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SMART IOT BASED ROBOTIC NURSE WITH MULTILANGUAGE VOICE INTEREACTIVITY

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ABSTRACT

In recent years, technology has become an integral part of everyday lives, particularly in healthcare. Despite advancements, the widespread acceptance of the Internet of Things (IoT) and robotics in healthcare applications remains limited. This study explores the transformative role of these technologies in healthcare services, focusing on the development of an autonomous robotic nurse. The project entails the creation of a robotic vehicle that can be remotely activated by a doctor using a bed number as a trigger. The robotic nurse autonomously navigates to the patient's bed, employing non-contact temperature sensors and oximeter sensors for medical diagnosis. Vital body parameters are transmitted to the doctor through IoT protocols.

Keywords: *Robotic nurse, IoT, Video stream, Telemedicine, Multi-language, Speech recognition, etc.*

I. INTRODUCTION

The evolution of modern technology has empowered researchers and scientists to revolutionize healthcare services. Cutting-edge technologies have been extensively utilized in the development and implementation of various medical devices for diagnosis, treatment, monitoring, and testing. This progress is attributed not only to the advancement of clinical-grade sensors but also to the integration of sensor networks within healthcare facilities. The amalgamation of sensors and networks has significantly optimized healthcare delivery from remote locations, enhancing adaptability, accessibility, and affordability. Prominent technologies driving the transformation of healthcare applications include big data analytics, machine learning, artificial intelligence, cloud computing, computer vision, and the Internet of Things (IoT). Data analytics, for instance, showcases potential in identifying patterns and hidden features within health data, contributing to efficient decision-making and improved healthcare quality. Artificial intelligence techniques, particularly machine learning, have augmented the work of healthcare professionals by processing vast amounts of electronic health records for applications such as respiratory condition diagnosis, early detection of cancers and heart diseases, and predicting overall human health conditions

II. LITERATURE SURVEY

Marcin Zukowski et al [1] have developed a humanoid medical assistant and companion robot dedicated to children's hospitals. They have focused on the robot being able to express emotions and communicate with the children by recognizing their faces and using pictures and text on the chest display to tell stories and present educational videos. The 'Robot' autonomously navigates through hospital rooms and performs simple medical tests like measuring patient's body temperature or heart rate and sends live video feed to the doctors and nurses.

The robot is run using ODROID XU and XU4 with Ubuntu 14.04 operating system and has a dedicated Raspberry Pi 2 computer to animate the robot's eyes. Marcin Zukowski et al [2] presented the implementation of patients' temperature measurement system for the medical robotic assistant. They have experimented with MLX90614 infrared thermometer and FLIR Lepton thermal camera and found out that the MLX90614 infrared thermometer cannot be used as the only input source of the system and to get more accurate results, robot would need to come as close as less than 0.3 metres to a patient's face. To overcome this they created a hybrid system having infrared thermometer along with thermal camera to provide ambient temperature and approximate skin temperature that can be used to detect presence of humans in front of the robot. Azeta Joseph et al [3] have presented an overview of the current and potential applications of humanoid robotics in healthcare settings. Their paper describes various characteristics required in humanoid robots in healthcare such as presence of vision system, sensing behavior, mobile platform and the ability to perform dexterous manipulation tasks. We explored similar human assistant robots available in various roles as helpers for the patients in hospitals. [4-10].

III. METHODOLOGY

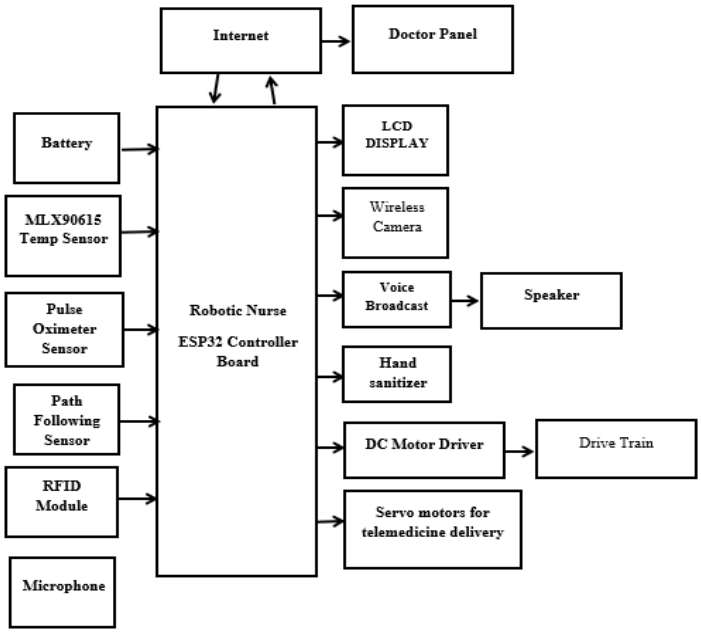

Fig (1): The block diagram of the Robotic Nurse

The proposed work introduces an autonomous robotic nurse, equipped with IoT capabilities, to provide patient care effectively, functioning as an IoT-enabled virtual healthcare assistant. An IoT panel is developed to be managed by healthcare professionals. By entering the patient's bed number into the IoT panel, doctors can trigger the system, prompting the robotic nurse to autonomously navigate through the hospital to reach the patient's bedside. The temperature and oxygen measurement systems conduct initial assessments, relaying the results to the doctor via the developed IOT panel. Doctors can remotely prescribe medications through a telemedicine system, enabling the robotic nurse to deliver them directly to the patient using IoT. The system facilitates live video streaming of the patient to the doctor through the control panel, enhancing remote treatment capabilities. To prevent infection spread, the robotic nurse incorporates a self-disinfection feature after examining patients.

Additionally, a Sanitization chamber for masks and a sanitizer dispenser for hands are integrated, ensuring comprehensive hygiene. To enhance accessibility, the robotic nurse incorporates multilanguage voice broadcast and speech recognition-based services for seamless communication and interaction with patients and medical staff.

IV. ADVANTAGES AND APPLICATION

1. Facilitates contactless patient care, ensuring treatment without direct physical contact.
2. Enhances safety for doctors and medical staff by eliminating the need for direct interaction.
3. Operates autonomously, minimizing the need for manual intervention in healthcare procedures.
4. Mitigates the risk of infection transmission between individuals, contributing to infection control.
5. Provides efficient and effective treatment for patients through advanced healthcare technologies.
6. Enables telemedicine services via IoT, ensuring timely and accurate delivery of prescribed medications.
7. Utilizes IoT video surveillance for remote patient visualization and diagnosis.
8. Applicable for implementation in multi-bed hospitals, enhancing healthcare delivery in diverse settings.
9. Incorporates a self-sanitization system, ensuring the robot is free from viruses and bacteria.

V. CONCLUSION

The development and implementation of the robotic nurse system represent a significant advancement in the field of healthcare. By offering contactless treatment, the system ensures the safety of both healthcare professionals and patients, particularly in environments where infectious diseases pose a significant threat. The autonomous functionality of the robotic nurse streamlines healthcare procedures, minimizing the need for manual intervention and thereby increasing efficiency. The integration of telemedicine services and IoT-based video surveillance enhances remote patient monitoring and diagnosis, enabling more accessible and timely healthcare delivery. Additionally, the inclusion of a self-sanitization feature ensures a consistently hygienic environment, further contributing to infection prevention. Overall, the anticipated outcomes highlight a transformative approach to healthcare that prioritizes safety, efficiency, and accessibility, setting a new standard for patient care.

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