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IoT Enabled Medical Assistance Robot

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Abstract: **Robotics is a trending broad field with various applications. In our daily lives, robots have taken on an oddity. In the recent years, there is a rise in the use of robotic automation in both industries and for daily activities. The system is designed to minimise human mistakes and interferences resulting in more precise work with accuracy and proper management.**

This project uses virtual telepresence to drive the robot with arms to move in all directions. The robot is controlled to move towards the patients based on the commands given to it which can be viewed through a camera even if the user is not present at the same location as that of the robot. This is done over IOT which is connected with our smartphones.

ESP32 Microcontroller is used as it has integrated Wi-fi and Bluetooth for easy accessibility. Also, all the hardware can be easily connected through this microcontroller.

The RFID card is used to update the patient details like the heart rate and the respiratory rate which in encrypted format can be viewed by the doctors. This is done for safety of patient details as patient details can be decrypted by the assigned doctor only.

Robotic arms are used to provide the proper medication to the patient based on the command given by the doctor. Camera is also used to consult the doctor virtually which will be useful during emergency situations.

Keywords: *virtual telepresence, IoT, wi-fi, RFID*

1. INTRODUCTION

Today, everyone values their time, thus robotics is used inorder to prevent obstacles and make life easier. Robots are machines that is programmed to perform certain actions based on its programmed application. They are widely used in industries, hospitals, schools, restaurants, etc.

Here, virtual telepresence robot is used to reduce the time required for moving from the user's start point to the desired monitoring location. Virtual reality and direction control in robots are two technologies that can be used for a various applications. Virtual reality has been employed extensively in a variety of industries, including chemical, graphics and video gaming industries. Virtual reality has a special effect on a person so as to make one feel it as real.

Robots are designed to reduce human work load and perform those works programmed to it efficiently. With the help of a smartphone, the user can control the robot's movement by experiencing a live feed through virtual telepresence. Camera is used to view the movement of the robot using a smartphone.

2. BACKGROUND

The Virtual telepresence robot is connected through the IOT. This provides audio and video facility to the user. These robots are built such that they can function in any environment. In this paper, the camera present in the robot helps in live streaming of the locations and thus works on the commands give by the user to move in different directions.

The ESP32 microcontroller acts a medium to connect all the hardware for its proper functioning. The robot's arms and movement are both managed by the driving circuit. The camera connected is used to view the movement of the robot for controlling it to move to the required location. This is efficiently done using IoT linking everything to smartphones for easy accessibility.

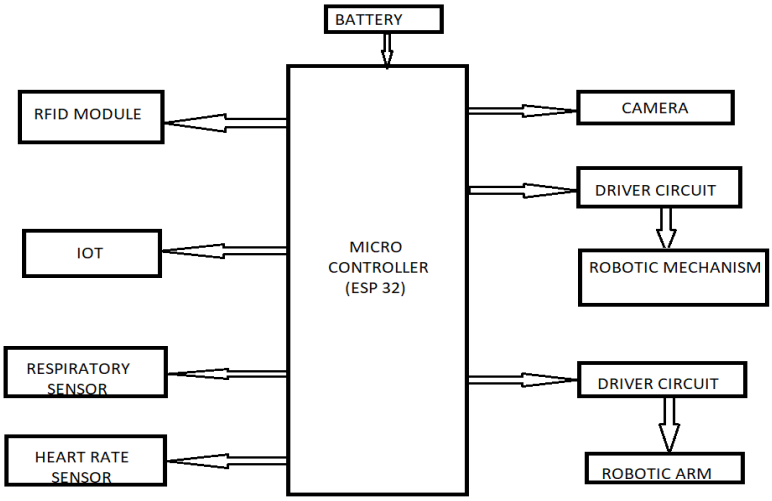

Figure 1: Block diagram

This is the block diagram for this paper. Here ESP 32 microcontroller is the brain of the system. This microcontroller is mounted on the top of the robot. Input is received by the smartphone through the wi-fi or bluetooth. Smartphone is used to control the robot to move in different directions. This commands are further sent to the driver motors which helps in the movement of the robot and also the robotic arms. The camera is used to capture the images or livestream which can be viewed through the smartphone.

3. HARDWARE

The hardware parts used in the virtual telepresence robot is affordable and can be easily bought in the electronic stores. Below is the description of the parts.

3.1 Microcontroller ESP32

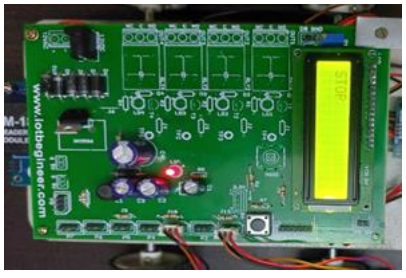

Figure 2: ESP32 Microcontroller

A low-cost, low-power system on a chip microcontroller with built-in or integrated Wi-Fi and dual-mode bluetooth is called the ESP32. Espressif Systems, a Chinese corporation with its headquarters in Shanghai, created the ESP32 microcontroller.

The specifications are:

- 32-bit dual-core LX6 CPU with a 240 MHz clock speed.
- 448 KB of ROM and 520 KB of SRAM.
- It has 150 Mbps 802.11b Wi-Fi connectivity support.
- It complies with both the BLE and standard Bluetooth v4.2 requirements.
- It has 34 Programmable GPIOs.
- 1 Host controller and 1 Slave controller.
- Has secure boot and flash encryption.

3.2 DC Motor Driver L293D

A quadruple high-current half-H driver is the L293D device. It is made to deliver bidirectional drive current up to 600 mA at a 5 V voltage. It can be utilised as a bipolar stepper motor driver or a dual DC motor driver. They are employed as stepper motor drivers and bidirectional DC motor controllers in robotics applications.
It features a 5V voltage supply, a maximum input voltage of 7 VDC for the logic controller, strong noise immunity, temperature protection, and header connector functionality for connecting the supply and motor.

3.3 DC Motor

DC motors with gears are a variation of the DC motor. A gear assembly will be fastened to the motor of a geared DC motor. A DC motor's speed is expressed as RPM and is computed in terms of shaft revolutions per minute. The gear aids in lowering speed and boosting torque.

Figure 3: DC Motor

3.4 IOT

The Internet of things connects commonplace items including physical items that have electronics, software, sensors, and data exchange capabilities. As a result, it is a system network that facilitates the interchange of information. An example of a networked computer combining to gather and produce informational output is found in lightbulbs, refrigerators, flower pots, clocks, fans, planes, trains, autos, etc.

3.5 Heart Rate Sensor

Pulse waves, which demonstrate changes in a blood vessel's volume brought on by the pumping of blood, are measured using a heart rate sensor. Any change in volume can be measured using an optical sensor and a green LED to identify pulse waves. 60 to 100 beats per minute constitute the typical range.

Figure 4: Heart rate sensor

3.6 Respiratory sensor

The respiratory sensor is used to measure the breathing rate. This is done by placing the sensor near the body of a patient and breathing to check it's range. It is controlled by the respiratory centre of the brain.

4. RESULT

Initially the microcontroller is in OFF state. The ESP32 microcontroller is used to drive the other modules connected to it. The sensors , RFID module, battery, motor drivers are connected to the microcontroller.

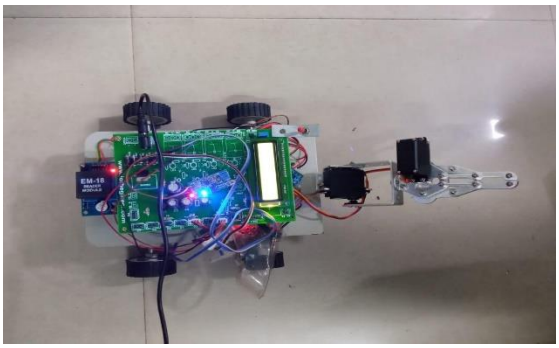

Figure 5: Hardware setup

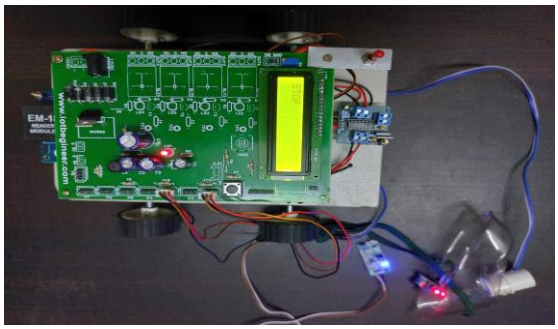

Figure 6: Initially in OFF state

The microcontroller is connected to IOT and using it the robot is controlled which can move in different directions i.e left, right, forward and backward.

Figure 7: Control Panel

The application used is to get the patients heart rate and respiratory rate through the sensors and is stored in IOT which can be read only by validated email OTP send to and verified by the system. This helps the data to be secure and easy maintenance.

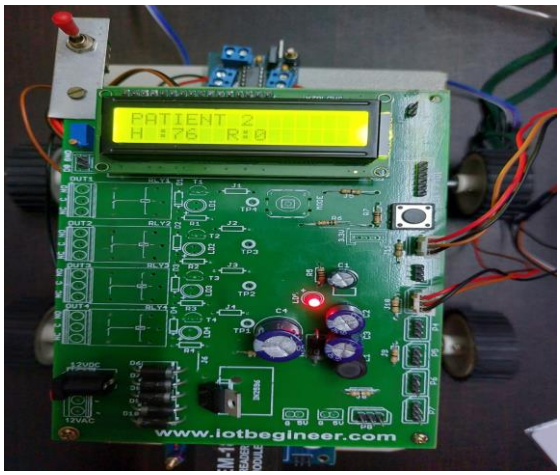

Figure 8: Reading patient details

The patients heart rate and respiratory rate is read and displayed on the display of the controller which is further saved in the IoT for accessibility to doctors.

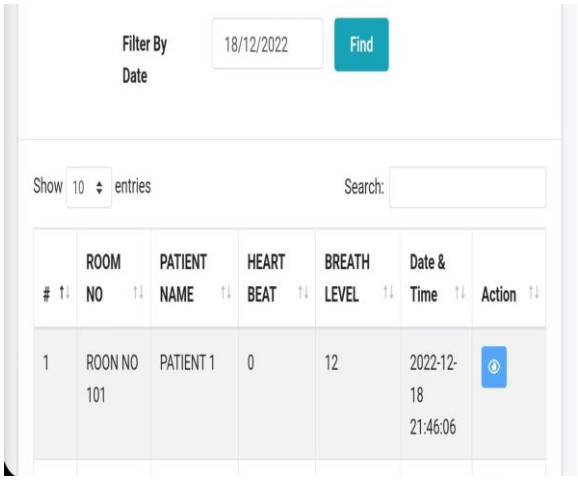

Figure 9: Patient details

Room No	Patient Name	Heart rate	Breath level	Date& Time
101	ABC	76	12	1/3/23 &10:00 am
112	PQR	72	10	7/3/23 &10:50 am
125	XYZ	71	9	11/3/23 &12:00 am

Figure 10: Sample patient data

Thus, these data can be viewed by any doctor through valid email ID updated in the IOT website. This will help in easy access of data for consultation of doctors from different places.

5. CONCLUSION

The virtual telepresence pick and place robot controlled by IOT is designed and implemented. These robots have a wide range of industrial and medical applications such as pick and place robots, surgical robots etc. They can be employed in places where precision and accuracy are required. Robots can also be employed where human hand cannot penetrate. It is seen that the robotic arm is designed very efficiently and that the designed robotic arm is capable to lift the objects of medium weight.

6. FUTURE SCOPE

In the future, pick and place arm robot can be designed for many other applications which will have a very high accuracy for its specific applications. Robots can perform human actions more efficiently and in a faster manner without any delay. Therefore, automatic movement of the robots can be designed in future which will not require the controlling of a user for its movement.

7. REFERENCES

[1] Reshma, ‘virtual telepresence robot using raspberry pi‘, in journal *of International Journal of Research in Engineering, Science and Management* Volume-**3**, Issue-7, July-2020

[2] ‘Remote controlled pick and place’, Meenakshi Prabhakar et al *2021 IOP Conf. Ser.: Mater. Sci. Eng*. 1012 012003

[3] Shamin P Shaji, Sharon Mariam George, Rahul Shaji, Steffy Don, Ms P Careena, ‚Virtual Telepresence Robot', in *International Journal of Innovative and Emerging Research in Engineering*, Volume **4**, Issue 2

[4] Lavanya M, M. L. Vaishnavi, M . Raaga Vaishnavi, Manish T. J.,Veerappa Chikkagoudar, Virtual telepresence robot', in *International Journal of Advance Research, Ideas and Innovations in Technology*, ISSN: 2454-132X Impact Factor: 6.078 (Volume **7**, Issue 3 - V7I3-2208)

[5] Ana Marie. D Celebre, Ian Benedict A. Medina, ‚Home Automation Using Raspberry Pi through Siri Enabled Mobile Devices', *8th IEEE International Conference Humanoid, Nanotechnology, Information Technology Communication and Control, Environment and Management* 9-12 December 2015,Waterfront Hotel, Cebu City, Philippines.

[6] Zsolt Szécsi , Kroly Simon, ‚Argus: Hardware and Software System for Automatic or Semi-automatic Photo Taking', *SISY 2015 IEEE 13th International Symposium on Intelligent Systems and Informatics* September17–19,2015,Subotica,Serbia.