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Voice and Remote Controlled Home Automation System for Bedridden Patients and Senior Citizens

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Abstract: - This project presents a voice and remote-controlled home automation system designed to assist bedridden patients and senior citizens. Using IoT technology, a ESP32 micro controller, voice commands, and a custom mobile application, the system enables easy control of household appliances such as lights, fans, TV, and AC. Dual-mode operation through voice control and mobile access allows hands-free usage and remote monitoring. The system is cost-effective, user-friendly, and helps improve independence, safety, and quality of life for individuals with limited mobility.

Index Terms **– IoT Mobile Application ,Voice-Activated Control, Smart Assistive System, Bedridden Patients, Senior Citizens**

1. INTRODUCTION

Rapid advancements in embedded systems and Internet of Things (IoT) technologies have led to the development of smart home automation systems that improve comfort, safety, and energy efficiency. Home automation enables electronic control of household appliances through wireless communication, allowing users to manage devices with minimal physical effort and increased convenience.For bedridden patients and senior citizens, operating conventional electrical switches and appliances can be difficult due to limited mobility or health conditions. Such individuals often depend on caregivers for basic daily tasks, which can reduce their independence and quality of life. Voice and remote-controlled technologies provide an effective solution by enabling hands-free and accessible interaction with home environments.This project proposes a Voice and Remote Controlled Home Automation System designed specifically to assist elderly individuals and bedridden patients. The system integrates IoT technology with voice recognition and a mobile application to allow easy control of household appliances. By offering a low-cost, user-friendly, and reliable solution, the proposed system promotes independent living while reducing caregiver workload in homes, hospitals, and assisted living facilities.Advancements in IoT and embedded systems have made smart home automation possible, improving comfort and accessibility. This system is specially designed to help bedridden patients and senior citizens who have difficulty operating household appliances.

The system uses a ESP32 micro controller connected to Wi-Fi. It works in two ways: through voice commands using a voice assistant and through a mobile IoT application. When a user gives a command, it is sent to the ESP32 micro controller , which processes it and performs the required action.

Appliances like lights, fans, TV, and AC are controlled using a relay module. A servo motor is used to adjust the bed position, and an LCD displays the system status. The system works in real time and does not require physical switches, helping users live more independently and reducing dependence on caregivers.

2. PROPOSED SYSTEM

The proposed system is a dual-mode home automation solution that helps bedridden patients and elderly individuals control household appliances independently. It is built around a ESP32 micro controller connected to Wi-Fi and blue tooth for real-time communication.The system operates through voice commands and a mobile IoT application. Appliances such as lights, fans, TV, and AC are controlled using a relay module, while a servo motor adjusts the bed position. An LCD provides system status updates. Overall, the system is low-cost, reliable, and designed to improve

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convenience and independence for users with limited mobility The system is designed to respond quickly and reliably to user commands by continuously monitoring inputs from voice control and the mobile application. Once a command is received, the ESP32 safely processes and executes it through the connected hardware.Electrical safety is ensured using a relay module that isolates low-voltage control circuits from high-voltage appliances. Wi-Fi communication provides stable and remote access to the system. The design also supports future expansion, allowing additional features and devices to be added. Overall, the system offers a flexible, secure, and user-friendly solution that improves comfort and independence for users with limited mobility.

3. IMPLEMENTATION DIAGRAM

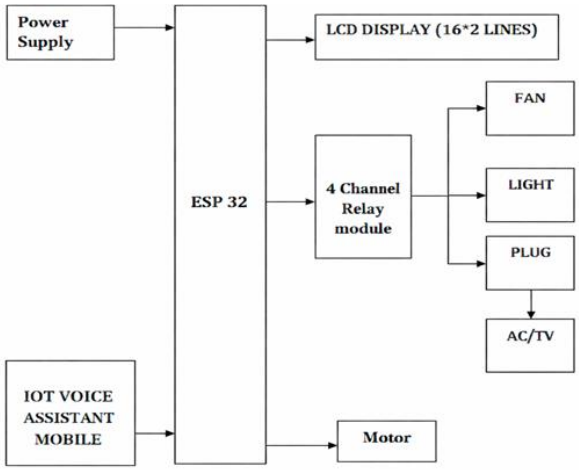

Fig .1: Implementation Diagram

Power Supply provides voltage to the ESP32, which receives commands from the IoT voice assistant or mobile app, displays system status on a 16×2 LCD, controls appliances like fan, light, plug point, AC/TV through a 4-channel relay module, and operates a servo motor for bed adjustment(Fig.1).

4. FLOW OF PROJECT

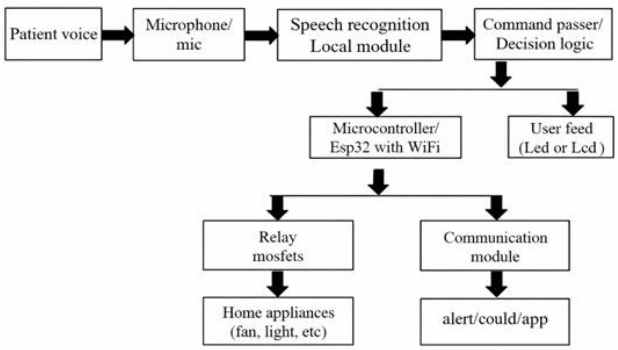

Fig.2: Flow of Project

The system works by capturing the user's voice command through a microphone and converting it into a text instruction using a speech recognition module. This command is then processed and sent to the ESP32 micro controller, which acts as the central controller. Based on the instruction, the controller activates the required appliance—such as a fan, light, TV, or air conditioner—through a relay circuit. The system also provides feedback through an LCD or LED display to show the device status. The entire process operates in real time, enabling efficient and hands-free control of household appliances.

5. HARDWARE MODULES

1.ESP32 :

The ESP32 is a low-power microcontroller designed for IoT applications, featuring built-in Wi-Fi and Bluetooth for wireless communication. It has multiple GPIO pins and supports communication protocols like UART, SPI, I2C, and PWM for easy hardware integration. In this project, the ESP32 serves as the main controller, receiving commands from a voice assistant or mobile app and controlling appliances such as lights, fans, and air conditioners through relay modules.

Fig.3: ESP32 Board

2.Voltage supply :

The system uses a 9 V battery with an L7805 regulator to provide a stable 5 V supply, ensuring safe and reliable operation of the ESP32 board and relay modules.It will keep the components safe from high volatge which causes the damage to components

Fig.4 : voltage supply

3. Precision motor :

A precision motor operates using PWM signals from a micro controller to control its shaft angle. It uses a

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feedback mechanism to compare the desired and current positions, rotating until the correct angle is reached and then holding it firmly. This ensures accurate and stable movement, typically within a 0 to 180 degrees range and aslo range from 180 to 0 degrees

Fig.5: precision motor

4.Load Control Module:

A Load Control Module is an electronic device that manages and automates electrical appliances, allowing them to be switched ON or OFF manually, remotely, or automatically in home, industrial, or IoT systems.

Fig.6: load control module

5.Flat-panel display:

A Flat Panel Display (FPD) is a thin, lightweight screen used to show text, images, or graphics. It consumes less power than CRTs and is commonly used in home automation, industrial systems, and IoT projects. Types include LCD, LED, OLED, and touch panels, often connected to microcontrollers to display real-time device status and sensor data.

Fig.7: 16x2 flat panel Display

6.Temperature Sensor :

A temperature sensor measures the heat level of an environment and sends the data to the system. In this project, it displays room temperature on the LCD and helps automate devices like fans or AC for comfort and efficiency.

Fig.8 : Temperature sensor

6. SOFTWARE TOOLS:

1.Arduino IDE (Tool) :

The Arduino IDE is software that allows writing, compiling, and uploading programs to Arduino microcontrollers, providing tools like a text editor, console, and toolbar to communicate with the hardware for automation projects.

Fig.9 : Arduino software

2.Python:

Python is a programming language we can develop apps by using the python software tool we developed the app which we use in our project by using python we can create Iot projects, software ,automation etc this are all run by python

Fig.10: Python tool

3.IOT home app:

This the app designed for the giving commands from user this app have voice assistance and also remote buttons we can operate by both of them by giving commands we can operate the system that what we need to do.By this app we can control home appliances like Fan(off/on), Ligth(off/on), Bed(up/down) etc.

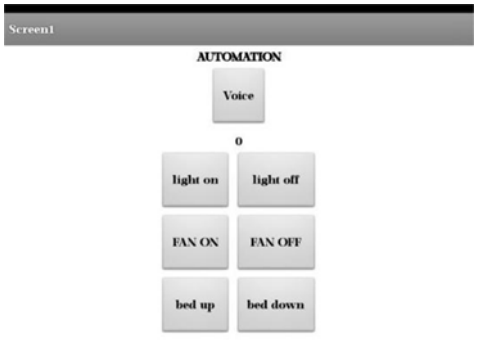

Fig.11: IOT App

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7. RESULTS :

The experimental results for the Voice and Remote controlled Home Automation System for Bedridden Patients and senior citizens using ESP32 Controller, mobile app, LCD Module, 4 Channel Relay Module, FAN, Light, TV/AC, and Servo Motor can be shown in below fig.12 in hardware setup.

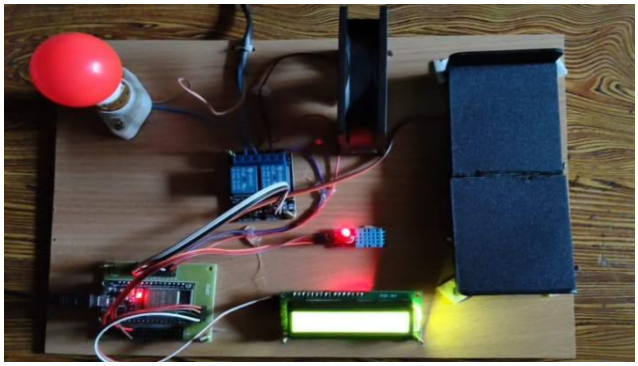

Fig.12:Hardaware setup

In this project, a mobile application with voice control allows users to operate the system using spoken commands. Tests will evaluate how effectively the app recognizes and executes these commands.The LCD screen provides real-time feedback, such as room temperature, so users can easily monitor conditions. Its clarity and responsiveness will be observed during testing.A 4-channel relay module manages appliances like fans, lights, TV/AC, and servo motors, turning them on or off based on voice or remote instructions. The overall system aims to offer practical and user-friendly home automation for bedridden patients, enabling them to control devices and adjust the bed without physical effort. The experiments will also confirm the accuracy and reliability of all components involved.

8. CONCLUSION:

In this conclusion, the Voice And Remote controlled Home Automation System for Bedridden Patients and senior citizens In This project develops a voice and IoT app–based home automation system to help bedridden patients control household appliances independently. Using a ESP32 with Wi-Fi, appliances such as lights, fans, TV/AC, and bed positioning can be operated through voice commands or a mobile application. The system is low-cost, user-friendly, and suitable for homes, hospitals, and elderly care centers. It improves comfort, reduces dependence on caregivers, and can be enhanced in the future with health monitoring and smart features

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