International Journal of Scientific Research in Science and Technology
Available online at : www.ijsrst.com
OPEN ACCESS
Print ISSN: 2395-6011 | Online ISSN: 2395-602X
doi : https://doi.org/10.32628/IJSRST

Real-Time Location Tracking and Emergency Patient Data Dispatch to Nearby Hospitals

Dr. D. Jithendra Reddy[1], M. Priyanka[2], K. Yashaswini Murthy[2], S. Vinuhya[2], M. Vidya Sagar[2], C.Nikhil[2]
[1]Assistant Professor, [2]B Tech Students
Department of Electronics and Communication Engineering, Annamacharya Institute of Technology and Sciences, Tirupati, Amdhra Pradesh, India

ARTICLEINFO

Article History:
Accepted: 03 March2024
Published: 28March 2024

Publication Issue :
Volume 11, Issue 11
March-April-2024

Page Number :
477-487

ABSTRACT

The integration of Internet of Things (IoT) technology into hospital management systems represents a significant shift in modern healthcare delivery, particularly in the context of smart hospitals where accurate location tracking of individuals in distress is crucial for timely medical assistance. Healthcare systems have innovated solutions leveraging IoT integration to enable real-time location tracking during emergencies, coupled with the transmission of essential patient data to nearby medical facilities. This abstract offers a comprehensive overview of the importance and implementation specifics of IoT-enabled location tracking in emergency scenarios, with a particular emphasis on integrating patient vital signs such as heart rate and blood pressure. The proposed solution introduces an electronic Wi-Fi controller-based IoT hospital management system, aimed at streamlining patient health monitoring processes. This system, facilitated by a hardware kit, ensures continuous monitoring of vital health metrics like heart rate and temperature, while also enabling seamless transmission of patient location data via Google Maps based on longitude and latitude coordinates to an IoT web server. Ultimately, this integrated approach seeks to improve patient outcomes and save lives in critical situations by swiftly sending relevant data to nearby hospitals. IoT integration facilitates smooth communication and data transmission between tracking devices and medical facilities, enhancing overall emergency response efficiency.

Keywords: Internet of things, GPS, Nearest Hospitals, Cloud

I. INTRODUCTION

In today's fast-paced world, prioritizing the safety and well-being of individuals, especially in emergencies, is paramount. The introduction of a location tracking system for people in distress could revolutionize emergency response protocols. By utilizing GPS technology, those in need could instantly transmit their precise location to nearby hospitals. This real-time data transmission would enable emergency responders to quickly reach the individual, significantly reducing response times and potentially saving lives. In emergency situations, rapid and accurate location tracking is crucial for timely medical assistance. Furthermore, integrating capabilities for monitoring vital signs, such as heart rate and temperature, into the system adds an additional layer of support. These vital signs offer essential medical information to healthcare professionals, aiding them in better preparing for the specific needs of the patient upon arrival. Equipping hospitals with this data allows medical teams to streamline triage processes and allocate resources efficiently, optimizing the delivery of care. Ultimately, this integrated approach to emergency response combines location tracking with vital signs monitoring, ensuring a swift and informed medical response when every second counts. With technology propelling advancements in emergency services, we can enhance the safety and well-being of individuals in their time of need like never before.

II. LITERATURE REVIEW

Recent literature highlights the growing integration of IoT in smart hospital management systems, particularly in implementing location tracking for people within healthcare facilities. Studies emphasize the benefits of real-time monitoring and resource optimization. Challenges such as privacy concerns and system reliability are identified, alongside proposed solutions. Overall, the focus is on enhancing patient care and operational efficiency through IoT-enabled solutions in hospital settings. Smart Hospital Management Systems: The design and development of smart hospital management systems leveraging IoT integration have been extensively explored in the literature. Zhang et al. (2021) present a study on the design and implementation of a smart hospital management system based on IoT, emphasizing its ability to improve patient care quality and optimize resource utilization. Jiang et al. (2018) conduct a survey of smart healthcare systems, discussing the integration of IoT technologies to enable data-driven decision-making and enhance healthcare services.

This paper explores a smart healthcare system in an IoT framework for real-timemonitoring patient vital signs and room conditions. Utilizing two sensors: one for heartbeatdetection and the other for measuring body temperature [1]. This paper elaborates on thecreation of an IoT device to transmit accurate patient GPS coordinates to a server [2]. Thispaperdelvesintoanefficientpatientmonitoringandambulancetrackingsystem,enablingrapidthirty-second diagnostics with sensors capturing essential parameters, to dispatch [3]. Thepaper focuses on diverse deployment approaches for constructing a cloud and IoT-basedsystem for smart home and hospital environments [4].In alignment with the IoT vision, weintroduceaSmartHospitalSystem(SHS)thatharnessesavarietyofinterdependenttechnologies, including RFID, WSN, and smart mobile devices [5]. Smart Hospital InformationManagement System, integrating IoT technologies Promising benefits extend beyond hospitals to patients, enhancing overall healthcare management [6]. This paper examines configuring aPDAasanSDNswitch,conductingMininet-basedSDNemulationto validate

itsfeasibilityinWBANs, aiming to minimize deploymentcomplexity,network overhead, and efficientlymanage deviceinterconnectionswithinthenetwork[7].

Aiming to explore IoT applications in the medical sector and enhance medical careservices in health institutions [8]. The paper addresses the architecture, implementation, andtesting of a specific biomedical application utilizing a WBAN at Ege University Hospital [9].Integrate neural networks and fuzzy systems into a secure healthcare monitoring system tocreateaself-prioritizingsmarthealthcare[10].TheRemoteHealthMonitoring (RHM) systemcan sense certain human vital signs such as, temperature, respiration and heartbeat (pulse)which isconnectedinrealtimeenvironment[11].Thesystemformonitoringthepatient'sbody24/7 by using IoT. Now a days, patient monitoring system is getting much more popularity tothe researcher and patient guardian [12]. Real time location system (RTLS) doubled thepotential exposures list for pertussis disease beyond the conventional method of EMR-basedcontact identification [13]. In this paper, we have presented an IoT enabled approach that canprovide emergency communication and location tracking services in a remote car that meetsanunfortunateaccidentoranyotheremergencysituation[14]

III.PROPOSED SYSTEM

The proposed method for location tracking in emergency cases involves leveraging IoT integration to ensure swift and accurate transmission of critical patient data to nearby hospitals. This system is designed to efficiently track individuals in distress and promptly relay their location alongside vital signs such as body temperature and heart rate to medical facilities for immediate attention. Through IoT-enabled devices and sensors, real-time monitoring of patient health metrics is facilitated, allowing for seamless transmission of this data to hospital systems. In this method, IoT devices are strategically placed to continuously monitor the patient's vital signs, ensuring timely detection of any abnormalities indicative of an emergency situation. The gathered data is then transmitted securely to the nearest hospitals via IoT communication channels. Integration with GPS technology enables precise location tracking, ensuring that emergency responders can swiftly reach the individual in need. Furthermore, the system is equipped with algorithms designed to analyze the collected data, detecting any deviations from normal health parameters. Upon identifying a potential emergency, the system triggers automatic alerts to the designated healthcare facilities, providing them with the patient's exact location and comprehensive medical details. By combining IoT technology with real-time data transmission and vital signs monitoring, this proposed method offers a comprehensive solution for enhancing emergency response protocols. It enables healthcare providers to receive timely and accurate information, allowing them to deliver prompt and targeted medical assistance, ultimately improving patient outcomes in critical situations.

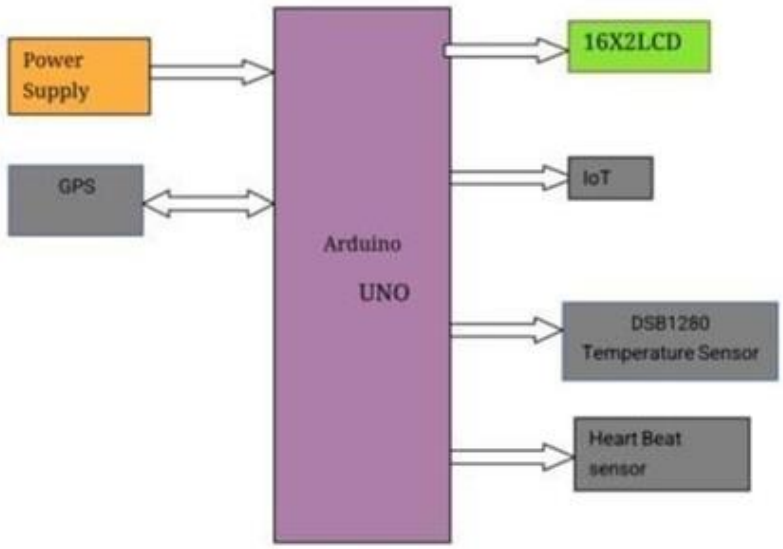

Fig.1:BlockDiagramsmarthospitalmanagement

IV. WORKING PRINCIPLE

The working of a smart hospital management system begins with a power supply. Here,we use a stepdown transformer as it provides appropriate voltage level to the system. Thevoltage required for the system is 12v. In case of emergencies or accidents, the heart rate andtemperature sensors detect the patient's body temperature and heart rate. The Arduino boardacts as a communicator between the sensors and IoT device. It collects the patient's data(temperature and heart rate) from the sensors and dispatch the data to the IoT (ESP8266)device.ThisIoTdevicesendsthedispatched patient'sdatato aservercalledThing speak.Thisserverpossessareadandwritelink.Thewritelinkisupdatedwiththepatient'sdatawhichwasobtainedbytheIoTdeviceandthenearbyhospitalswiththereadlink,receivesthisinformation. To locate the nearest hospitals, a Global Positioning System (GPS) is used in thesystem.Basedon thelatitudeandlongitudeofthearea,theGPSlocatesthenearesthospital Aftertheinformationofthepatient'sconditionisreceivedbythehospital,theycanmakethenecessaryarrangementswhicharerequiredtoprovideforthehealthofthepatient.

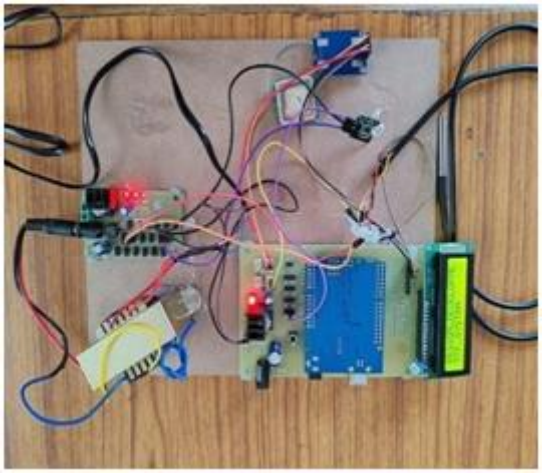

Fig.2:HardwareKit

V. COMPONENTS USED

5.1 ARDUINOUNO: The Arduino UNO, built around the ATmega328 microcontroller, is a widely used microcontroller board. It operates on an open-source platform, with both hardware and software specifications freely accessible to the public.

Fig.3:ArduinoUno

5.2 IOT(ESP8266)The Internet of Things (IoT) comprises internet-connected physical objects capable of exchanging data. The ESP8266, functioning as both a system and Wi-Fi microchip, facilitates IoT applications. It can serve as a Wi-Fi adapter for various microcontroller types, expanding their connectivity capabilities.

Fig.4: Wi-fiModule

5.3 HEARTRATESENSOR(DSB1280)

The heartbeat sensor operates on photoplethysmography, detecting changes in blood volume within body organs, altering light intensity. In applications focusing on monitoring heart pulse rates, pulse timing is crucial. Blood volume flow correlates with the heart pulse rate, and as blood absorbs light, signal pulses correspond to heartbeats. Therefore, accurately timing these pulses is essential for monitoring heart rates effectively. By interpreting changes in light intensity caused by blood volume fluctuations, the sensor can reliably track heartbeat rhythms for various medical and fitness applications.

Fig.5:Heart RateSensor

5.4 TEMPERATURESENSOR

TheDHT11(Fig.5)isaminimal-expensecomputerizedtemperatureanddampnesssensor.Thissensor is predominantly used in conjunction with many microcontrollers to solve many real-world Problems.This sensoruses a thermistor and capacitivemoisture and a capacitivemoisture sensorareusedinthissensortomeasure the surroundingairsensor

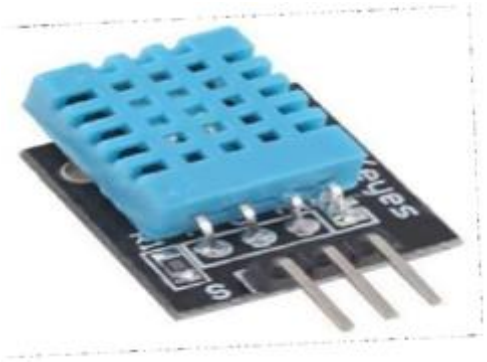

Fig.6:TemperatureSensor

5.5 LIQUIDCRYSTALDISPLAY(16*2)

LCD(liquidcrystaldisplay)screenisanelectronicdisplaymodulethatusesthelightmodulatingpropertiesofliquidcrystal.

Fig.7:LCD

VI. RESULT

Smart hospital management with IoT integration involves deploying sensors, collectingdatafrompatientsinemergencycases,andsendingthedatatonearbyhospitalsthroughaserverand real-time data on patients, equipment, and the environment. The server used anotherapplication like Google Maps based

on longitude and latitude. This data is then processed andanalyzedtoprovideinsightsandautomatetaskslikepatientmonitoring, resourceallocation

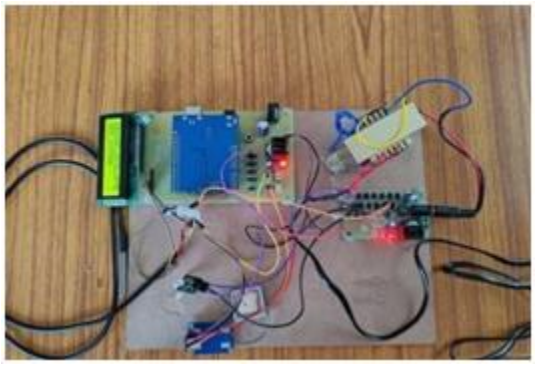

Fig.8:HardwareKit

Upon powering on, a step-down transformer provides 12V for ease of kit testing. The sensor, designed to measure temperature, transmits data to a central system via IoT integration. Specifically, the temperature sensor is tasked with detecting the body temperature of patients, contributing vital information for monitoring and managing their health status.

Fig.9:DisplaytheTemperature

When the temperature exceeds a certain threshold, the system automatically sends the data tothe nearesthospitals

Fig.10: DisplaytheHeart Beat

Additionally, it displays the patient's blood pressure, including both systolic and diastolicmeasurements. And send the data to the nearest hospitals in emergency cases (or) accidents.GPS shows where the emergency or accident was detected and sends the server to the nearesthospitals.

Fig.11:DisplaytheBloodPressure

The website displays real-time outputs via a Wi-Fi module, updating values every second. Operating through mobile applications, it provides data on patient heart rate and temperature, showcasing advanced technology. All operations are stored securely in the cloud, ensuring no loss of data. Additionally, it presents directional commands given to the robot on ThingSpeak, offering comprehensive monitoring and control capabilities for seamless integration into various applications and systems.

{"channel":{"id":2420660,"name":"Design and Development of Smart Hospital Management using IoT integration","latitude":"0.0","longitude":"0.0","field1":"Field Label 1","created_at":"2024-02-03T08:23:00Z","updated_at":"2024-02-05T07:26:26Z","last_entry_id":7},"feeds":[{"created_at":"2024-02-03T08:25:52Z","entry_id":1,"field1":"0"},{"created_at":"2024-03-01T04:43:51Z","entry_id":2,"field1":"We_created_a_pulseSensor_Object_!"},{"created_at":"2024-03-01T04:47:31Z","entry_id":3,"field1":"A__Heart Beat_Happened___BPM_____74"},{"created_at":"2024-03-01T05:12:37Z","entry_id":4,"field1":"We_created_a_pulseSensor_Object_!"},{"created_at":"2024-03-01T05:12:58Z","entry_id":5,"field1":"We_created_a_pulseSensor_Object_!"},{"created_at":"2024-03-01T05:13:14Z","entry_id":6,"field1":"We_created_a_pulseSensor_Object_!"},{"created_at":"2024-03-01T06:32:22Z","entry_id":7,"field1":"A__Heart Beat_Happened___BPM_____104"}]}

Fig.12:Output

VII. CONCLUSION

Integrating location tracking with real-time health data transmission in emergencies holds the potential to transform emergency response systems. Through the utilization of technologies like the Internet of Things (IoT) alongside existing infrastructure, emergency services stand to significantly diminish response times, leading to lives being saved. The convergence of location tracking and health data transmission empowers emergency responders to swiftly identify the precise location of individuals in distress, facilitating the dispatch of resources to the nearest healthcare facility. This optimizes resource allocation and personnel deployment for timely intervention. Additionally, the sharing of patient data and location among various emergency responders, including hospitals, promotes better coordination and ensures seamless transitions of care. By harnessing IoT and data integration capabilities, emergency services can achieve faster response times, improve patient care, and enhance coordination, ultimately making a substantial difference in critical situations and saving more lives.

VIII. REFERENCES

[1]. Islam,MdMilon,AshikurRahaman,andMdRashedulIslam."DevelopmentofsmarthealthcaremonitoringsysteminIoTenvironment."SNcomputerscience1(2020):1-11.DOI:https://doi.org/10.1007/s42979-020-00195-y

[2]. Kanani, Pratik, and Mamta Padole. "Real-time location tracker for critical health patient using Arduino, GPS Neo6m andGSM Sim800L in health care." 2020 4th international conference on intelligent computing and control systems (ICICCS).IEEE,2020. DOI:https://doi.org/10.1109/ICICCS48265.2020.9121128

[3]. Poongodi,Manoharan,etal."Smarthealthcareinsmartcities:wirelesspatientmonitoringsystemusingIoT."TheJournalofSupercomputing(2021)DOI:https://doi.org/10.1007/s11227-021-03765-w

[4]. Isravel, Deva Priya, and Salaja Silas. "A comprehensive review on the emerging IoT-cloud based technologies for smarthealthcare." 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS). IEEE,2020.DOI:https://doi.org/10.1109/ICACCS48705.2020.9074457

[5]. Catarinucci, Luca, et al. "An IoT-aware architecture for smart healthcare systems." IEEE internet of things journal 2.6(2020)DOI:https://doi.org/10.1109/JIOT.2015.2417684

[6]. Kumar, J. Naveen Ananda, and Shivani Suresh. "A proposal of smart hospital management using hybridcloud, IoT, ML, and AI." 2019 International Conference on Communication and Electronics Systems(ICCES).IEEE,2019 DOI:https://doi.org/10.1109/ICCES45898.2019.9002098

[7]. Sallabi, Farag, et al. "Managing IoT-based smart healthcare systems traffic with software defined networks." 2018internationalsymposiumonnetworks,computersandcommunications(ISNCC).IEEE,2021DOI:https://doi.org/10.1109/ISNCC.2018.8530920

[8]. Kadhim, Kadhim Takleef, et al. "An overview of patient's health status monitoring system based on internet of things(IoT)."WirelessPersonalCommunications114.3(2020):2235-2262.DOI:https://doi.org/10.1007/s11277-020-07474-0

[9]. Akkaş,M.Alper,RadosvetaSokullu,andH.ErtürkÇetin."HealthcareandpatientmonitoringusingIoT."InternetofThings11(2020).IEEEDOI:https://doi.org/10.1016/j.iot.2020.100173

[10]. ElZouka,HeshamA.,andMustafaM.Hosni."SecureIoTcommunicationsforsmarthealthcaremonitoringsystem."Internet ofThings13(2021):IEEE.DOI:https://doi.org/10.1016/j.iot.2019.01.003

[11]. Nduka, Anene, et al. "Internet of things based remote health monitoring system using arduino." 2019 Third Internationalconference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC). IEEE, 202.DOI: https://doi.org/10.1109/I-SMAC47947.2019.9032438

[12]. Ruman,MdRaseduzzaman,etal."IoTbasedemergencyhealthmonitoringsystem."2020InternationalConferenceonIndustry4.0Technology(I4Tech).IEEE,2020DOI:https://doi.org/10.109/I4Tech48345.2020.9102647

[13]. Hellmich, Thomas R., et al. "Contact tracing with a real-time location system: A case study of increasing relativeeffectivenessinanemergencydepartment."Americanjournalofinfectioncontrol(2018)-IEEEDOI:https://doi.org/10.1109/ISVLSI.2017.122

[14]. Koley, Subha, and Prasun Ghosal. "An IoT enabled real-time communication and location tracking system for vehicularemergency."2017IEEEcomputersocietyannualsymposiumonVLSI(ISVLSI).IEEE, 2020DOI:https://doi.org/10.1109/ISVLSI.2017.122

ABOUTAUTHORS

Dr. Jithendra Reddy Dandu Institute of Technology & Sciences, Tirupati,AndhraPradesh.He successfully completed his full-time Ph.D. in the Department of Instrumentation and Control Engineering at the Kerala Academy of Research and Education in 2023. Prior to that, he pursued his Master of Technology in Digital Systems and Computer Electronics from JNTU. Ananthapur University obtained his B.Tech. in Electronics and Instrumentation Engineering from JNTU Ananthapur University in 2011. He expressed his interest in the research fields of medical image processing, artificial intelligence, and embedded systems.

Ms. Priyanka Mandyam, studying for a B.Tech degree in the ECE department at Annamacharya Institute of Technology and Sciences, Tirupati District,A.P,India.HerInterestedareas areElectronics.

Ms.YashaswiniMurthy Studying

4th B.Tech degree in ECE Department at Annamacharya Institute of Technology and Sciences, Tirupati District,A.P,India. HerInterestedareas areElectronics.

Ms. Vinuhya Sama is studying for a 4th B.Tech. degree in the ECE Department at Annamacharya Institute of Technology and Sciences, Tirupati District,A.P,India.HerInterestedareas areElectronics.

Mr. Nikhil Cheni is studying for a 4th B.Tech. degree in the ECE Department at Annamacharya Institute of Technology and Sciences, Tirupati District, A.P., India. His interested areas are electronics.

Mr.Vidya Sagar Mandapalli is studying 4th B.Tech. in the ECE Department at Annamacharya Institute of Technology and Sciences, Tirupati District,A.P,India. His InterestedareasareElectronic