Intelligent Ambulance – AI and Human Interface Technology

[1]Ashwini M. (1DS19EC021), [1]Bindu K.R. (1DS19EC028),
[1]Divya K.K. (1DS19EC036), [1]Aishwarya C. (1DS20EC401),
[2]Dr. Sindhu Sree M. [3]Dr. Pavithra G., [4]Dr. T.C.Manjunath,
[5]Aditya T.G., [6]Sandeep K.V., [7]Rajashekar M. Koyyeda,
[8]Dr. Suhasini V.K., [9]Dr. Vijayakumar K.N.
[1]Final year (ECE) BE Students, Dept. of Electronics & Communication Engg.,
Dayananda Sagar College of Engineering, Bangalore
[2]Assistant Professor, ECE Dept., Dayananda Sagar College of Engineering, Bangalore
[3]Associate Professor, ECE Dept., Dayananda Sagar College of Engineering, Bangalore
[4]Professor & HOD, ECE Dept., Dayananda Sagar College of Engineering, Bangalore
[5]Second year BE (CSE) Student, PES University, Bangalore
[6]Assistant Professor, Electronics & Telecommunication Engg. Dept., DSCE, Bangalore
[7]Assistant Professor, EEE Dept., Tatyasaheb Kore Inst. of Engg. & Tech., Kolhapur, Maharashtra
[8]Prof. & Head, Mechanical Engg. Dept., DJ Sanghvi College of Engg., Mumbai
[9]Principal & Prof., Dept. of MCA, Bharati Vidyapeeth's Inst. of Mgmt. & Info. Tech., Mumbai

Abstract

This paper involves the review of papers related to an efficient ambulance management system in this project report we will be going through research papers related to similar topics and find information to improve the process of making an ambulance intelligent. 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, IoT, AI, ML and mobile computing can be used to improve the ambulance management and emergency help services. . Ambulance service is one of the crucial services that gets delayed. Sometimes on-sight doctors are not available, so the patient does not get medical attention immediately. In health monitoring system, the patient's vital health parameters such as ECG, Heart Rate and Body Temperature are monitored. These parameters are sent the hospital server using IoT and cloud technology. In the current era of technology, Artificial Intelligence (AI) is playing a vital role in the health care sector especially cardiac disease detection which is a major cause of sudden death. The work given here is a mini-project that is taken up as a part of the curriculum completed by electronics and communication engineering students in the second year of the electronics & communication engineering department at Dayananda Sagar College of Engineering in Bangalore.

Keywords

Artificial Intelligence (AI), Internet of Things (IoT), Machine Learning (ML), Cloud computing,

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 [1].

2. Loss of life

There is loss of life due to the delay in the arrival of ambulance to the hospital in the golden hour. This delay is mainly caused by the waiting of the ambulance in the traffic signals. Traffic congestion and tidal flow management were recognized as major problems in modern urban areas, which have caused much uncomfortable for the ambulance. More over road accidents in the city have been nonstop and to bar the loss of life due to the accidents is even more crucial. To implement this we introduce a scheme called Automatic ambulance rescue system using shortest path finding algorithm. The ambulance is controlled by the central unit which furnishes the most scant route to the ambulance and also controls the traffic light according to the ambulance location and thus reaching the hospital safely [2].

3. Affected areas

One of the widely affected service due to traffic jams is that of an ambulance. Many a times, ambulance consist of emergency or critical patients which needs to be taken to the hospital in minimum amount of time providing proper treatment to the patient so that chances of surviving increases in critical condition. A Patient may lose his life if there is delay in reaching of ambulance to the hospital. According to the surveys 95% of the heart attacks cases can be treated, if the ambulance can reach the hospital at current time without stucking into the traffic. For this, it is needed that the vehicles on the road to make way for the ambulance. But sometimes, the ambulance gets stuck in the traffic which in turn wastes a lot of time waiting for the traffic to get clear. We can overcome these limitations by the emerging technology such as IoT, i.e., Internet of Things.

4. Software implementation

Various software implementations and hardware devices can be connected with the help of wireless networking tools or wired tools. In IoT the components are connected and controlled by the internet. Thus the impact of IoT in today's era is significant as it helps to represent the object digitally and makes itself something greater than the object by itself [3]. Monitoring of health parameters of the patient in ambulance and transferring these to the hospital and at the same time traffic lights are controlled by the driver of ambulance to reach hospital as early as possible. Health parameters such as ECG, Heart rate, body temperatures are calculated by hardware and further using serial communication are stored in PC present in ambulance through which they are transferred to hospital. For traffic controlling purpose RF communication is used.

5. Traffic density

Traffic density is also considered while designing the algorithm to control the traffic lights. Embedding of health Monitoring system and traffic controlling system may lead to save one precious life [4]. In the olden days, there are no smart phones, internet facility& now it's changed. The Android-based health monitoring system is a healthcare management application that helps the doctor to diagnose the patient anywhere at any time. A Registered user can have the facility anywhere. Whenever he/she in need of an ambulance, consultancy etc. The user can easily contact the healthcare centre. Especially during the situations when the patient is unable to visit the hospitals. The states of the patients are checked regularly by the healthcare system [1]-[5].

6. The personal health Information (PHI)

The personal health Information (PHI) is sent by the user using the android application [5]. Machine learning is a branch of artificial intelligence that has been upgraded (AI). Using artificial intelligence, we can create more intelligent machines. Machine learning is a strategy for learning from examples and experiences that is not explicitly changed. Medical professionals utilize machine learning tools and methods to analyse medical data in order to detect hazards and offer appropriate diagnosis and treatment, i.e., scope of remote healthcare includes anything from tracking chronically sick patients, elderly people, preterm children, and accident victims. i.e., eddy current study explores the machine learning technologies' capability of monitoring remote patients and alerts their current condition through the remote system. New advances in contactless observation demonstrate that it is only necessary for the patient to be present within a few meters of the sensors for them to work. Sensors

connected to the body and environmental sensors connected to the surroundings are examples of the technology available [6].

In [31], the system consists of a sensor node to track patients' vitals during different activities which patients perform. The proposed sensor node collects patients' data using the sensors attached to the nRF5340 Development Kit (DK). The connected sensors are accelerometer, microphone, pulse oximeter, heart rate sensor, and temperature sensor. The accelerometer enables monitoring different patient physical activities, including walking, sleeping, exercising, and running. But the machine learning models are used to detect cough and healthy breathing only the dimensional data. Tree based learning algorithms are considered to be one of the best and mostly used supervised learning methods. Naive Bayes algorithms are mostly used in sentiment analysis, spam filtering, recommendation systems etc. the performance of the classifier. They interpret sensory data through a kind of machine perception, labelling or clustering raw input. System architecture is the conceptual model that defines the structure, behaviour, and more views of a system [6]-[10].

7. Conclusions

For controlling the traffic signals in favor of ambulances during the accident. It is found that ambulance wait longer at hospital emergency departments today than in previous years. With this system the ambulance can be maneuvered from the accident spot to the hospital without time lag. The traffic signal is automatically, hence making uninterrupted traffic to the ambulance vehicle. Hence reduce the emergency response time and increase the minimum inconvenience to regular traffic in saving the life of the people. This system can be effectively implemented for an entire city or countries with large population like INDIA for better results. Thus, we have presented a system and give a clear way to emergency purpose vehicles on road so that they can reach their destination in least time without stopping at a traffic intersection. This system can be effectively implemented for an entire city or countries with large population like India for better results.

References

[1] Akash Bansode , Sanket Thakare, Sarthak Pawar, Subodh Wavhal and Prof. D S Rakshe, Smart Ambulance Management Application Using Cloud, IJARIIE-ISSN(O)-2395-4396, Vol-8 Issue-3 2022.

[2] P. Arunmozhi , P. Joseph William, Automatic Ambulance Rescue System Using Shortest Path Finding Algorithm, International Journal of Science and Research (IJSR), Volume 3 Issue 5, May 2014.

[3] Anu Philip , Siml P Thomas , Neethan Elizabeth Abraham , Reshma Chandran, A Survey on Smart Ambulance Traffic Control System -A Support for Implantable Medical Devices,IJCSE,2017.

[4] Gargi Beri , Ashwin Channawar, Pankaj Ganjare , Amruta Gate , Prof. Vijay Gaikwad, Intelligent Ambulance with Traffic Control, IJLRET, Volume 02 - Issue 05, May 2016.

[5] Aiswarya G, Anjali U K, Amal Mathew, Alen Benny, Jamshid C T, Prof. Tinimol Andrews, Android based Remote Health Monitoring System, IJERT, Volume 9, Issue 13,2021.

[6] M. Dhinakaran , Khongdet Phasinam , Joel Alanya-Beltran , Kingshuk Srivastava , D. Vijendra Babu , and Sitesh Kumar Singh, A System of Remote Patients' Monitoring and Alerting Using the Machine Learning Technique, Journal of Food Quality, 8 February 2022.

[7] Tugay Akca, Emre Kocyigit, Ozgur Koray Sahingoz and Mucahid Tozal., "Intelligent Ambulance Management System in Smart Cities.," in IEEE-2020

[8] GargiBeri, PankajGanjare, Amruta Gate, AshwinChannawar, Vijay Gaikwad, Intelligent Ambulance Traffic Control.

[9] Himadri Nath Saha , Neha Firdaush Raun, Maitrayee Saha, Monitoring Patient's Health with Smart Ambulance system using Internet of Things (IOTs),IEEE 2017.

[10] Alokkumar Rao, Bharat S. Chaudhar, Development of LoRaWAN based Traffic Clearance System for Emergency Vehicles, IEEE 2020.

[11] Divya Ganesh, Gayathri Seshadri, Sumathi Sokkanarayanan, Panjavarnam Bose, Sharanya Rajan and Mithileysh Sathiyanarayanan. "Automatic Health Machine for COVID-19 and Other Emergencies.," in IEEE-2021.

[12] Seetharaman R, Karthikeyan S, Saranraj M, Sankar Kumar P, Naina Mohamed M, "Density Based Traffic Control using RFID in Labview", ISSN: 2321-2004, Trichy, India, Vol. 8, Issue 4, April 2020.

[13] Sakshi Dhuria , Mohd. Yusuf Khan , Rupal Mishra , Shivam Narsingh , Satya Prakash Singh, Ambulance Tracking with Patient Health Monitoring by the use of GPS and GSM,2021.

[14] Gowthami.P, "an Android based Patient monitoring System" , vol.3 , IIJIRAE , 2016.

[15] Yunzhou Zhang, Huiyu Liu, Xiaolin Su, Pei Jiang & Dongfei Wei " Remote Mobile Health Monitoring System based on Smart Phone and Browser/Server Structure", Journal of Healthcare Engineering,2015.

[16] Fayezah Anjum, Abu Saleh Mohammed Shoaib, Abdullah Ibne Hossain, Mohammad Monirujjaman Khan , "Online Health Care".

[17] Benfano Soewito , Devinca Limto ,Christina Yuanita, Vincent , Noprianto, Health Monitoring with Artificial Intelligence,2020.

[18] G. Beri, P. Ganjare, A. Gate, A. Channawar, Vijay Gaikwad, "Intelligent Ambulnce with Traffic Control", in International Jour. of Elect, Electronics and Comp Systems, vol. 4 , pp 43-46, Feb.2016.

[19] "The real-time monitoring system for in-patient based on Zigbee",Ping Wang in Second International Symposium onIntelligent Information Technology Application 2008 IEEE.

[20]] S.Thelen,M.Czaplik, P. Meisen, D. Schilberg and S. Jeschke,"Using Off-The-Shelf Medical Devices For Biomedical Signal Monitoring in a Telemedicine System for Emergency Medical Services," IEEE Journal of Biomedical and Health Informatics , 2015.

[21] R.Waldron and D.M.sixsmith,"Emergency physician awareness of prehospital procedures and medications," Western Journal of emergency medicine, vol. 15, p.504,2014.

[22] "Integration of Active RFID and WSN for Real Time Low-Cost Data Monitoring of Patients in Hospitals",ShahMihir Rajesh in 2013 international conference on Control, Automation , Robotics and Embedded systems(CARE).

[23] Ramya P; Priyadarshini V; Varun Kumar K; Vinitha Alamelu G K. "Life Saving Ambulance Monitoring Using Image Processing". International Research Journal on Advanced Science Hub, 2, 3, 2020, 5-11. doi: 10.47392/irjash.2020.17

[24] R. Devi Priya, R. Sivaraj, Ajith Abraham, T. Pravin, P. Sivasankar and N. Anitha. "Multi-Objective Particle Swarm Optimization Based Preprocessing of Multi-Class Extremely Imbalanced Datasets". International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems Vol. 30, No. 05, pp. 735-755 (2022). Doi: 10.1142/S0218488522500209

[25] Deshmukh K P. "Wireless Transceiver Module HC-12 based Automatic Water-level Monitoring and Control System". International Research Journal on Advanced Science Hub, 2, 10, 2020, 24-28. doi: 10.47392/irjash.2020.184

[26] Naveenkumar S; Kirubhakaran R; Jeeva G; Shobana M; Sangeetha K. "Smart Health Prediction Using Machine Learning". International Research Journal on Advanced Science Hub, 3, Special Issue ICARD-2021 3S, 2021, 124-128. doi: 10.47392/irjash.2021.079

[27] Hari Prasada Raju Kunadharaju; Sandhya N.; Raghav Mehra. "Detection of Brain Tumor Using Unsupervised Enhanced K-Means, PCA and Supervised SVM Machine Learning Algorithms". International Research Journal on Advanced Science Hub, 2, Special Issue ICSTM 12S, 2020, 62-67. doi: 10.47392/irjash.2020.262

[28] Sona Solanki; Asha D Solanki. "Review of Deployment of Machine Learning in Blockchain Methodology". International Research Journal on Advanced Science Hub, 2, 9, 2020, 14-20. doi: 10.47392/irjash.2020.141

[29] Shreekar Kolanu; Shikhar Jyoti Dutta; Saurav Roy; Maheswari M.. "A Diabetic Diet Suggester and Appointment Scheduler Chatbot using Artificial Intelligence and Cloud". International Research Journal on Advanced Science Hub, 3, Special Issue 6S, 2021, 77-81. doi: 10.47392/irjash.2021.170

[30]   Praveen Kumar Mishra; Prabhakar Tiwari. "Cyber Security in Smart Grid". International Research Journal on Advanced Science Hub, 2, 6, 2020, 26-30. doi: 10.47392/irjash.2020.33

[31]   Salini Suresh; Suneetha V; Niharika Sinha; Sabyasachi Prusty. "Latent Approach in Entertainment Industry Using Machine Learning". International Research Journal on Advanced Science Hub, 2, Special Issue ICARD 2020, 2020, 304-307. doi: 10.47392/irjash.2020.106

[32]   Gayathri N Shenoy; Chithu Rajan; Shibi Varghese; Vignesh M.V; ShanmugaPriya M; Priya S; Aparna George. "STERILOID: Room Sanitization Robot". International Research Journal on Advanced Science Hub, 2, 8, 2020, 100-104. doi: 10.47392/irjash.2020.101

[33]   Mohan Kumar B.N; Rangaraju H.G. "Array Multiplier and CIA based FIR Filter for DSP applications". International Research Journal on Advanced Science Hub, 3, Special Issue ICEST 1S, 2021, 52-59. doi: 10.47392/irjash.2021.020

[34] Divya D. Nanwani, Puja R. Kshirsagar, Bhavana P. Kawalkar, Pritish Deshmukh, Ambulance Tracking and Patient Health Monitoring Using GPS and GSM, 2017.

[35] Pooja Kadam, Nivedita Patil, Pooja Patil, Snehal Shitole, Prof. Patil S.D., Prof. Patil D.R., Smart Ambulance with Traffic Management,2020.

[36] P. Ponsudha, Haritha.K, Gayathri.D, Harshitha Shree P., Swetha C, "Efficient ambulance service with real time ambulance monitoring syatem" International Journal of Applied Engineering Research, 2019.

[37] M Sanjay Karanth, Bindhu kumar K T, Gururaj Reddy J, Manoj K, Veda. B, "Smart ambulance with patient monitoring", 2015.

[38] Mery Subito1, Alamsyah, and Ardi Amir, Web-Based Wireless Monitoring System on Patient's Vital Sign, 2019.

[39] Tia Gao, Logan K. Hauenstein, Alex Alm, David Crawford, Cassius K. Sims, Azmat Husain, and David M, Vital Signs Monitoring and Patient Tracking Over a Wireless Network,2016.

[40] Sathyasri.B, Dr. M.AntoBennet, Bhuvaneshwari.S, Deepika.M, Artifitial intelligence based e-Health management system,2018.

[41] Jayavardhana Gubbi,a Rajkumar Buyya, Slaven Marusic,aMarimuthu Palaniswamia "Internet of Things (IOTs): A Vision, Architectural Elements, and Future Directions".

[42] Timothy Malche, Sumegh Tharewal and Mohammad Aman Ullah, Artificial Intelligence of Things-(AIoT) Based Patient Activity Tracking System for Remote Patient Monitoring, 2022

[43] Amogh Powar, Seema Shilvant, Varsha Pawar, Pratiksha Shetgaonkar, Shailendra Aswale, Data Mining & Artificial Intelligence Techniques for Prediction of Heart attack,2019.

[44] Yuanyuan Pan, Minghuan Fu Biao Cheng , Xuefei Tao and Jing Guo, Enhanced Deep Learning Assisted Convolutional Neural Network for Heart Disease Prediction on the Internet of Medical Things Platform,2020.

[45] Kunder Akash, H N Shashank, SRIKANTH S, THEJAS A M, Prediction of Stroke Using Machine Learning, 2020.