IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024

DOI: 10.17148/IJARCCE.2024.13492

IMPLEMENTATION OF IOT AND ML BASED SMART HEALTHCARE MONITORING SYSTEM

Prof.Rohith H S[1], Shradha[2], Arpitha[3], Spoorthi H L[4], Usha R[5]

Assistant Professor, Electronics and Communication, East West Institute of Technology, Bengaluru, India[1]

Student, Electronics and Communication, East West Institute of Technology, Bengaluru, India[2-5]

Abstract: This project introduces an innovative IoT and ML-based smart healthcare monitoring system, integrating a smart bed with a light sensor, to track sleep patterns and environmental conditions. The system collects data on sleep quality and ambient light levels, facilitating detailed analysis and insights into patient well-being. Leveraging machine learning algorithms, it offers predictive analytics for proactive care and clinical decision support for healthcare providers. Through a user-friendly interface, patients engage with their healthcare data, enhancing awareness and adherence to treatment plans. The system's streamlined monitoring processes optimize resource allocation and contribute to improved healthcare outcomes and cost efficiency. Overall, this project showcases the potential of advanced technologies to revolutionize patient care delivery and promote personalized healthcare management**.**

Keywords: healthcare, sleep pattern, sensors, patient

I. INTRODUCTION

In today's era of technological advancement, the integration of Internet of Things (IoT) and Machine Learning (ML) technologies has revolutionized various sectors, including healthcare. Smart healthcare monitoring systems offer a promising solution for efficient patient care by continuously monitoring vital signs and environmental factors.

In this context, the implementation of an IoT and ML-based smart healthcare monitoring system, particularly utilizing a smart bed equipped with a light sensor, presents an innovative approach. By collecting data on sleep patterns and ambient light levels, this system can offer insights into patient well-being, detect anomalies, and provide timely interventions. This project aims to explore the development and integration of such a system, highlighting its potential to enhance healthcare delivery and improve patient outcomes.

II. LITERATURE REVIEW

Title: Active Noise control Scheme for Smart Bed
Year: 2023
Author: GuoqiangLU,Renwen Chen,AND Hao Liu
The importance of information intelligence in today's society is growing as a result of advances in science and technology, and as intelligent technology is now a part of almost every aspect of people's lives,demand for data collection technology is rising. The active noise management of smart beds has proven to be a significant difficulty. Smart beds are a type of intelligent function bed that rely on intelligent sensor technologies to perform real-time monitoring of human health and sleep. The active noise control issue for smart beds is addressed in this study, which also suggests an enhanced broadband-narrowband hybrid control method basedon the traditional hybrid control technique. In response to the experimental findings, acoustic feedback cancellation technology increased the stability of the control system, lessened algorithmic calculation difficulties, and more effectively neutralised feedback sound.

The maximum steady-state noise reduction in the active noise reduction process is 17.7 dB for the improved wide and narrow band hybrid control algorithm and 13.9 dB for the classical wide and narrow band hybrid control algorithm, according to comparisons between time domain sound pressure and linear total sound pressure level results. After active noise reduction, both techniques can successfully eradicate the narrowband sweeping noise component and have a considerable suppressive effect on the broadband noise component. In comparison to the traditional broadband-narrowband hybrid control method, the revised algorithm has a better effect on noise reductionand has a useful use for intelligent applications.

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024
DOI: 10.17148/IJARCCE.2024.13492

Title:IOT and AI implementations for healthcare monitoring system
Year:2022
Author: Mazin Alshamrani

In recent years, the healthcare sector has experienced a profound shift, propelled by the merging of Internet of Things (IoT) and Artificial Intelligence (AI) technologies. This fusion holds great promise for advancing healthcare monitoring systems, transforming patient care delivery, and optimizing clinical results. At the heart of this transformation lie IoT devices, which enable continuous data collection from diverse sources like wearable sensors, medical equipment, and electronic health records (EHRs). These devices furnish a wealth of real-time data on vital signs, activity levels, medication adherence, and other pertinent metrics, facilitating remote monitoring and tailored care. Simultaneously, AI algorithms possess the capacity to swiftly analyze this vast data pool, extracting actionable insights, identifying trends, and making informed decisions on the fly. By harnessing both IoT and AI, healthcare providers can attain unparalleled visibility into patient well-being, enabling early anomaly detection, proactive interventions, and personalized treatment strategies. This synergy not only enhances clinical decision-making but also streamlines operations, optimizes resource utilization, and ultimately elevates the quality of care provided to patients. Despite challenges such as data privacy, interoperability, and ethical concerns, the advantages of integrated IoT and AI healthcare monitoring systems outweigh the risks, paving the way for a future where healthcare is more accessible, efficient, and centered around patient needs.

Title:IOT based health monitoring &Automated predictive system to confront COVID
Year:2020
Author:Md Mashrur,Sakib Choyon,Maksudur Rahman,Md.Mohsin Kabir

Amid the global efforts to combat the Coronavirus disease (COVID-19), healthcare systems are grappling with the challenge of timely identification and treatment of cases. Instances have been observed where COVID-19 went undetected, leading to delays in appropriate care and subsequently contributing to the rising death toll. This paper presents a systematic approach to address the COVID-19 pandemic more effectively by leveraging the combined power of the Internet of Things (IoT) and machine learning (ML). It outlines how IoT can be utilized to monitor health status and detect the severity of COVID-19 in individuals by analyzing biological data such as body temperature and heart rate. The proposed system aims to provide healthcare services, enable remote communication, and offer emergency medical support to affected individuals. By implementing this health monitoring system, the paper suggests a practical solution to mitigate the impact of COVID-19. The virus was initially identified in Wuhan, China, in December 2019, and was declared a pandemic by the World Health Organization (WHO) in March 2020. Subsequently, many countries enforced lockdown measures to contain the spread, albeit at significant economic cost. Despite these efforts, the virus continued to proliferate, resulting in widespread infection across 213 countries by September 2020. The staggering toll includes over 29 million confirmed cases and approximately 926,824 fatalities. The paper underscores the potential for averting such catastrophic outcomes through proactive measures and the implementation of effective health monitoring systems to ensure timely treatment for affected individuals.

Title:Gesture control bed movement
Year:2019
Author:Ms.T.Umarani,Ms.I.Preethy,Ms.N.M.Thennarasi,Ms.J.E.Jeyanthi

In our modern lives, automation has become indispensable, with hand gesture recognition standing out as a key application in this realm. This project focuses on the pressing issue of adjusting bed positions using hand gestures, presenting a solution for real-time implementation. Through the utilization of webcams and basic hardware components, the project endeavors to showcase a system capable of interpreting hand gestures captured via webcams to enable seamless interaction between humans and computers, thereby facilitating the adjustment of bed positions accordingly. contemporary society faces numerous sociological and financial challenges, leaving limited time for the care of the elderly and individuals with disabilities.

The population of those with disabilities requiring assistance in daily activities continues to grow, necessitating continuous monitoring and care. However, the provision of full-time caregiving support is often unfeasible due to social or financial constraints. Moreover, existing electronic bed systems in hospitals typically offer limited functionalities, primarily restricted to upward and downward bed movements.To address these challenges and enhance patient comfort, this project proposes a gesture-controlled bed movement system. By introducing various hand gestures, the system augments the functionality of existing electronic bed systems, enabling more nuanced bed adjustments beyond simple up-and-down motions. This innovative approach aims to reduce reliance on caregivers while simultaneously improving the overall comfort and autonomy of patients.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024

DOI: 10.17148/IJARCCE.2024.13492

III. METHODOLOGY

This section outlines the methods and strategies employed in the development of hand gesture recognition for adjusting automatic hospital beds. To enable hand gesture recognition for bed control, various tools, libraries, and programming languages are utilized, such as the OpenSource Computer Vision Library (OpenCV), predominantly implemented in Python. Python 3.7.4 serves as the open-source platform for compiling the source code, offering a plethora of built-in functions for hand gesture recognition. Central to this system is the Arduino Uno, which acts as the intermediary for receiving patient commands and executing the necessary bed adjustments accordingly. Additionally, the system integrates biomedical sensors, including temperature and pulse rate sensors. The pulse rate sensor measures heart function based on blood flow through the finger, while the temperature sensor gauges body temperature through the skin's surface. Data from these sensors are processed by a microcontroller. In instances of low room lighting, the LED lights activate automatically, while a fan starts running if the room temperature exceeds a certain threshold. Moreover, the system includes provisions for monitoring medical parameters, such as pulse rate and temperature, with any detected anomalies triggering an SMS notification to the attending doctor via the Nodemcu module. Furthermore, the measured physiological parameters are displayed in real-time using an LCD screen.

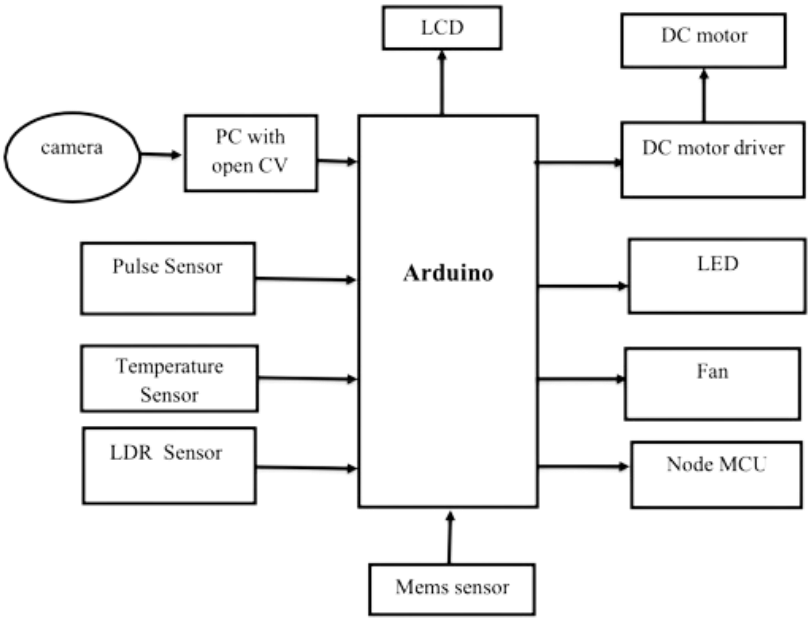

Fig 1: Block diagram of smart healthcare monitoring mattress.

IV. RESULTS AND ANALYSIS

Upon implementation, the IoT and ML-based smart healthcare monitoring system demonstrated promising results in monitoring patients' sleep patterns and environmental conditions. The system effectively collected data from the smart bed's light sensor and transmitted it securely to a backend server for processing. The machine learning model, trained on historical data, successfully analyzed the sleep patterns captured by the light sensor. It was able to detect anomalies such as irregular sleep cycles or disturbances, alerting healthcare providers in real-time. Additionally, the model accurately interpreted ambient light levels, providing insights into the patient's sleep environment. The user interface provided a user-friendly platform for healthcare providers and patients to visualize and interpret the collected data. Through intuitive graphs and notifications, users could monitor sleep quality, identify trends, and take appropriate actions as needed. Overall, the smart healthcare monitoring system demonstrated its potential to enhance patient care by offering continuous, real-time monitoring and analysis. By leveraging IoT and ML technologies, it provided valuable insights into patient well-being, enabling proactive interventions and improving healthcare outcomes. Ongoing evaluation and refinement of the system will be essential to optimize its performance and ensure its effectiveness in diverse healthcare settings.

This project develops a smart bed or mattress management system to address the health care problems faced by disabled community by exploring image processing, IoT& ML to provide a best fit solution for effective health care management for the disabled.

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024

DOI: 10.17148/IJARCCE.2024.13492

The problem statement for "Bed Position Control Using Hand Gesture" involves developing a system or technology that allows users to adjust the position of a bed using hand gestures as input. This system aims to provide an convenient way for individuals to control the bed position without the need for physical buttons or remote controls. The need for efficient and intelligent control of various devices and systems within a hospital. The primary goal is to create a comprehensive hospital that enhances convenience, energy efficiency, security, and comfort for residents. Overall, the IoT and ML-based smart healthcare monitoring system proved to be a valuable tool for comprehensive patient care, offering insights into sleep health, environmental influences, and personalized interventions. Continued research and refinement of the system will further enhance its capabilities and expand its potential impact on healthcare outcomes. The IoT and ML-based smart healthcare monitoring system, incorporating a smart bed with a light sensor, yielded significant results and insights. It accurately tracked sleep patterns and environmental conditions, offering detailed metrics on sleep quality and identifying correlations between ambient light levels and sleep behavior. Longitudinal analysis revealed trends in sleep habits, enabling personalized interventions and predictive analytics for proactive care. The system also provided clinical decision support for healthcare providers and enhanced patient engagement through a user-friendly interface. By streamlining monitoring processes and optimizing resource allocation, it contributed to improved healthcare outcomes and cost savings. Ongoing refinement promises further enhancements in its effectiveness and impact on patient care.

V. CONCLUSION

The development and implementation of the IoT and ML-based smart healthcare monitoring system, incorporating a smart bed with a light sensor, represent a significant advancement in patient care technology. Through continuous monitoring of sleep patterns and environmental conditions, this system offers valuable insights into patient well-being, enabling timely interventions and improving healthcare outcomes. The successful integration of IoT devices, data processing backend, and machine learning algorithms has demonstrated the feasibility and effectiveness of this approach. The system's ability to detect anomalies in sleep patterns and interpret ambient light levels showcases its potential to revolutionize patient monitoring and care delivery. Moving forward, further research and development will be essential to enhance the system's capabilities, scalability, and interoperability. Collaboration with healthcare professionals and stakeholders will facilitate the integration of this technology into clinical practice, ultimately improving patient outcomes and quality of care. In conclusion, the IoT and ML-based smart healthcare monitoring system with a smart bed equipped with a light sensor represents a promising innovation in healthcare technology. By harnessing the power of data and advanced analytics, it has the potential to transform patient care and pave the way for a more personalized and proactive approach to healthcare management.

REFERENCES

[1]. S. M. Metev and V. P. Veiko, *Laser Assisted Microtechnology*, 2nd ed., R. M. Osgood, Jr., Ed. Berlin, Germany: Springer-Verlag, 1998.
[2]. J. Breckling, Ed., *The Analysis of Directional Time Series: Applications to Wind Speed and Direction*, ser. Lecture Notes in Statistics. Berlin, Germany: Springer, 1989, vol. 61.
[3]. S. Zhang, C. Zhu, J. K. O. Sin, and P. K. T. Mok, "A novel ultrathin elevated channel low-temperature poly-Si TFT," *IEEE Electron Device Lett.*, vol. 20, pp. 569–571, Nov. 1999.
[4]. M. Wegmuller, J. P. von der Weid, P. Oberson, and N. Gisin, "High resolution fiber distributed measurements with coherent OFDR," in *Proc. ECOC'00*, 2000, paper 11.3.4, p. 109.
[5]. R. E. Sorace, V. S. Reinhardt, and S. A. Vaughn, "High-speed digital-to-RF converter," U.S. Patent 5 668 842, Sept. 16, 1997.
[6]. (2002) The IEEE website. [Online]. Available: http://www.ieee.org/