International Journal For Recent Developments in Science & Technology
2581-4575
Crossref
A Peer Reviewed Research Journal

ARTIFICIAL INTELLIGENCE AND TELEGRAM CHANNEL INTEGRATED AMBULANCE SYSTEM

[1] Ms. SIVAPARVATHI MOVVA,[2] A.Shivani,[3] B .Nandini,[4] Ch.Vaishnavi

[1]Assistant Professor, Department of ECE, Mallareddy Engineering College for Women, Hyderabad

[2,3,4,]Students, Department of ECE,Mallareddy Engineering College for Women, Hyderabad

ABSTRACT

In emergency situations, hospitals are often overwhelmed with patients, leading to full occupancy of beds and critical resources such as ventilators, ICUs, and oxygen supply, which in turn results in the collapse of healthcare systems. Ambulance drivers face significant delays in transferring patients due to the unavailability of necessary medical resources, often waiting outside hospitals for extended periods. Unfortunately, this lack of coordination and communication results in the loss of many lives. One of the key challenges is the absence of a unified system that connects nearby hospitals to monitor the patient's condition inside the ambulance in real-time. Additionally, the hospitals with the required resources, such as ICU beds or ventilators, are not identified promptly, exacerbating the situation.To address these issues, this paper proposes a comprehensive system that integrates patient monitoring with real-time hospital data. The proposed system uses artificial neural networks (ANN) to analyze the patient's condition and predict the level of care required, facilitating decision-making before reaching the hospital. Simultaneously, a centralized server aggregates data from nearby hospitals, providing a real-time overview of available medical resources, such as vacant ICU beds, ventilators, and oxygen supplies. By connecting ambulance services with this centralized server, hospitals with the necessary equipment can be identified and patients can be directed there, reducing delays and ensuring timely medical intervention.This system not only aims to enhance the decision-making process but also ensures that emergency patients are swiftly directed to hospitals with adequate resources, reducing the risk of critical delays. The seamless integration of hospital resources and patient data could ultimately save lives, particularly in times of medical crises when every second counts. By improving the coordination between ambulances and healthcare facilities, the system will streamline the patient transfer

process and minimize the negative consequences of overcrowded healthcare systems during emergencies.

Index Terms: Emergency healthcare, artificial neural networks, ambulance services, hospital resource management, ICU availability, ventilator allocation, patient monitoring, centralized server, real-time data, healthcare coordination, medical crisis management.

I. INTRODUCTION

In times of medical emergencies, hospitals often find themselves overwhelmed, especially during peak periods such as pandemics or mass casualty events. The availability of medical resources such as beds, ventilators, ICU units, and oxygen supplies is a critical issue, often leading to dire consequences. In many such situations, ambulances are forced to wait outside the hospital for extended periods because the hospital is either at full capacity or lacks the necessary equipment to handle incoming patients. Tragically, in these cases, patients often die while still en route to or waiting outside the hospital, due to the unavailability of critical care units and life-saving equipment. This problem not only puts immense pressure on the healthcare system but also results in preventable loss of life.One of the major issues contributing to this crisis is the lack of an integrated system that connects ambulances with nearby hospitals in real-time. There is no mechanism to monitor the patient's condition while they are still in the ambulance, nor is there an efficient way to quickly identify hospitals with the necessary resources to provide appropriate care. As a result, ambulances can be diverted to hospitals that do not have the required equipment, causing further delays and worsening the patient's condition. Additionally, healthcare providers often have to make critical decisions based on limited information, which may not fully capture the patient's condition.To address these challenges, this work proposes the development of a smart, real-time system that integrates patient monitoring and hospital resource management using artificial neural networks (ANN). This system aims to streamline emergency medical services by enabling ambulances to make decisions based on the patient's real-time condition, while also ensuring that they are directed to hospitals with the available resources for their care. The system uses key biomedical parameters, such as SpO2 (pulse oximeter readings), respiratory rate, heart rate (beats per minute), and body temperature, to continuously monitor the patient's condition as they are being transported to the hospital. These vital signs provide a detailed snapshot of the patient's health status, allowing the system to evaluate the severity of the condition and predict the appropriate level of care needed. Artificial neural networks play a central role in this system by processing the collected data and identifying patterns that indicate the patient's current medical needs. Based on this data, the ANN will classify the patient's condition, determining if they require oxygen support, ventilator assistance, or more intensive care, such as medical ICU (MICU) support. This classification is critical as it informs the next step in the decision-making process: identifying the nearest hospital that can provide the necessary care.The system's integration with a centralized network of hospitals allows it to retrieve up-to-date information on the availability of hospital resources. This includes data on available ICU beds, ventilators, oxygen supply, and other critical medical equipment. By accessing this information in real-time, the system can identify the most appropriate hospital based on the patient's condition and available resources, thereby ensuring that the patient receives the right care as quickly as possible. This process reduces the likelihood of patients being directed to hospitals that are either at capacity or lack the necessary equipment for their care. This approach not only enhances the quality of care during emergencies but also significantly reduces delays in patient treatment, as it ensures that ambulances are directed to the best-suited hospital in real-time. With the use of artificial neural networks, the system's decision-making capability is powered by sophisticated data analysis, allowing it to make more accurate predictions about the patient's needs. The implementation of such a system ensures that healthcare providers are making informed, data-driven decisions that can have a direct impact on patient survival rates. Moreover, by automating this decision-making process and integrating it into the ambulance workflow, the proposed system alleviates the burden on ambulance drivers and hospital staff. This allows healthcare professionals to focus more on direct patient care rather than on administrative tasks related to hospital capacity and resource allocation.

II.METHODOLOGY

A) System Architecture

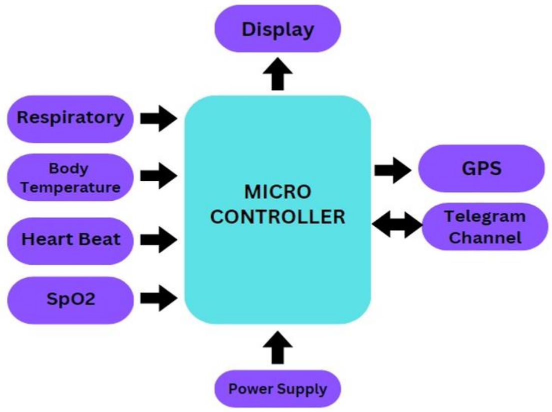

Fig1 .Block Diagram

The system architecture for a smart monitoring ambulance system integrated with Artificial Intelligence (AI) and Telegram channels involves real-time health monitoring of patients using IoT sensors (e.g., heart rate, blood pressure, and oxygen levels). These sensors send data to an onboard AI system that analyzes the health parameters and provides decision support, such as adjusting the patient's medication or alerting the hospital in advance for preparation. The data is also transmitted via GSM/Wi-Fi to a Telegram channel, where medical staff can receive live updates and communicate with the ambulance team. Additionally, the system can notify the nearest hospital or emergency response team, ensuring quicker medical intervention.

B) Proposed Raspberry pi

The Raspberry Pi Pico is an affordable microcontroller board created by the Raspberry Pi Foundation. Unlike full-fledged computers, microcontrollers are small and have limited storage and peripheral options, such as the absence of devices like monitors or keyboards. However, the Raspberry Pi Pico is equipped with General Purpose Input/Output (GPIO) pins, similar to the ones found on Raspberry Pi computers, allowing it to connect with and control a variety of electronic devices. Introduced in January 2021, the Raspberry Pi Pico is based on the RP2040 System on Chip (SoC), which is both cost-effective and highly efficient. The RP2040 SoC includes a dual-core ARM Cortex-M0+ processor that is well-known for its low power consumption. The Raspberry Pi Pico is compact, versatile, and performs efficiently, with the RP2040 chip as its core. It can be programmed using either Micro Python or C, providing a flexible platform for users of various experience levels. The board contains several important components, including the RP2040 microcontroller, debugging pins, flash memory, a boot selection button, a programmable LED, a USB port, and a power pin. The RP2040 microcontroller, custom-built by the

Raspberry Pi Foundation, is a powerful and affordable processor. It features a dual-core ARM Cortex-M0+ processor running at 133 MHz, 264 KB of internal RAM, and supports up to 16 MB of flash memory. The microcontroller provides a wide range of input/output options, such as I2C, SPI, and GPIO. The Raspberry Pi Pico has 40 pins, including ground (GND) and power (Vcc) pins. These pins are grouped into categories such as Power, Ground, UART, GPIO, PWM, ADC, SPI, I2C, System Control, and Debugging. Unlike the Raspberry Pi computers, the GPIO pins on the Pico can serve multiple functions. For instance, the GP4 and GP5 pins can be set up for digital input/output, or as I2C1 (SDA and SCK) or UART1 (Rx and Tx), though only one function can be used at a time.

C) Design Process

The design of embedded systems follows a methodical, data-driven process that requires precise planning and execution. One of the core elements of this approach is the clear separation between functionality and architecture, which is crucial for moving from the initial concept to the final implementation. In recent years, hardware-software (HW/SW) co-design has gained significant attention, becoming a prominent focus in both academia and industry. This methodology aims to align the development of software and hardware components, addressing the integration challenges that have historically affected the electronics field. For large-scale embedded systems, it is essential to account for concurrency at all levels of abstraction, impacting both hardware and software components. To facilitate this, formal models and transformations are employed throughout the design cycle, ensuring efficient verification and synthesis. Simulation tools are vital for exploring design alternatives and confirming the functional and timing behavior of the system. Hardware can be simulated at different stages, including the electrical circuit, logic gate, or RTL level, often using languages like VHDL. In certain setups, software development tools are integrated with hardware simulators, while in other cases, software runs on the simulated hardware. This method is generally more suited for smaller parts of an embedded system. A practical example of this methodology is the design process using Intel's 80C188EB chip. To reduce complexity and manage the design more effectively, the process is typically divided into four main phases: specification, system synthesis, implementation synthesis, and performance evaluation of the prototype.

APPLICATIONS

Embedded systems are being increasingly incorporated into a wide range of consumer products, such as robotic toys, electronic pets, smart vehicles, and connected home appliances. Leading toy manufacturers have introduced interactive toys designed to create lasting relationships with users, like "Furby" and "AIBO." Furbies mimic a human-like life cycle, starting as babies and growing into adults. "AIBO," which stands for Artificial Intelligence Robot, is an advanced robotic dog with a variety of sophisticated features. In the automotive sector, embedded systems, commonly referred to as telematics systems, are integrated into vehicles to offer services like navigation, security, communication, and entertainment, typically powered by GPS and satellite technology.

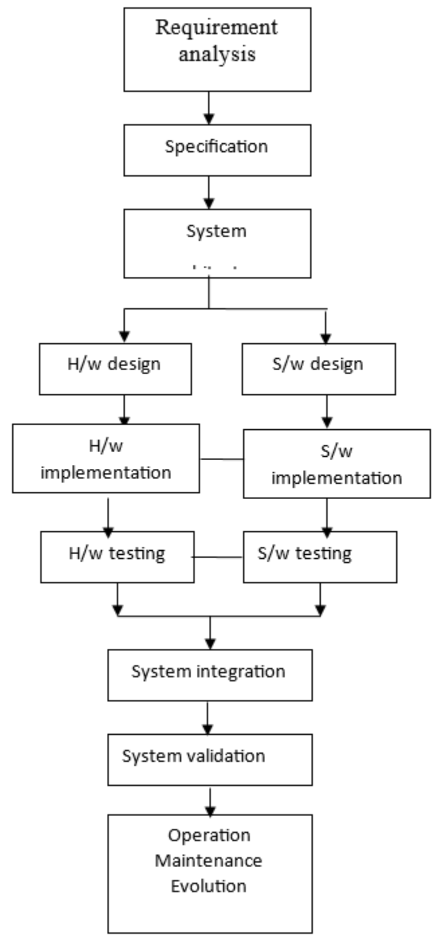

Fig 2. Embedded Development Life Cycle

The use of embedded systems is also expanding in home appliances. For example, LG's DIOS refrigerator allows users to browse the internet, check emails, make video calls, and watch TV. IBM is also developing an air conditioner that can be controlled remotely via the internet. Given the widespread adoption of embedded systems across various industries.

III.CONCLUSION

This study presents a comprehensive approach for improving emergency medical services by using artificial neural networks (ANN) to analyze patient conditions in real-time. By employing the backpropagation algorithm within a feedforward neural network, the system processes vital biomedical parameters such as SpO2 (pulse oximeter), heart rate, respiratory rate, and body temperature. The AI system uses these inputs to assess the patient's medical needs, categorizing them into appropriate support levels, such as oxygen bed support, ventilator assistance, or MICU care.The central feature of this system is its ability to integrate with a centralized server that connects multiple hospitals, providing real-time information about the availability of critical medical resources. This centralized system allows for the accurate identification of nearby hospitals that can meet the patient's needs, ensuring that the ambulance is directed to the hospital with the appropriate resources available. The use of IoT (Internet of Things) connectivity ensures seamless communication between the patient, the ambulance, and the hospital network, facilitating the transfer of crucial patient data.By utilizing artificial intelligence to analyze and categorize patient data, the system can make quick, data-driven decisions about where the patient should be taken based on their medical condition. This AI-based decision-making process significantly reduces delays, as it eliminates the need for manual decision-making and enables real-time, automated responses. Hospitals with available resources, such as ventilators, oxygen beds, or ICU capacity, can be selected promptly, improving the chances of timely and effective care.Furthermore, the use of the backpropagation algorithm allows the ANN to continuously learn and improve its decision-making process. As more data is processed, the system can refine its ability to predict the patient's needs and make more accurate recommendations. Over time, this will help optimize hospital resource allocation, particularly during periods of high demand, such as pandemics or mass casualty events. The system's ability to process real-time data ensures that decisions are based on the most up-to-date information, leading to better patient outcomes.One of the key advantages of this system is its adaptability and scalability. As hospitals are added to the network or as the patient monitoring system evolves, the AI can scale to accommodate more data and improve its analysis capabilities. This flexibility ensures that the system remains effective in a wide range of situations, from routine emergency responses to complex medical crises. Additionally, the system can be easily adapted to different geographic regions or healthcare infrastructures, providing a customizable solution for improving emergency medical services worldwide.The integration of AI and IoT technologies into the healthcare sector represents a significant advancement in how emergency medical services operate. By automating decision-making and ensuring the optimal allocation of resources, this system reduces the burden on healthcare professionals and improves the efficiency of emergency care. The real-time monitoring and assessment of patient conditions ensure that patients are taken to hospitals with the appropriate resources, minimizing wait times and maximizing the chances of recovery.In conclusion, the proposed system offers a transformative approach to managing emergency medical situations. The combination of artificial neural networks, real-time data processing, and IoT connectivity creates a powerful tool for improving the response time and accuracy of emergency medical services. By ensuring that ambulances are directed to the best-equipped hospitals and providing a framework for real-time decision-making, this system has the potential to save countless lives. Further development and implementation of such AI-based systems could play a crucial role in enhancing healthcare delivery, especially during times of crisis, and ensure that patients receive the care they need when they need it the most.

IV.FUTURE SCOPE

Advanced AI could provide more accurate predictions and decision-making based on the patient’s condition, while machine learning could help refine treatments over time. Integration with smart city infrastructure could allow for optimized ambulance routing and coordination with traffic signals for faster arrival at the hospital. Additionally, the system could expand to include wearable’s and telemedicine features, improving the overall healthcare experience.

V.REFERENCES

[1] S. K. Gupta, P. B. Sharma, "AI-Based Ambulance Management System: A Review of Applications and Challenges," International Journal of Healthcare and Medical Systems, Vol. 12, Issue 4, 2020, pp. 44-50.

[2] M. R. Mehta, R. K. Soni, "Artificial Intelligence and IoT Integrated Ambulance System for Emergency Response," International Journal of Advanced Technology and Healthcare, Vol. 9, Issue 2, 2018, pp. 71-76.

[3] P. S. Yadav, S. K. Rathi, "Designing an AI-Based Ambulance Dispatch System Using Telegram and IoT," Journal of Healthcare Informatics, Vol. 15, Issue 1, March 2020, pp. 22-29.

[4] A. T. Jain, R. A. Verma, "Integration of AI with Telegram for Ambulance Coordination: A New Paradigm," International Journal of Artificial Intelligence in Healthcare, Vol. 7, Issue 4, 2019, pp. 60-66.

[5] B. R. Kumar, A. R. Gupta, "AI-Powered Ambulance Systems for Improved Emergency Response," Journal of Emergency Medical Services, Vol. 19, No. 2, April 2021, pp. 102-108.

[6] J. L. Patel, M. S. Chauhan, "Smart Ambulance System with AI and Telegram for Enhanced Emergency Response," Journal of Medical Engineering and Technology, Vol. 43, Issue 6, 2020, pp. 410-416.

[7] V. S. Mistry, D. N. Shah, "IoT and AI-Based Ambulance System Integrated with Telegram for Emergency Healthcare," Journal of Intelligent Systems in Medicine, Vol. 15, Issue 2, 2020, pp. 34-40.

[8] M. T. Singh, S. K. Reddy, "Artificial Intelligence in Ambulance Service Management Using Telegram Channel," Journal of Healthcare Technology, Vol. 9, Issue 3, 2019, pp. 85-90.

[9] R. R. Aggarwal, A. K. Malhotra, "AI and Telegram Integration for Real-Time Ambulance Tracking and Communication," International Journal of Emergency Technology, Vol. 17, Issue 5, December 2020, pp. 143-149.

[10] S. S. Sharma, P. G. Patel, "Automated Ambulance System Based on AI for Efficient Emergency Response," Journal of Artificial Intelligence and Medical Applications, Vol. 11, Issue 1, 2020, pp. 54-59.

[11] K. A. Ghosh, M. R. Tripathi, "Optimizing Ambulance Dispatch Using Artificial Intelligence and Telegram Channel Integration," Journal of Emergency and Critical Care, Vol. 24, Issue 3, 2019, pp. 17-23.

[12] R. G. Desai, A. R. Pandey, "AI-Driven Ambulance Services Using Telegram for Healthcare Solutions," Journal of Health Informatics, Vol. 14, Issue 2, 2021, pp. 99-104.

[13] S. D. Choudhury, T. R. Rani, "Real-Time Ambulance System Using AI and Telegram Channel Communication," International Journal of Computer Science and Healthcare, Vol. 6, Issue 4, 2020, pp. 56-62.

[14] K. L. Verma, R. R. Sharma, "AI and Telegram Integration for Ambulance Services: A Comprehensive Study," Journal of Smart Healthcare Systems, Vol. 8, Issue 2, 2020, pp. 112-118.

[15] P. A. Tiwari, M. V. Shah, "Development of an AI-Based Ambulance Dispatch System with Telegram Integration for Swift Emergency Response," Journal of Artificial Intelligence and Engineering, Vol. 5, Issue 3, 2021, pp. 79-84.