
5) Security: The security is given higher priority as it uses the heartbeat of the user as its password this is highly secure as heartbeat is unique.
6) Delay in transmission: As the delay in transmission could cost a life the transmission of data sensed from the sensors is swiftly transmitted to the mobile application for further analysis.
7) User-friendly: It is very user friendly as it is very flexible and the mobile application is also purely GUI based
8) False Alarms: Keeping the false alarms on mind the system is designed to handle it well without causing any chaos by implementing the safe button which aborts the process.

IV. Proposed System

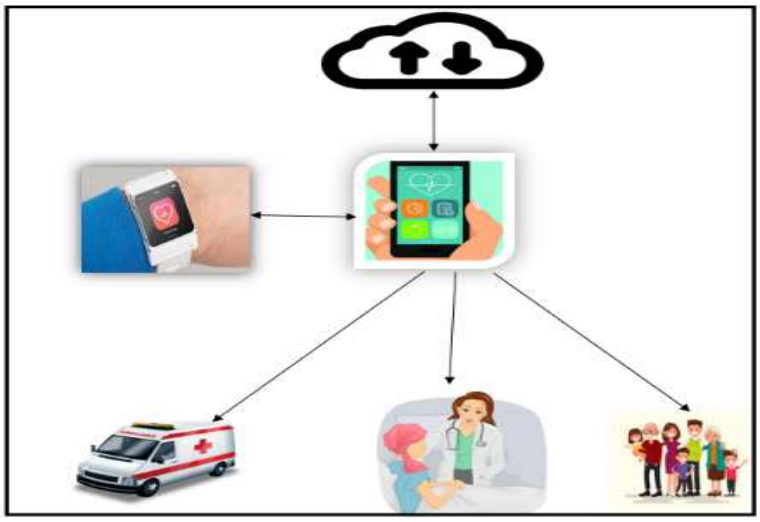


Fig 1: Virtual Assistant

The aim is to develop a wearable device like wristband that would detect emergency and call an ambulance in case of life-threatening emergency. By continuously measuring vital signs of the person, the device will be able to detect an emergency situation.

A wristband which is inbuilt with various sensors to monitor the heart rate, blood pressure levels, body temperature etc and the sensed data is compared to the threshold values stored in the cloud once the data crosses the threshold limit an alarm is raised so that the person can take the necessary precautions. In case the situation of the patient is critical the ambulance is alerted with the location of the patient. The location of the patient is tracked by the location tracker in the mobile phone which is linked to the application thus providing the ambulance the exact location of the patient. With the help of the cloud services the ambulance will be alerted with the patient's preferred hospitals if any so that the patient can be reached to that particular hospital. To ensure immediate treatment of the patients as soon as they enter the hospital, doctors are alerted through automatic call by GSM and a virtual copy of the patient's medical history stored in the cloud is sent, so as to make the required arrangements. The cloud is used to store and access information anywhere over the internet instead of using any external storage devices. The following are the features of the application

1) The user has to register by giving their credentials and by uploading their medical history, documents for identification in order to ensure security verification is done through OTP.

2) The user can upload the details of their preferred hospital to be taken in cases of emergency.

3) The user can add the contacts of the family members via the mobile app to send an SOS alert in case of emergency and in order to authenticate the members to keep track of the user.

4) The user can upload the contact number of their family doctor in case continuous monitoring is required.

5) To handle the issue of false alarms the application is designed with the safe button which aborts the ongoing process.

V. System Architecture

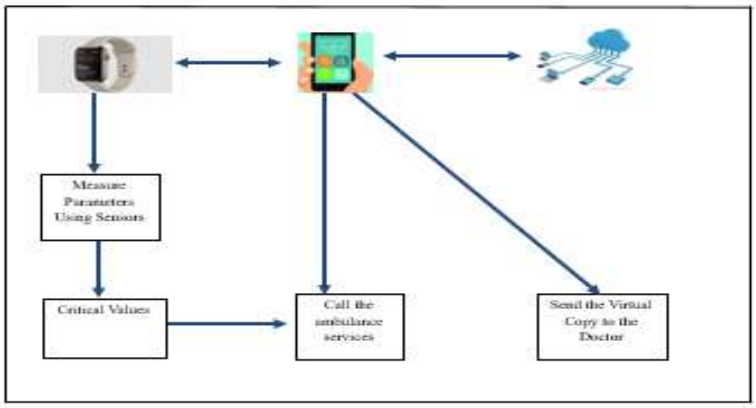


Fig 2: System Architecture

The system architecture focuses on two parts of the system. One is the wearable device and the other is the mobile app that will be synchronized with the wearable device once the unique number of the device is keyed in. In case of emergency the wearable device would measure the Respiratory Rate (RR) at regular intervals in time after the previous check. A voice message asks *"Is Everything Fine?"* If the person thinks that it is incorrect detection or a false alarm then he can immediately switch off the measurements by just pressing the safe button. If the person doesn't respond then the wearable concludes that the airway is blocked and automatically signals over to the ambulance services with the location of the user through the GPS location of the mobile, if the person responds saying *YES or NO* this would imply that his/her airway is clear and the emergency needs to be verified by measuring oxygen saturation and heart rate. The user can add his/her closed ones in the "*Emergency Contact List*" so that SOS alert is sent to them in case of an emergency. If there's any emergency then it will alert the closed ones.

The proposed system is based on the assumption that the device detecting the accident and identifying the human vital signals can also provide correct identity to the person the medical history of the person is stored on the cloud through the app which can be retrieved during the time of emergency. Medical history could include: Blood group, Allergies, Any ongoing medication, previous injury or treatment undertaken. To ensure immediate treatment of the patients as soon as they enter the hospital, doctors are alerted through automatic call by GSM and a virtual copy of the patient's medical history stored in the cloud is sent, so as to make the required arrangements.

VI. Algorithm

Step 1- Download the application.

Step 2- Sign Up

Step 3- Enter all the required credentials.

Step 4- Privacy is given the top priority as it uses the heartbeat of the person as the password to login.

Step 5- In case of emergency the wearable device would measure the Respiratory Rate (RR) at regular intervals in time after the previous check. A voice message asks "Is Everything Fine?" If the person thinks that it is incorrect detection or a false alarm then he can immediately switch off the measurements by just pressing the safe button. If the person doesn't respond then the wearable concludes that the airway is blocked and automatically signals over to the ambulance services with the location of the user through the GPS location of the mobile, if the person responds saying YES or NO this would imply that his/her airway is clear and the emergency needs to be verified by measuring oxygen saturation and heart rate.

Step 6- The RR would be measured and if the RR is in critical range then the procedure of communication repeats. If the RR value is in normal range, then the next step would be to measure oxygen saturation. If the oxygen saturation value is not in

the normal range, then the mobile app is signaled to call the ambulance, otherwise the device is deactivated until the stipulated time is completed or the safe button is pressed. In the first case of measuring RR, if the value of RR was normal, then also the same procedure is followed.

Step 7- To ensure immediate treatment of the patients as soon as they enter the hospital, doctors are alerted through automatic call by GSM and a virtual copy of the patient's medical history stored in the cloud is sent, so as to make the required arrangements.

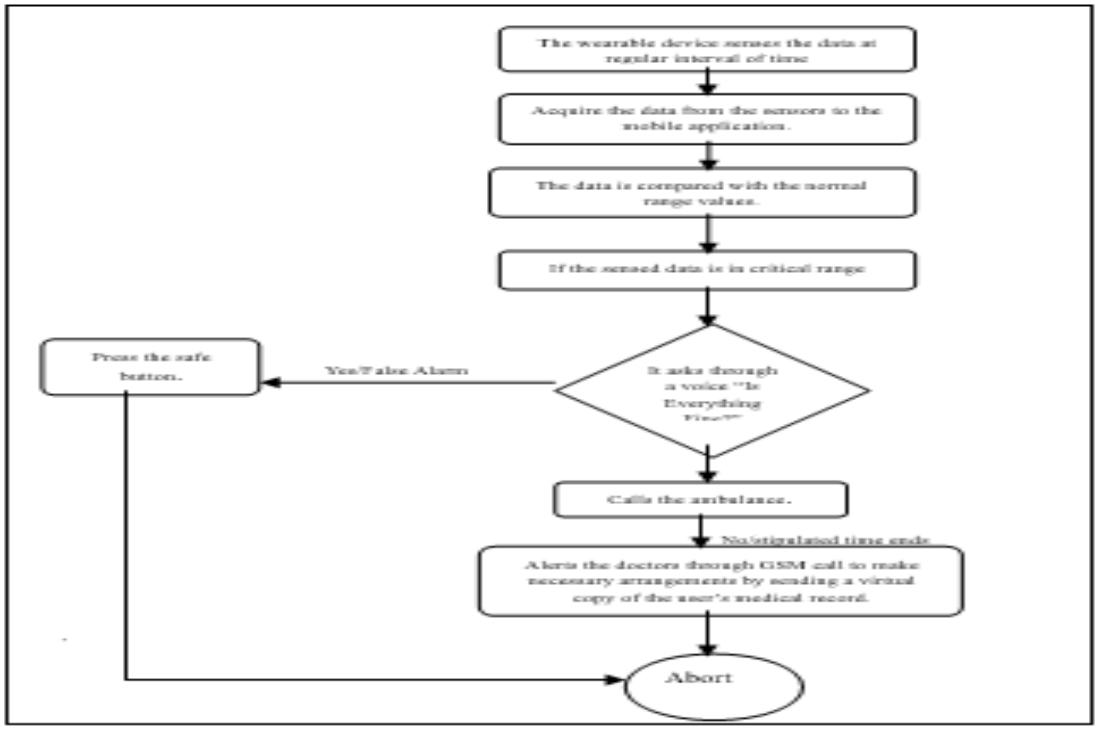
Step 8- The user can add his/her closed ones in the "Emergency Contact List" so that SOS alert is sent to them in case of an emergency.

Step 9- To ensure privacy of the patients' medical history only the closed ones present in the "Emergency Contact List" can track the patients' medical record as well as location.

Step 10- The app can be used to remotely monitor the elderly people and keep a continuous track of their medical records.

Step 11- The app can also be used to store and retrieve the medical track record even during a normal visit to the doctor.

VII. FLOW CHART



VIII. Advantages and Disadvantages

Advantages:

1) Helps in monitoring vulnerable patients who are prone to medical issues.
2) The device enables convenient and accurate tracking of medical records and health parameters, for your overall well-being.
3) It is set to make our lives safer and more efficient.
4) The app can be used as a locker to store the medical records virtually which makes them handy.

Disadvantages:

1) Due to the high cost of the wearable device this technology seems to be more of a luxury rather than a necessity.
2) Battery life is a critical issue when it comes to wearables device technology as batteries do not last a sufficient amount of time, and still need to be charged on an almost near-daily basis. It is also one of the most frustrating aspects for wearable developers because battery life does not develop at the same rate as other technologies.

IX. Future Scope

Introduction to Big Data: - With increase in user data and internationalization, with overhead of databases increasing big data should be handled with efficient algorithm as the access time to historic data must be as short as possible.

Online medical support: - Service can be added to help medical emergency actions, user can get quick response from certified and authenticated doctors about first aid in any medical situation. 3. Bio-sensors in wearable IDs: - Various sensors can be integrated into the wearable IDs to get a direct alert to the mobile application direct about any medical situation.

X. CONCLUSIONS

Healthcare system is emerging and scaling greater heights ever since the concept of Internet of things has evolved. The Internet of things has numerous applications in healthcare, from remote monitoring sensors and medical device integration. It has the potential to not only keep patients safe and healthy, but to improve how the doctors deliver care as well. In this paper a work system is proposed which helps in monitoring vulnerable patients who are prone to medical issues as well as it helps the users who face emergencies and in critical cases the system is enabled to alert the ambulance with the current location of the user. Security is given higher priority as it uses the heartbeat of the user as the security password. Though IOT is revolutionized, it still needs to be improved in terms of efficiency which can be done through various technologies integration. Thus, helping the users in achieving results of the given proposed system with a high possibility of user satisfaction.

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