

Examination of AI Based Virtual Doctor Robot Fabricated Using Composite Material

Geetika Mathur^{1*}, Sangram Keshari Das², Shilpa Kalra³, Himank Sharma⁴, Harshit Gupta⁴

Abstract

The accessibility and affordability of healthcare have become significant concerns for a substantial portion of the population in the modern era. In the past two decades, there has been a growing emphasis among researchers on the utilization of natural fibers as reinforcements for structural materials that are based on polymers or cementitious materials. The current investigation offers a The Virtual Doctor Robot is a cutting-edge healthcare solution that leverages the Internet of Things (IoT) technology. It functions as a healthcare professional who is both intelligent and interactive, offering medical services through remote communication channels. The robot is equipped with state-of-the-art medical devices and sensors that allow it to perform comprehensive medical examinations. The high specific strength-to-weight and stiffness-to-weight ratios of advanced composites have made them a popular choice for a variety of engineering applications. Carbon, glass, and Kevlar are among the most frequently employed high-strength fibers in industries such as aerospace and aircraft engineering. The tensile and bending rigidity of composite structures are bolstered by the substantial tensile strength of these fibers. These composites are significantly influenced by polymer-based matrices, which buffer the brittle, high-strength fibers from impacts. The high specific strength-to-weight and stiffness-to-weight ratios of advanced composites have made them a popular choice for a variety of engineering applications. Carbon, glass, and Kevlar are among the most frequently employed high-strength fibers in industries such as aerospace and aircraft engineering. This research pertains to the development of an autonomous mobile virtual doctor through the incorporation of advanced artificial intelligence (AI), robotics, and medical technology. The system offers an unparalleled 24/7 healthcare companion by excelling in disease detection, medication dispensing, and medical inspections.

Keywords: Composite materials; Robots; IoT, medical technology, artificial intelligence

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INTRODUCTION

In the past two decades, there has been a growing emphasis among researchers on the utilization of natural fibers as reinforcements for structural materials that are based on polymers or cementitious materials. The high specific strength-to-weight and stiffness-to-weight ratios of advanced composites have made them a popular choice for a variety of engineering applications. Carbon, glass, and Kevlar are among the most frequently employed high-strength fibers in industries such as aerospace and aircraft engineering. The tensile and bending rigidity of composite structures are bolstered by the substantial tensile strength of these fibers. These composites are significantly influenced by polymer-based matrices, which buffer the brittle, high-strength fibers from impacts. Furthermore, the matrix contributes to the

absorption of vibration energy, which guarantees the structural integrity of rigid systems during seismic events. Although advanced composites provide a plethora of benefits for engineering applications, there are still opportunities for advancement and challenges to be addressed. The accessibility and affordability of healthcare have become significant concerns for a substantial portion of the population in the modern era. Accessing routine medical exams and essential health examinations is a challenge for numerous individuals, particularly those with disabilities and elderly patients. This issue has been exacerbated by factors such as high healthcare costs, geographical barriers, limited mobility, and a lack of assistance. Furthermore, the necessity of remote medical solutions to mitigate the transmission of maladies and physical contact has been underscored by the emergence of highly contagious diseases such as Covid-19. In response to these obstacles, the concept of a Virtual Doctor Robot was introduced with the objective of offering a novel healthcare approach. The Virtual Doctor Robot utilizes remote communication technologies, including video conferencing and messaging, to provide medical services remotely. Patients can now consult with healthcare professionals from the convenience of their residences, thereby decreasing the necessity for in-person visits to clinics or hospitals. This accessibility can be particularly advantageous for individuals who require medical attention outside of regular office hours, those who reside in remote areas with limited healthcare access, and those with limited mobility. The objective of the paper in [1]. is to develop an automated system that can rapidly establish connections with healthcare providers, including hospitals and physicians, in order to mitigate the increasing mortality rates in rural areas and prevent the transmission of diseases. Their work is licensed under the Creative Commons Attribution 4.0 International License. The authors in [2]. proposed an IoT-based model as a plausible solution due to its scalability, which enables continuous and precise health surveillance on a global scale. Their previous research suggested the development of a healthcare infrastructure that is based on the Internet of Things (IoT) and enables the remote monitoring of patients in critical conditions. In the same vein, [3]. introduced an additional model that involves the use of IoT to facilitate remote diagnostics prior to patients' arrival at hospitals, thereby improving the efficacy of treatment in intelligent healthcare systems. This encompasses an e-health system that is based on Wireless Sensor Networks (WSN) and is designed to provide a consistent monitoring of the health of diabetic patients. Blood glucose levels can be transmitted to physicians or mobile phones through wearable sensors. The author of [4]. created a healthcare system that enhances telemedicine, which is the remote provision of healthcare services, by utilizing fuzzy neural networks. Despite the numerous benefits that telemedicine offers, it also encounters a number of obstacles. The sector's accelerated expansion over the next decade is expected to exacerbate these challenges, which are acknowledged by providers, payers, and regulators. These challenges will present both technical and operational obstacles. The author proposed a model in [5] that could substantially reduce healthcare costs by eliminating the need for patients to visit hospitals for minor health concerns through the use of IoT and health wearable's. The health data of a patient, which is monitored over time by an application, could be used by physicians to prescribe medications. In [6], a portable physiological monitoring system is introduced, which is intended to perpetually monitor a patient's temperature, pulse, and other critical environmental parameters. I propose a continuous monitoring and control mechanism for the storage of patient data on a server, which utilizes a Wi-Fi Module for wireless communication. The author developed a model in [7]. in which the majority of medical personnel expressed interest in remotely controlling their assistant robots via the internet. During emergencies, any paramedic could operate a portable tele-echography robot system called FASTele. Patient Monitoring Systems (PMS), advanced healthcare, smart healthcare, digital thermometers, and non-contact infrared thermometers have all been the subject of numerous methods. Associative cortices, which are essential for learning, neuronal plasticity, and recuperation, were demonstrated to be stimulated by the integration of multisensory inputs in [8]. Neurocognitive therapy has been compared to other rehabilitation approaches in only a few studies. However, promising evidence indicates that it can significantly improve upper-limb function, daily living activities, and overall quality of life in comparison to conventional task-oriented training. Finally, in [9, 10]. a backbone for IoRT applications was proposed: an intelligent network infrastructure that is dynamically augmented by peripheral nodes, which are generated by interconnected robotic devices.

OBJECTIVE OF RESEARCH

The primary objective of this research is to address the obstacles encountered by geriatric patients and individuals with disabilities who encounter difficulty in visiting healthcare facilities on a regular basis. This research also aims to offer patients assistance in the event of an emergency by establishing a mechanism for the prompt coordination of emergency medical support. This research also aims to offer healthcare assistance in remote regions that can bridge the divide in healthcare access, where medical facilities are limited or not readily available. Another objective of this research is to offer support during pandemics, epidemics, or highly contagious diseases, and to reduce physical contact and human interaction. This research also aims to offer support in the monitoring and management of chronic and long-term diseases.

DESCRIPTION OF RESEARCH

The comprehensive description and the examples provided herein are illustrative, and any modification or variation within the scope of the RESEARCH will be readily apparent to an individual with expertise in the field. Additionally, all technical and scientific terms employed in this document shall be interpreted in accordance with the standard of understanding of an individual who is ordinarily proficient in the field, unless otherwise specified.

Featuring a movable base that enables it to effortlessly traverse a variety of environments, the Virtual Doctor Robot is engineered with portability in mind. The robot is furnished with sophisticated sensors and medical instruments that have been meticulously calibrated to ensure the precise and dependable measurement of health parameters. For example, the SpO₂ sensor measures the oxygen saturation level in the blood, which offers crucial information regarding the patient's respiratory health. The patient's blood pressure is precisely recorded by the blood pressure monitor, which is a critical parameter for the evaluation of cardiovascular health.

The heartbeat is detected by a sensor, which measures the pulse rate and provides information about cardiac activity. A precise and non-invasive thermometer is employed to monitor the body temperature, which assists in the diagnosis of fever or other temperature-related conditions.

The interactive user interface of the Virtual Doctor Robot enables patients to effectively communicate their health concerns and symptoms. Patients are permitted to engage with the automaton during the consultation and provide a comprehensive account of their medical history, symptoms, and any other pertinent information. The collected data is analyzed by the robot's sophisticated artificial intelligence algorithms, which then combine it with the patient's medical history to make precise and informed medical decisions. In the event that the robot identifies potential health hazards or concerns, it may recommend lifestyle modifications or additional medical evaluation.

The functionalities of the Virtual Doctor Robot are not intended to replace the expertise of human physicians; rather, they are intended to complement and improve healthcare services. The automaton is capable of effectively connecting patients with emergency services and facilitating the scheduling of ambulances in situations where immediate medical attention is necessary. Microcontroller and IoT technology guarantee the system's reliability and robustness, facilitating efficient data administration and seamless connectivity. Safeguarding patient data and guaranteeing privacy compliance, the Virtual Doctor Robot functions within a secure and encrypted network. The research offers a healthcare solution that is integrated, user-friendly, and efficient, and that can positively impact healthcare accessibility, particularly for those who are confronting physical and geographical barriers, by incorporating state-of-the-art technology as shown in Figure 1 and Figure 2.

AI System for Disease Detection

The Virtual Doctor Robot is powered by a sophisticated artificial intelligence system that is specifically engineered to detect a wide range of diseases. The artificial intelligence interprets and

processes patient symptoms in real-time by utilizing machine learning algorithms and data-driven analysis. This allows the Virtual Doctor Robot to promptly and precisely identify potential medical conditions, thereby facilitating proactive and expeditious healthcare interventions. An innovative artificial intelligence system is the foundation of the Virtual Doctor Robot's intelligence. This system is continuously learning and adapting to new medical data, utilizing advanced machine learning algorithms. It employs a vast database of medical knowledge to accurately identify potential diseases by analyzing an extensive range of symptoms presented by patients. The real-time processing capabilities of artificial intelligence facilitate rapid and precise diagnostic assessments, thereby providing opportune insights for effective medical interventions.

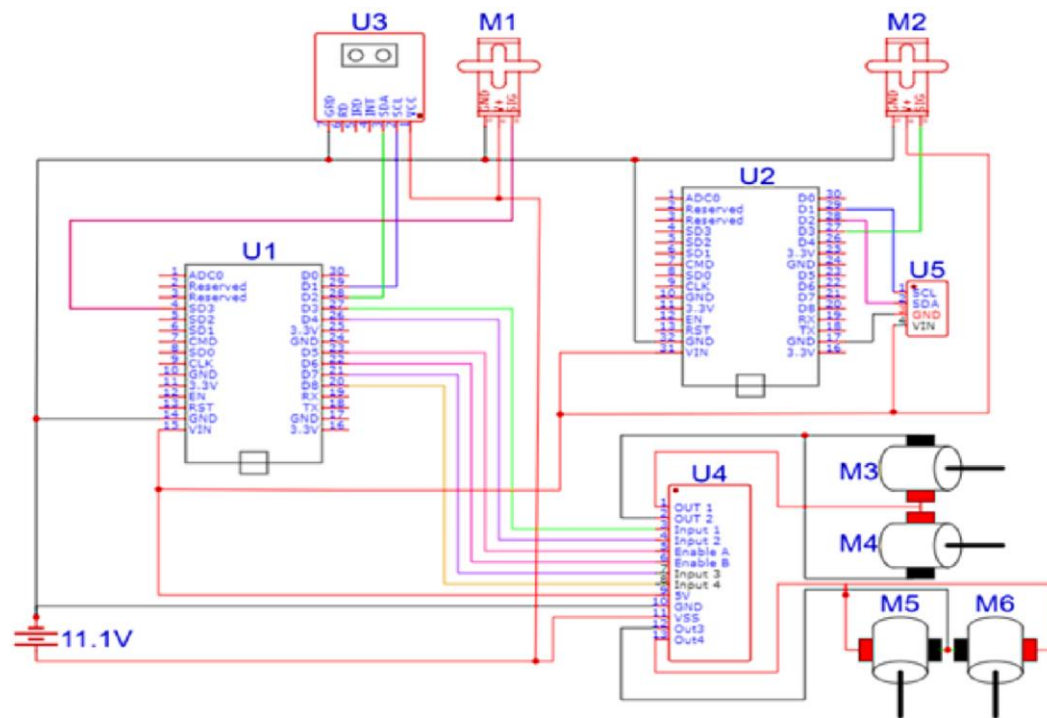


Figure 1. Layout of AI based model.

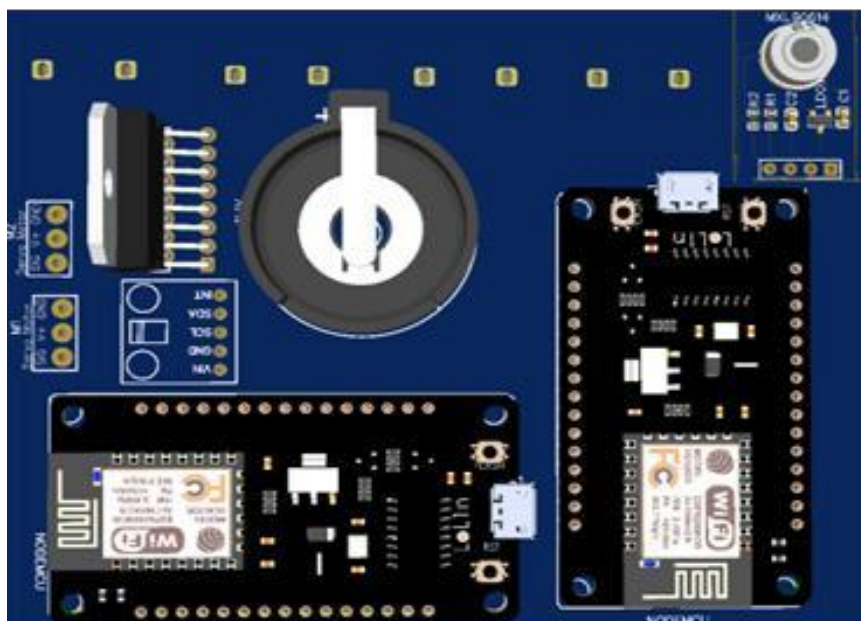


Figure 2. Layout of model

Medical Accessibility Enhancement

Innovative technology is employed by the Virtual Doctor Robot to confront the issue of restricted healthcare accessibility. It affects a variety of aspects of healthcare accessibility. The Virtual Doctor Robot has the potential to substantially enhance healthcare access for individuals who are either physically disabled or live in remote regions with inadequate healthcare facilities. It is no longer necessary for patients to travel lengthy distances for medical consultations, which alleviates the burden of transportation costs and time off work. The robot's virtual consultations have the potential to reduce the costs associated with conventional in-person medical visits. Patients can reduce their travel expenses and circumvent prospective hospital expenses. The risk of exposure to other maladies is reduced by the elimination of the need for physical waiting rooms during virtual medical visits. Patients have the ability to arrange consultations at their leisure, which enables them to manage their daily schedules with greater flexibility. The Virtual Doctor Robot guarantees that patients have access to healthcare at all hours, including during emergencies and at unusual hours, by providing medical attention beyond the typical office hours.

Automatic Drug Drawers Dispenser

Revolutionizing the administration of prescriptions, the Virtual Doctor Robot features an inventive automatic drug dispenser. This system is designed to ensure a precise and timely dispensing process by providing a carefully selected selection of medications. Automation not only improves efficiency but also reduces the margin of error in medication distribution. The Virtual Doctor Robot's framework is incorporated with the Automatic Drug Drawers Dispenser, a technological marvel that consists of modular drawers that are supplied with a diverse array of medications. This automated system guarantees the efficient and error-free dispensing of prescriptions.

CONCLUSIONS

The current investigation offers a The Virtual Doctor Robot is a cutting-edge healthcare solution that leverages the Internet of Things (IoT) technology. It functions as a healthcare professional who is both intelligent and interactive, offering medical services through remote communication channels. The robot is equipped with state-of-the-art medical devices and sensors that allow it to perform comprehensive medical examinations. Vital health parameters, including blood pressure, pulse rate, body temperature, and oxygen saturation (SpO₂), are routinely assessed with precision and accuracy. The Virtual Doctor Robot is capable of conducting medical examinations and diagnosing a variety of health conditions and symptoms by utilizing this data. The consultation process can be rendered more personalized and effective by the robot's ability to examine patients' medical histories. The Virtual Doctor Robot is capable of prescribing medications and providing medical advice in accordance with the diagnosis, thereby establishing itself as a comprehensive healthcare service provider. The primary goal of the project is to resolve the obstacles encountered by geriatric patients and individuals with disabilities who encounter difficulty in visiting healthcare facilities on a regular basis. Furthermore, the robot's presence in remote regions can serve as a bridge to the healthcare access divide, particularly in areas where medical facilities are scarce or unavailable. The Virtual Doctor Robot is essential for the management of chronic diseases, as it facilitates the continuous surveillance and intervention of conditions such as high blood pressure, cardiac disease, and diabetes. Additionally, the robot functions as an invaluable educational resource, furnishing patients with critical information and increasing their awareness of their health conditions and preventive measures. It is important to acknowledge, however, that virtual doctor visits may not be effective for all medical concerns, and certain conditions may still necessitate an in-person examination by a qualified healthcare professional. In emergency situations, the robot can effectively assist patients by facilitating the scheduling of ambulances through its program, thereby ensuring that they receive expeditious and critical medical intervention.

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