SMART ROBOT FOR HEALTH ASSISTANCE

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Abstract

The main objective of this project is to present the development of an "Smart Robot for Health Assistance". Most countries, particularly first world countries, are faced with an increasingly higher percentage of people in need of healthcare assistance, either due to old age or some disabilities or impairments, requiring prolonged care, constant examination, and following up the patients very closely. This pressure, both in number of and time dedicated to the patients, will put a strain on the current healthcare and social systems all over the world. Solving this problem, however, is not a simple matter, not just due to the lack of professionals but also due to the increasing costs of maintaining these services. The implementation of such a system would not only remove some of the workload from the medical professional, but also be more reliable in the long run, not suffering from attention, exhaustion or other issues that often affect us. With this system we intend to show the possibility of using robot platforms in this context, paving the way for further development and implementation of such platforms in hospitals and other healthcare facilities.

I. INTRODUCTION

According to the (World Health Organization), the percentage of healthcare dependent population, such as elderly and people with disabilities, among others, will increase over the next years. This trend will over whelm the health and social systems of most countries. The adoption of robots could assist these health systems in responding to this increased demand, particularly in high intensity and repetitive tasks. Most countries, particularly first world countries, are faced with an increasingly higher percentage of people in need of healthcare assistance, either due to old age or some disabilities or impairments, requiring prolonged care, constant examination, and following up the patients very closely. This pressure, both in number of and time dedicated to the patients, will put a strain on the current healthcare and social systems all over the world. The implementation of such a system would not only remove some of the workload from the medical professional, but also be more reliable in the long run, not suffering from attention, exhaustion or other issues that often affect us. we aim to introduce a robotic solution for the increasing strain on healthcare systems, allowing repetitive tests and exams to be handled by a robot platform, removing some of the pressure from the medical professionals, preventing errors due to exhaustion and stress, and maintaining consistency over time and across patients. In the last few years, the sector has witnessed huge growth in healthcare robots to be used for well- being and health improvement. We have come across a lot, whether it be the first surgical robot or the robots that imply artificial intelligence and machine learning.

There are robots to mainly monitor vital signs that can detect illness and long-term monitoring of the patients. Also, some robots address all the safety measures of medication management, and these robots are mainly used for elderly people. There are also certain assistant robots for elderly people which help them in an indoor and outdoor environment. Hence the robots have a significant impact on the healthcare sector. The main focus of introducing robots in healthcare is that they can perform precise tasks and take care of patients, specifically the old age population. Many of the review papers available today lack the of active research projects on healthcare robots. After reviewing several successful research papers on the robot's development, we aimed to highlight the various aspects of robots in the healthcare systems.

METHODOLOGY

A. Block diagram

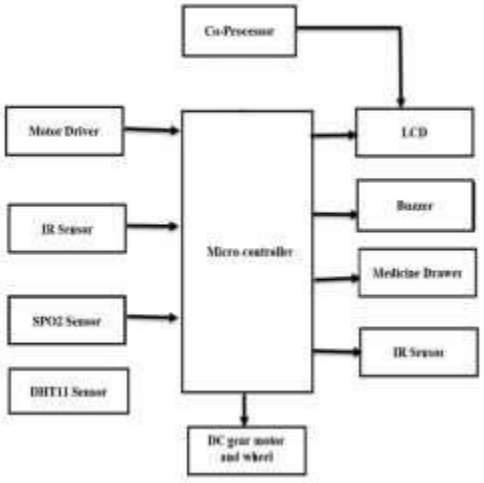

Fig 1 - Block diagram of Smart Robot for Health Assistance

The robot is equipped with various sensors such as DHT11 Sensor, infrared sensors, SPO2 sensors, Buzzer , Motor Driver ,Co-Processor, Liquid Crystal Display(LCD), DC Motor,ESP8266 Controller, Battery which are used to gather information about patients vitals from one location Its can also deliver the required .medicines to the particular selected bed number through the blynk application and also we can see and the information through the blynk application and we can select the bed number through the blynk application and the patients vitals is also shown in the on board LCD display and we can also see in the blynk application. We have programed it like for first bed the motor will rotate for 10 cycles and so on and it will wait

For some time and return back to its original position after some time.This is achieved by delaying the program.in the blynk application we can see the message of “medicine delivered message” and the other message like “please load the medicine” and in the starting it will show the welcome message.The robot's environment which The ESP8266 microcontrolleris the brain of the robot which processes the information collected by the sensors and sends commands to the robot's actuators. The robot is equipped with various actuators such as motors, motor driver, which areused to control the movements of the robot. The robot is powered by a battery or a power supply unit which provides the necessary energy to run the robot. The robot is equipped with a communication module such as blynk application, which is used to communicate with other devices or robots.The robot's control software is responsible for controlling the robot's movements, processing sensor data, and sendingcommands to the robot's actuators is shown in Fig 1.

B. Working Principle of the proposed system

Proposed system consists of following components:

- ESP Microcontroller
- L298N motor driver
- Channel relay module
- Liquid Crystal Display(LCD)
- Co-Processor
- SPO2 Sensor
- IR Sensor
- DHT11 Sensor
- Buzzer
- DC Motor
- Battery(12V)

C. Circuit diagram and Methodology

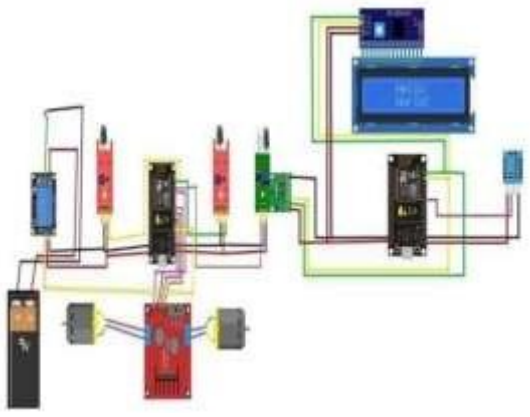

Fig 2 – Wiring connection for Smart Robot for Health Assistance

First the bed number is selected and by keeping that as a reference the robot starts moving forward along the path and counts the number of beds. If the count is equal to bed number , if it is true then the robot will stops deliver the medicine and return to it original place. If count is not equal to bed number then the robot will keep going forward until the count number is equal to bed number.

If any obstacle appear in front of the robot then its stops at that place and alert the person using speaker/buzzer. If no obstacle appear then it proceeds further and delivers the medicine. We have used controller as a main controller. IR sensor is connected to the controller and two controller is used to detect the obstacle which comes in the way. DC gear motor and wheel is connected to chassis so that the robot can move from one place to another, LCD display is used to see the message like welcome screen and the live readings of vitals of the patient and bed number, speaker is used to alert the person if any person comes or any obstacle comes it will detect the obstacle and buzzer will be ON, and medicine drawer is used for storing the patients medicine. We have used the sensors like DHT11 sensors for measuring the temperature of the patient , and SPO2 sensor for heart rate monitor and oxygen level of the patient and this reading can be seen through blynk apk.

d. Implementation using ESP8266 Controller

Fig 3 shows the screenshot of compiling page to implement the program inside the controller. ESP8266 firmware is compiled by converting Embedded C source code into binary code that can be run on the microcontroller. A compiler that supports the source programming language reads the files, analyses the code, and translates it into a format suitable for the target platform. Compilers that translate source code to machine code target specific operating systems and computer architectures. Configuring the ESP8266 is the process of setting up its hardware and software to enable itto perform a specific task or function. Here are the steps toconfigure an ESP8266: Connect the ESP8266 to computer: The ESP8266 can be connected to computer using a USB cable. Ensure that the USB cable is connected to the correct portson both the ESP8266 and the computer. Install the required drivers: The computer may require drivers to communicatewith the ESP8266. These drivers can usually be downloaded from the manufacturer's website. To program the ESP8266, you will need an integrated development environment (IDE) such as Arduino IDE or ESP-IDF. The IDE providesa platform to write, compile, and upload code to the ESP8266.Select the board: The IDE needs to be configured to recognize the ESP8266 board. To do this, select the board type and serial port in the IDE. Upload the code: Upload the code to the ESP8266 using the IDE's upload feature. Verify the code:

Fig 3 – Compiling page

E. Application

1. Logistics/Deliver - it can deliver small medicines and items to the patient. To the selected bed number through blynk application.
2. Medical assistance - we have used sensors like DHT11 SPO2 for measuring body vitals such as temperature, Humidity, Heart rate and oxygen level .
3. Care and Services - it doesn't require more number of doctors/nurse or ward boys for providing services to the patients.
4. Storage and Supply of medicines - we have used medicine tray to carry the medicines to the selected bed number through blynk application
5. Logistical tasks that are routine and burden the health care workers

F. Advantages

1. Increased efficiency: With the ability to perform multiple tasks, a multi-purpose robot can savetime and increase productivity, reducing the needfor multiple machines or workers.
2. Versatility: A main purpose of the robot can perform a variety of tasks, making it a flexible and versatilemachine that can be used in various settings and applications.
3. Reduction in manual labour: A robot with a pick and place arm can perform tasks that would normally require manual labour, reducing the physical strain on workers and potentially reducing the risk of workplace injuries. Remote operation: A multi-purpose robot can be remotely

G. Result of Health Assistance robot

We have used controller as a main controller. IR sensor is connected to the controller and two controller is used to detect the obstacle which comes in the way. DC gear motor and wheel is connected to chassis so that the robot can move from one place to another, LCD display is used to see the message like welcome screen and the live readings of vitals of the patient and bed number, speaker is used to alert the person if any person comes or any obstacle comes it will detect the obstacle and buzzer will be ON, and medicine drawer is used for storing the patients medicine. We have used the sensors like DHT11 sensors for measuring the temperature of the patient , and SPO2 sensor for heart rate monitor and oxygen level of the patient and this reading can be seen through blynk apk. First the bed number is selected and by keeping that as a reference the robot starts moving forward along the path and counts the number of beds. If the count is equal to bed number , if it is true then the robot will stops deliver the medicine and return to it original place. If any obstacle appear in front of the robot then its stops at that place and alert the person using speaker/buzzer. If no obstacle appear then it proceeds further and delivers the medicine.In the end the working model of "SMART ROBOT FOR HEALTH ASSISTANCE" was ready and we are able to go to the specified bed number and provide the required medicines to the patients and also we are able to take the vitals from the patients like heart rate, oxygen level and temperature and the readings are successfully displaying in the LCD and also on the Blynk application

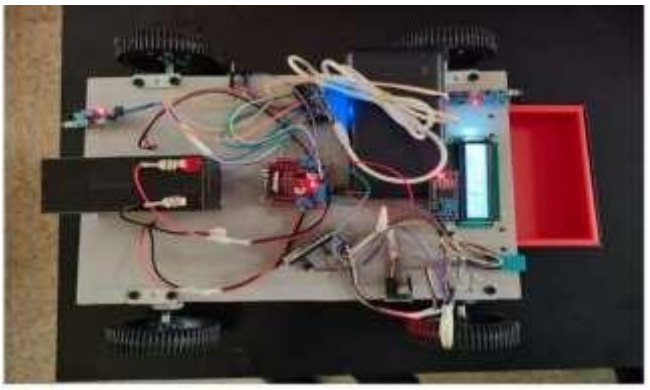

Fig 4 – Final Working Model

The robot is equipped with various sensors such as DHT11 Sensor, infrared sensors, SPO2 sensors, Buzzer , Motor Driver ,Co-Processor, Liquid Crystal Display(LCD), DC Motor,ESP8266 Controller, Battery which are used to gather information about patients vitals from one location Its can also deliver the required .medicines to the particular selected bed number through the blynk application and also we can see and the information through the blynk application and we can select the bed number through the blynk application and the patients vitals is also shown in the on board LCD display and we can also see in the blynk application. We have programed it like for first bed the motor will rotate for 10 cycles and so on and it will wait For some time and return back to its original position after some time. This is achieved by delaying the program.in the blynk application we can see the message of "medicine delivered message" and the other message like "please load the medicine" and in the starting it will show the welcome message. The robot's environment which The ESP8266 microcontrolleris the brain of the robot which processes the information collected by the sensors and sends commands to the robot'sactuators.

H. Scope of future work

Early Disease Detection - Smart robots can use advanced sensor technologies, such as image recognition, voice recognition, and biosensors, to detect early signs of diseases like cancer, diabetes, and cardiovascular conditions. Remote Patient Monitoring: Smart robots can be used for remote patient monitoring, especially for elderly or chronically ill patients who require continuous monitoring of vital signs, medication adherence, and overall health status. Surgical Assistance: Smart robots can assist surgeons during complex surgeries by providing real-time feedback, precise instrument manipulation, and reducing the risk of human error. Data Analysis and Predictive Analytics: Smart robots can analyze large amounts of health data, including electronic health records, genomic data, and wearable device data, to identify patterns, trends, and insights for better Assistance and treatment planning. Infection Control: Smart robots can play a significant role in infection control by disinfecting patient rooms, common areas, and medical equipment using ultraviolet light, hydrogen peroxide vapor, or other advanced disinfection techniques. This can help prevent the spread of infections in healthcare settings.

II. CONCLUSION

Modern technologies are very effective in the development of healthcare robots. Healthcare robots are set to have a bright future. Currently, the most common applications of robots in practice are in aging and assisted care living, where companion robots are employed to alleviate symptoms and improve patient quality of life. Although there are few examples of healthcare robots in the literature, the opportunity for this type of robot will grow in the following decades as more tech-savvy people attend aged care institutions. Researchers and engineers must examine clinical regions' needs and design robots to satisfy those needs. Engineering ideas must be grasped to encourage robotics in personal care and assist patients in selecting the most appropriate type of healthcare technology. As more healthcare robots are used in clinical settings, improvements will drive further advancements in nursing robot technology, eventually improving nursing care efficiency, quality, and perception. In the future, with this study, we aimed to study various biomedical sensors, controllers, and actuators in detail.

III. REFERENCES

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