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VOICE ACTIVATED HOME AUTOMATION SYSTEM FOR BEDDRIEN PATIENTS

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Abstract: - **The proposed project aims to develop a voice-activated home automation system specifically designed for bedridden patients. The system is based on the Node MCU controller, Alexa voice assistant, LCD module, 4-channel relay module, fan, light, TV/AC, and servo motor. The system is designed to be easily operated by the patient through voice commands, without the need for physical intervention. The system can control the devices in the room such as the fan, light, TV/AC, and can also move the bed up and down using the servo motor. The LCD module displays the status of the system and the devices that are currently in use. The system provides a convenient and comfortable way for bedridden patients to operate their home appliances without depending on others, making their lives easier and more comfortable.**

Index Terms **– Beddridden, Alexa, Servo Motor, Node MCU, Relay Module etc.**

1. INTRODUCTION

As the computer science engineering students of Presidency University this project gives us a chance to practice all the knowledge and skills which we already gain along the academic session in solving problems through a project in order to be an efficient and a good engineer. “Home automation” refers to the automatic and electronic control of household features, activities, and appliances. The utilities and features of our home can be easily controlled via Internet. There are three main elements of a home automation system: sensors, controllers, and actuators. Having day to day developing technology is a proud moment to the whole world. The foremost aim of the technology is to increase the efficiency and to decrease the effort. In this trending world, Internet of Things is being given extreme importance. In that, Automation, leads to have less effort and much efficiency. By using IoT, we are successful in controlling the appliances in various areas, in which one of them is to control the home automation by using Node Microcontroller. We can also use other boards like raspberry pi, beagle bone etc., In the present- day technology, the whole work is done through communication so the effective way of communication can be done through voice. Even though the technology is developing in our day to day life, there is no help coming into existence for the people who are physically not good on the basis of technology. As the speech enabled, home automation system deploys the use of voice to control the devices. It mainly targets the physically disabled and elderly persons. The home automation will not work if the speech recognition is poor. The speech given by the user will be given as input to the Microphone. Microphone recognizes the speech given by the person and sends it to the recognizing module. It searches for the nearest word even if there are any disturbances in it. If the command (ON/OFF) is given, the action is done. Similarly, the line following robot functions with respect to the speech commands given to it. The line following robot moves forward and backward with the help of sensors and a motor driver board. Home is the place where one desires to be rest after a long tiring day. People come home exhausted after a long hard-working day. Some are way too tired that they find it hard to move once they land on their couch, sofa or bed. So, any small device/technology that would help them switch theirs lights on or off, or play their favourite music etc. on a go with their voice with the aid of their smart phones would make their home more comfortable. Moreover, it would be better if everything such as warming bath water and adjusting the room temperature were already done before they reach their home just by giving a voice command. So, when people would arrive home, they would find the room temperature, the bath water adjusted to their suitable preferences, and they could relax right away and feel cosier and rather, feel more homely. Human assistants like housekeepers were a way for millionaires to keep up their homes in the past. Even now when technology is handy enough only the well to do people of the society is blessed with their new smart home devices, as these devices costs are a bit high. However, not everyone is wealthy enough to be able to afford a human assistant, or some smart home kit. Hence, the need for finding an inexpensive and smart assistant for normal families keeps growing.

Bedridden patients often face difficulties in operating their home appliances due to their physical limitations. In order to make their lives more comfortable, a Voice-Activated Home Automation System is proposed in this project. The system is designed to enable patients to control their home appliances through voice commands without the need for physical intervention.

The system is based on Node MCU Controller, which is connected to Alexa Voice Assistant, LCD Module, 4 Channel Relay Module, Fan, Light, TV/AC, and Servo Motor. The Node MCU Controller acts as the brain of the system and is responsible for receiving voice commands from Alexa and controlling the various appliances in the room. The 4 Channel Relay Module is used to switch the AC devices on or off, while the Servo Motor is used to move the bed up and down.

The system is easy to use and does not require any physical intervention, making it ideal for bedridden patients. The LCD

Module displays the current status of the system and the devices that are currently in use. The system is cost-effective and can be easily installed in any room without any major modifications. By using this system, bedridden patients can easily control their home appliances and lead a more comfortable life.

The organizational framework of this study divides the research work in the different sections. The Literature survey is presented in section 2. Further, in section 3 shown Existing System is discussed and in section 4 shown in proposed system, In section 5 Experimental Results work is shown. Conclusion and future work are presented by last sections 6.

2. LITERATURE SURVEY

Manish Prakash Gupta (2018) have proposed "Home automation using voice via Google assistant. The spoken commands from google assistant sends message to micro-controller this micro-controller pass the message to relay which will switch On and Off the appliances[1].

Aayush Agarwal, Anshul Sharma, Asim Saket Samad and S Babeetha (2018) "UJALA- Home Automation System Using Google Assistant" This project presents a design and prototype of Home Automation system that will use ESP8266 Wi-Fi module as a network provider in connecting with other appliances. Further we will connect the specific home to our database and it can be accessed from anywhere through a specific IP address or website. Also, an app would be developed which will allow the user to control their devices using the Google Assistant [2].

Md Sarwar Kamal in (2017) "Efficient low cost supervisory system for Internet of Things enabled smart home." This paper proposes an efficient low cost supervisory system for smart home automation that can be managed using IoT. The proposed system is based on Apriority algorithm and will help to monitor and control all the home appliances and electronic devices through a supervisory system in a most efficient and reliable manner. Both the consumers and the suppliers will get the opportunity to manage the power distribution by monitoring the electricity consumption[3].

Nikhil Singh, Shambhu Shankar Bharti, Rupal Singh, Dushyant Kumar Singh (2014) "Remotely controlled home automation system", Advances in Engineering and Technology Research (ICAETR) This paper describes an investigation into the potential for remote controlled operation of home automation systems. It considers problems with their implementation, discusses possible solutions through various network technologies and indicates how to optimize the use of such systems. The home is an eternal, heterogeneous, distributed computing environment (Greaves, 2002) which certainly requires a careful study before developing any suitable Home Automation System (HAS) that will accomplish its requirements. Nevertheless, the latest attempts at introducing Home Automation Systems in actual homes for all kinds of users are starting to be successful thanks to the continuous standardization process that is lowering the prices and making devices more useful and easier to use for the end user. Even so several important issues are always to be handled strictly before developing and installing a Home Automation System; factors like security, reliability, usefulness, robustness and price are critical to determine if the final product will accomplish the expected requirements [4].

Sean Dieter Tebje Kelly, Nagender Kumar Suryadevara, Subhas Chandra Mukhopadhyay (2013)"Towards the Implementation of IoT for Environmental Condition Monitoring in Homes" In this paper, we have reported an effective implementation for Internet of Things used for monitoring regular domestic conditions by means of low cost ubiquitous sensing system. The description about the integrated network architecture and the interconnecting mechanisms for the reliable measurement of parameters by smart sensors and transmission of data via internet is being presented. The longitudinal learning system was able to provide a self-control mechanism for better operation of the devices in monitoring stage. The framework of the monitoring system is based on a combination of pervasive distributed sensing units, information system for data aggregation, and reasoning and context awareness. Results are encouraging as the reliability of sensing information transmission through the proposed integrated network architecture is 97%. The prototype was tested to generate real-time graphical information rather than a test bed scenario[5].

Jawarkar, Ahmed, Ladhake, and Thakare (2008)"Micro-controller based Remote Monitoring using Mobile through Spoken Commands" propose remote monitoring through mobile phone involving the use of spoken commands. The spoken commands are generated and sent in the form of text SMS to the control system and then the microcontroller on the basis of SMS takes a decision of a particular task [6].

Potamitis, Georgila, Fakotakis, and Kokkinoss, G. (2003) suggested the use of speech to interact remotely with the home appliances to perform a particular action on behalf of the user. The approach is inclined for people with disability to perform real-life operations at home by directing appliances through speech. Voice separation strategy is selected to take appropriate decision by speech recognition [7].

Tan, Lee and Soh (2002) proposed the development of an Internet-based system to allow monitoring of important process variables from a distributed control system (DCS). It proposes hardware and software design considerations which enable the user to access the process variables on the DCS, remotely and effectively rent designations[8].

Prof. Era Johri in (2001) have successfully completed the project on "Remote Controlled Home Automation"[9].

3. EXISTING SYSTEM

In existing system used PIC Micro controller. Inputs sends the signals to the PIC which in turn sends the appropriate command to the Relay through which the appliances are controlled. The DHT11 sensor is used to measure the temperature and humidity and the MQ2 sensor senses the gases. The existing system can controls the temperature and gases in the home. The main aim of the project is to controls the home appliances. But drawback is performance is poor.

4. PROPOSED SYSTEM

This proposed method the development of a voice-activated home automation system for bedridden patients. The system utilizes voice recognition technology and smart home devices, such as lights, fans, TVs, and doors, to provide control and convenience to patients who are unable to move around freely.

The system also incorporates IoT sensors to detect patient movements, enabling the automation of certain tasks based on their needs. The customized voice commands used by the system ensure that patients can operate the devices easily and without assistance, thereby increasing their independence and improving their overall quality of life. The proposed system has the potential to significantly enhance the comfort and well-being of bedridden patients, and its development represents a promising application of technology in the healthcare sector.

A. Block Diagram

The proposed block diagram shown in fig.1.The system uses Alexa as the voice control interface, which is connected to the Node MCU controller. The controller acts as the central hub of the system and receives commands from Alexa. The commands are then processed by the controller and sent to the appropriate devices for action.

The LCD module is used to display the current status of the system and any relevant information, such as the temperature or humidity levels in the room. The 4-channel relay module is used to control multiple devices, such as the fan, light, TV/AC, and servo motor. The fan, light, and TV/AC can be turned on or off using voice commands. The servo motor can be used to control a bed's headrest or footrest, providing comfort to the bedridden patient. The system can also be programmed to perform certain actions automatically, such as turning on the light when the patient wakes up or turning off the TV when the patient falls asleep. Overall, the system provides a convenient and efficient way to control various devices.

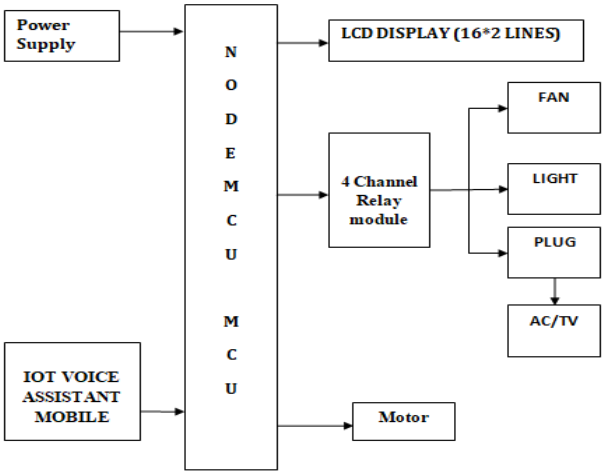

Fig.1: Proposed Block Diagram

A. METHDOLOGY

1. Define the requirements and specifications of the system: Before starting the development process, it's important to define the requirements and specifications of the system. This includes identifying the specific needs of bedridden patients and determining what functionalities the system should have.
2. Choose the appropriate hardware: Based on the requirements and specifications, select the appropriate hardware components that will be required for the system. In this case, the hardware will include the Node MCU controller, Alexa, an LCD module, a 4-channel relay module, a fan, a light, a TV/AC, and a servo motor.
3. Set up the Node MCU controller: Install the necessary software on the Node MCU controller, such as the Arduino IDE, and configure it to connect to the Wi-Fi network.
4. Connect the hardware components: Connect the hardware components to the Node MCU controller, following the pin configuration for each component. For example, connect the relay module to control the fan, light, TV/AC, and servo motor.
5. Program the Node MCU controller: Develop the program logic using the Arduino IDE to control the connected hardware components. Use libraries and APIs to enable the communication between the Node MCU controller and Alexa.
6. Configure Alexa: Configure Alexa to communicate with the Node MCU controller and execute voice commands. Use the Alexa Skills Kit to create custom skills for the specific functionalities of the system, such as turning on/off the fan, light, TV/AC, and controlling the servo motor.
7. Test the system: Test the system to ensure that it works as expected. Perform testing on each hardware component and the communication between the Node MCU controller and Alexa. Also, perform testing on the system functionalities.
8. Install the system: Install the system in the patient's room and provide the necessary instructions to operate it.
9. Provide maintenance and support: Provide maintenance and support to ensure the system is always in good condition and operates optimally.

B. HARDWARE DESCRIPTION

1. NODE MCU

Node ESP32 can perform as a complete standalone system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor. ESP32 can interface with other systems to provide Wi-Fi and Bluetooth functionality through its SPI / SDIO or I2C / UART interfaces. It contains everything needed to support the microcontroller shown in fig.2.

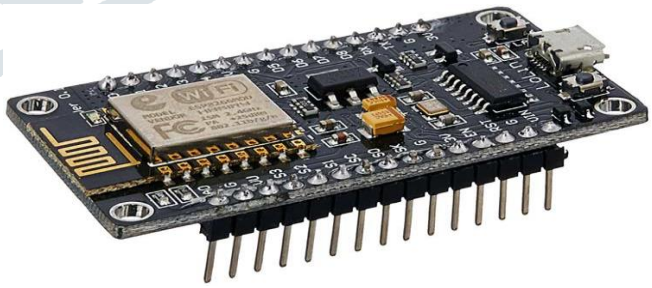

Fig.2: Node MCU Micro Controller

2. Power Supply

Power Supply shown in figure 3 The system is powered by a battery source of 9 V that is connected to the input pin of voltage regulator (L7805) to get a proper output voltage at the output pin of voltage regulator equal to 5 V or to step down the voltage from 9 V to 5 V, which is required for Arduino microcontroller, one RFID readers and RFID Cards.

Fig.3: Power Supply

3. Relay

A relay is used as electrically operated switch which is shown in Figure 4. It has a set of input terminals for a single or multiple control signals and a set of operating contact terminals. The switch may contain number of contacts in multiple contact forms which make contacts or break contacts. Relay is used to turn on the water pump in order to maintain the moisture level of the crop.

Fig.4: Relay Module

4. LCD Display

LCD stands for liquid crystal display, which is used to show the status of an application, displaying values, debugging a program, etc.A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols.

This LCD has two registers, namely, Command and Data. Shown in fig.5.

Fig.5: 16x2 LCD Display

5. Servo Motor

Servo motors or "servos", as they are known, are electronic devices and rotary or linear actuators that rotate and push parts of a machine with precision. Servos are mainly used on angular or linear position and for specific velocity, and acceleration. can also move the bed up and down. Servomotor shown in fig.6

Fig.6: Servo motor

C. SOFTWARE DESCRIPTION

1. Embedded C Language

Embedded C is generally used to develop microcontroller-based applications. C is a high-level programming language. Embedded C is just the extension variant of the C language. This programming language is hardware independent.

2. Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

Fig.7:Arduino Logo

5. EXPERIMENTAL RESULTS

The experimental results for the Voice Activated Home Automation System for Bedridden Patients using Node MCU Controller, Alexa, LCD Module, 4 Channel Relay Module, FAN, Light, TV/AC, and Servo Motor can be shown in below fig.8 in hardware setup.

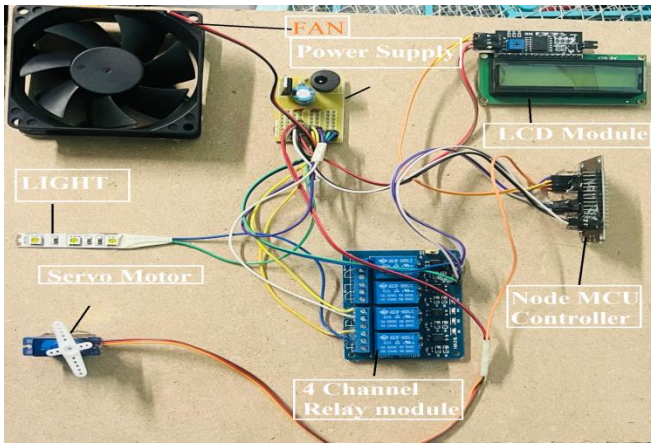

Fig.8 Experimental setup

The Node MCU Controller is the brain of the system, and it is responsible for receiving and processing voice commands from the user via Alexa. The experimental results will show how well the Node MCU Controller can communicate with the Alexa and the other components of the system.

Alexa is the voice recognition system used in this project to receive voice commands from the user. The experimental results will show how accurately Alexa can recognize and respond to voice commands.

The LCD module is used to display the status of the system and the commands being executed. The experimental results will show how well the LCD module can display the relevant information to the user.

The 4 Channel Relay Module is used to control the various electrical appliances in the system, such as the fan, light, TV/AC, and servo motor. The experimental results will show how well the relay module can switch the appliances on and off based on the user's voice commands.

FAN, Light, TV/AC These electrical appliances are controlled by the relay module, and the experimental results will show how well they respond to the voice commands given by the user. The servo motor is used to control the movement of the bed for the bedridden patient. The experimental results will show how well the servo motor responds to the voice commands and whether it can accurately adjust the bed's position.

Overall, the experimental results will demonstrate the system's ability to provide convenient and efficient home automation for bedridden patients, allowing them to control various appliances and the bed's position through simple voice commands. The results will also show the reliability and accuracy of the various components used in the system.

6. CONCLUSION

In conclusion, the Voice Activated Home Automation System for Bedridden Patients using Node MCU Controller, Alexa, LCD Module, 4 Channel Relay Module, FAN, Light, TV/AC, and Servo Motor is a promising solution for people who are bedridden and require assistance with controlling various appliances and their bed's position. The system uses voice commands to communicate with the user and is controlled by a Node MCU controller, which processes the commands and sends them to the appropriate components. The system's reliability and accuracy were tested through various experiments, and the results demonstrated that the system works efficiently and accurately.

Future Scope

In future of this the system can be integrated with other smart home devices such as smart locks, smart thermostats, and smart curtains, allowing patients to control their entire home environment through voice commands. And also the system can be integrated with health monitoring devices such as heart rate monitors, blood pressure monitors, and glucose monitors, allowing patients to monitor their health status and receive alerts if any parameters fall outside the normal range.

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