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HOME AUTOMATION USING NODE MC AND BLYNK APP

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Abstract **-** This paper presents the design and implementation of a Home Automation system utilizing a Node MCU-32S processor. The system incorporates various functionalities such as lighting control, alarm and reminder settings, smart security features, and an entertainment system. The core components include a computer with appropriate programming, interconnecting cables or wireless links, a high-speed Internet connection, and essential home systems. The system is remotely controllable via the Blynk application on an Android device, allowing users to manage and monitor their home environment conveniently. With the Node MCU-32S's capabilities, the system provides efficient and reliable automation for modern households.

Keywords: Home Automation, Node MCU-32S, Blynk application, Lighting Control, Alarm System, Smart Security, Entertainment System.

I. INTRODUCTION

An automated home is sometimes called a smart home. Home automation can include the scheduling and automatic operation security systems, lighting, reminder systems and entertainment appliances. The fundamental components of a well-designed home automation system include a computer with the appropriate programming, the various devices and systems to be controlled, interconnecting cables or wireless links, a high-speed Internet connection and essential home systems. The Home Automation project is based on a Node MCU-32S processor, which is supported by 520KB SRAM, 8-bit DAC. This paper comprises of the following functionalities: controlling the lighting, setting alarms and reminders, smart security system and an entertainment system. The lighting functionality, alarms, reminders and entertainment system can be remotely controlled via Blynk application present on an android device. The android application controls the Node MCU-32S wirelessly to perform the necessary function.

II. METHODOLOGY

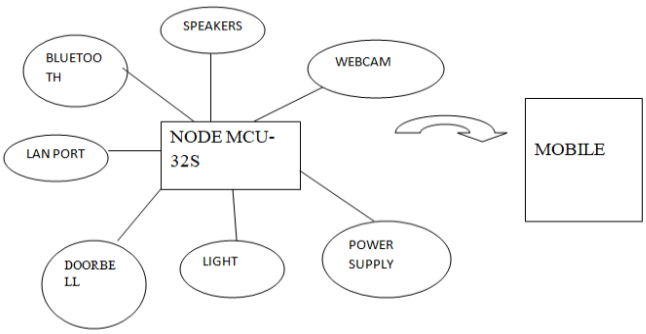

Fig.1.1 Block diagram for office automation using IOT

Detailed steps with reference to the block diagram

1. Smart Doorbell:The doorbell button is wired to the Node MCU-32S. Upon pressing the doorbell, a command is triggered on the Node MCU-32S to activate the webcam, capture an image, and transmit it back to the Node MCU-32S. Subsequently, the Node MCU-32S sends the image through both messaging and email services via the LAN port for remote notification.
2. Regulating Appliances:Appliances like doorbell lights and fans are connected to the Node MCU-32S via GPIO pins. The Blynk application on a mobile device communicates wirelessly with the Node MCU-32S over the internet. Commands from the Blynk app are received by the Node MCU-32S through its LAN port. The Node MCU-32S then executes scripts to control the appliances according to the received commands.
3. Wireless Speakers:The Node MCU-32S is linked to the speakers through an auxiliary port. These speakers facilitate wireless sound output. Users can select music from the audio clips stored on their mobile phones. By connecting the phone to the Node MCU-32S via Bluetooth, users can play the selected audio clips wirelessly through the speakers.

III. HARDWARE REQUIREMENT

(1)Node MCU-32S

Fig.1.2 Node MCU-32S

Here are some key points about the ESP32 microcontroller series:
1. Low Cost and Low Power: ESP32 microcontrollers are designed to be cost-effective and power-efficient, making them suitable for a wide range of IoT applications.
2. Integrated Wi-Fi and Bluetooth: The ESP32 series features integrated Wi-Fi and dual-mode Bluetooth connectivity, allowing for seamless wireless communication.
3. Dual-Core and Single-Core Variants: ESP32 microcontrollers are available in both dual-core and single-core variations, offering flexibility in performance and power consumption based on application requirements.
4. Clock Rate:The ESP32 microprocessor utilizes a Tensilica Xtensa LX6 core, with clock speeds of up to 240 MHz, providing sufficient processing power for various IoT tasks.
5. Development Boards: Similar to the ESP8266 breakout boards, there are numerous ESP32 development boards available in the market, including variants compatible with the NodeMCU platform.
6. USB Connectivity: ESP32 development boards typically feature a USB connection port, facilitating easy programming and communication with a computer.
Overall, the ESP32 series offers enhanced capabilities compared to the ESP8266, making it a popular choice for IoT projects that require advanced features such as Bluetooth connectivity, higher processing power, and improved energy efficiency.

(2)Webcam

Fig1.3 Webcam with microphone

Utilizing a basic webcam with a microphone in your smart doorbell system offers several functionalities to enhance security and communication. Here's how it operates:

1. Image Capture: Upon activation of the doorbell, the webcam captures a snapshot of the visitor standing at the door. This image is then processed and prepared for transmission.

2. Email Notification: The captured image is promptly sent via email to the user's designated email address. This feature enables the user to receive visual confirmation of the visitor at the door, regardless of their physical location.

3. Two-Way Communication: The integrated microphone allows for two-way communication between the user and the visitor. When a call is initiated, the user can speak to the visitor through the microphone, facilitating real-time interaction and the exchange of information as needed.

By integrating image capture, email notification, and two-way communication capabilities, the smart doorbell system offers increased security and convenience for the user, enabling them to remotely monitor and communicate with visitors at their doorstep.

(3)Android Mobile Device

Fig.1.4Android Device

The android application is downloaded on the android device to provide the user with an interface to interact with the Node MCU-32S..This application allows the user to control the lighting, connect to the speakers via Bluetooth, set alarms and reminders.

(4) Ultra Link 2.0 Multimedia Speakers ULP-SP2W01

Fig.1.5Wired Speakers (Ultra Link 2.0 Multimedia Speakers ULP-SP2W01)

IV. SOFTWARE REQUIREMENT

IDE: It is an IDE (Integrated Development Environment) that rakes codes to be written, compiled and upload . Embedded C language, which is used with commodious by any user is wont for the Arduino software. Even for a being new to embedded C, it is elementary to grasp the details, since it is facile to understand. Library files should be installed for sensor deeds and also integration with Blynk app can be made possible.

IOT

Fig.1.6 IOT

Absolutely, the Internet of Things (IoT) represents a paradigm shift in how physical devices and everyday objects interact and communicate with each other and with users through the internet. Here's a breakdown of some key points about IoT:

1. Extension of Internet Connectivity: IoT extends internet connectivity beyond traditional computing devices like computers and smartphones to include a wide range of physical objects and devices.
2. Embedded Electronics and Sensors: IoT devices are embedded with electronics, sensors, and connectivity features that enable them to collect data, communicate, and perform various tasks.
3. Interconnectedness: IoT devices can communicate and interact with each other over the internet, forming interconnected networks of devices that can share data and collaborate to achieve specific goals.
4. Remote Monitoring and Control:One of the key features of IoT is the ability to remotely monitor and control devices from anywhere with an internet connection. This allows users to manage their devices, gather data, and perform actions without physical proximity to the devices.
5. Consumer Applications: A significant portion of IoT devices are designed for consumer use, offering various applications such as connected vehicles, home automation systems, wearable technology, connected health devices, and appliances with remote monitoring capabilities.
6. Internet of Wearable Things (IoWT): IoWT refers to the subset of IoT devices that are wearable, such as smartwatches, fitness trackers, and other wearable gadgets. These devices typically collect biometric data, track physical activity, and provide real-time feedback to users.
7. Connected Health: IoT is revolutionizing the healthcare industry by enabling the development of connected health devices and systems. These devices can monitor patients' vital signs, track medication adherence, and provide remote healthcare services.
8. Home Automation: IoT-powered home automation systems allow users to control various aspects of their homes, including lighting, heating, security cameras, and appliances, remotely via smartphone apps or voice commands.

Overall, IoT technology has the potential to transform various industries and aspects of everyday life, offering unprecedented levels of connectivity, convenience, and efficiency.

BLYNK APP

Indeed, Blynk is a versatile mobile platform designed to enable users to control and monitor a variety of hardware devices, including Arduino, NodeMCU-32S, Raspberry Pi, and more, over the internet. With its iOS and Android apps, Blynk provides a user-friendly interface for creating digital dashboards and graphical user interfaces (GUIs) for IoT projects.

Key features of Blynk include:

1. Cross-Platform Compatibility: Blynk is compatible with both iOS and Android mobile devices, allowing users to access and control their IoT projects from a wide range of smartphones and tablets.
2. Remote Control: Blynk enables remote control of hardware devices over the internet, allowing users to interact with their IoT projects from anywhere with an internet connection.
3. Drag-and-Drop Interface: Blynk simplifies the process of creating GUIs for IoT projects by providing a drag-and-drop interface for adding and configuring widgets. Users can easily customize the layout and functionality of their digital dashboards without the need for extensive programming knowledge.
4. Wide Range of Widgets: Blynk offers a variety of widgets that users can add to their digital dashboards, including buttons, sliders, gauges, graphs, and more. These widgets can be customized to control and display data from connected hardware devices.
5. Integration with Hardware Platforms: Blynk supports a wide range of hardware platforms, including popular microcontrollers like Arduino and ESP8266/ESP32-based boards like NodeMCU-32S, as well as single-board computers like Raspberry Pi. This allows users to easily connect their hardware projects to the Blynk platform.
6. Cloud Connectivity: Blynk provides cloud connectivity for storing project data and configurations, making it easy to access and manage IoT projects across multiple devices.

Overall, Blynk simplifies the development of IoT projects by providing a user-friendly platform for creating mobile interfaces and enabling remote control and monitoring of connected hardware devices over the internet.

V.HARDWARE IMPLEMENTATION

We connect the Node MCU-32S to the wired speakers. This enables the reminder, alarm and audio speaker functionality.

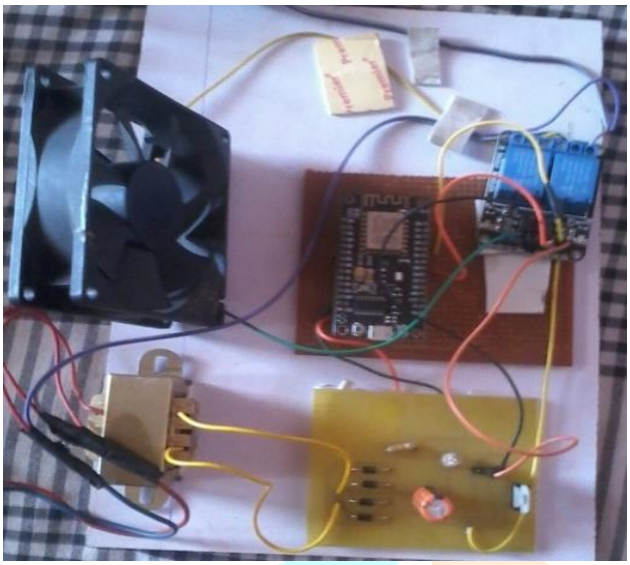

Fig.1.7Prototype of office automation

Fig.1.8 output with blynk app

The project aims at implementing the following:

(1) Smart Door Bell: When the bell is rung, a text message is sent to the owner of the house along with an email containing the picture of the visitor. The system ensures the user is informed about the entrant.

(2) Regulating Appliances: The appliances that fall under this category include fans and lights. The appliances mentioned above can be switched on and off by using the android application.

(3) Wireless Speakers : The system also can act as wireless speakers which can be put to use for multiple purposes .

Here We proposes office appliance automation by using Node MCU-32S microcontroller. A Wi-Fi modem ESP8266 inuilt on it is used for receiving commands over the internet. The Wi-Fi module receives user commands over the internet.. The microprocessor now processes this data and switches the loads through relays. Also it switches the fan, light, Doorbell as per users commands . It also controls the smart doorbell system, webcam system, speakers. When the bell is rung, a text message is sent to the owner of the house along with an email containing the picture of the visitor. The system ensures the user is informed about the entrant. then it displays the status of the system on mobile screen.

VI. ADVANTAGE

- Long distance control
- Can monitor appliances from Home.
- Appliance regulation mode.

CONCLUSION

The proposed system offers the owner or controller full authority to make decisions and manage home appliances using the Blynk application, thereby enhancing convenience and accessibility through portable devices like Android phones. It provides diverse methods for controlling devices within the home, contributing to a comfortable lifestyle that can be managed remotely.

As for future extensions to the project, integrating voice and video call functionality into the smart doorbell would significantly enhance its capabilities. This would enable real-time communication between the person at the door and the owner, even when they are away from home. By facilitating direct interaction and visual confirmation of visitors, this enhancement would further augment the safety and security features of the system.

Overall, these proposed enhancements not only offer additional convenience and control but also prioritize safety and security, making the smart home system more comprehensive and robust for users.

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