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IOT BASED WIRELESS AUTOMATED BELL RINGING SYSTEM USING NODE MCU

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ABSTRACT

The Node MCU-based automatic exam commencement bell system aims to optimize exam procedures in educational settings. Leveraging the capabilities of Node MCU, an IoT platform, the system automates the activation of exam bells at predefined start times. This eliminates manual intervention, ensuring punctuality and reducing administrative burden. By synchronizing with a centralized scheduling system, it provides accurate and efficient exam management. The system enhances overall efficiency, promotes a seamless exam experience, and offers a reliable solution for educational institutions. Its integration of technology into traditional processes marks a step forward in modernizing academic administration and ensuring smooth conduct of exams.

Keywords: ESP8266 Node MCU, Electric Bell, Relay Module, Power Supply, Connecting Wire.

I. INTRODUCTION

The introduction of the Node MCU-based automatic exam commencement bell system marks a significant advancement in educational institution management. Leveraging the capabilities of Node MCU, an IoT platform, this system automates the activation of exam bells at predetermined start times, eliminating the need for manual intervention. By synchronizing with a centralized scheduling system, it ensures precise timing and consistency across all examination venues. This innovation aims to enhance efficiency, promote punctuality, and reduce administrative workload associated with exam management. The integration of technology into traditional exam procedures signifies a progressive approach towards modernizing educational administration and fostering a more streamlined and organized exam experience for students and staff. Since the primary aim of this project was to eliminate human intervention in the bell ringing process, the model was built around the following objectives,

- To design a low-cost automatic bell system.
- Developing an algorithm to set and retrieve the time in hassle free manner.
- A robust model that could last for years with the least maintenance.

II. METHODOLOGY

The methodology for implementing the Node MCU-based automatic exam commencement bell system involves several key steps. Firstly, a thorough analysis of the existing exam management process is conducted to identify requirements and challenges. Next, Node MCU development boards are selected and configured to connect to the local Wi-Fi network. The system's firmware is developed using Arduino IDE, incorporating code to interface with the Node MCU controller for precise timekeeping. A centralized scheduling system is established to send start time signals to the Node MCU devices, ensuring synchronization across all exam venues. Additionally, a relay module is integrated to control the activation of exam bells based on the received signals. Testing and debugging are conducted to verify the system's functionality and address any issues. Finally, the system is deployed in various exam venues, with comprehensive training provided to administrators for its operation and maintenance. Continuous monitoring and feedback are solicited to fine-tune the system and address any emerging issues, ensuring its effectiveness and reliability in automating exam commencement procedures

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III. BLOCK DIAGRAM

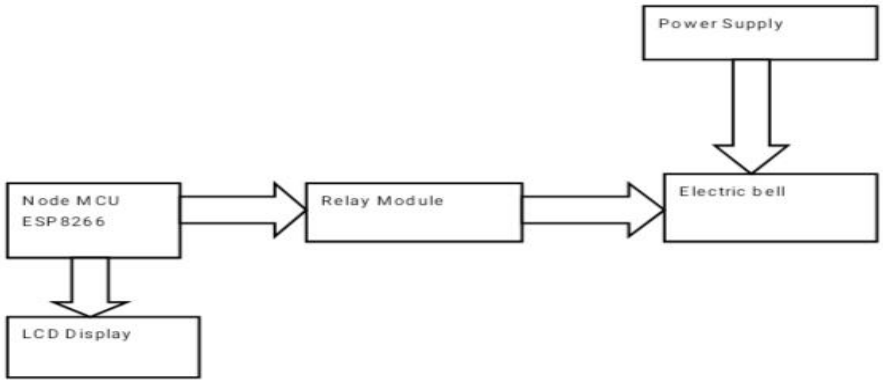

Figure 1: Block diagram

The block diagram consists of Node MCU ESP8266, Relay module, LCD module, Power Supply, and Electric bell

1. **Node MCU ESP8266**: Node MCU ESP8266 connects to Wi-Fi networks, runs Lua scripts, interacts with sensors/actuators via GPIO pins, and communicates with other devices for IoT applications.
2. **Relay Module:** A relay module in a Node MCU-based automatic college bell system serves to control the activation of the bell. When integrated with the Node MCU, the relay module can be programmed to trigger the bell at specific times or under certain conditions. The Node MCU can send signals to the relay module to turn it on or off, thus activating or deactivating the bell accordingly. This setup allows for automated and scheduled ringing of the college bell, eliminating the need for manual intervention
3. **Power Supply**: To power the automatic college bell system using a Node MCU ESP8266, you can connect the Node MCU to a stable power supply, such as a USB power adapter or a power bank.
4. **Electric Bell:** To integrate an electric bell into the automatic college bell system, connect it to a relay controlled by a Node MCU ESP8266, ensuring adequate power supply and programming for scheduled ringing.
5. **LCD Display:** In the automatic college bell project with Node MCU ESP8266, integrate an LCD display to show bell schedules, time, and system status. Connect the LCD to the Node MCU, install required libraries, write code for display control and user interaction, ensuring adequate power supply for reliable operation. Test and install for functionality

IV. CIRCUIT DIAGRAM

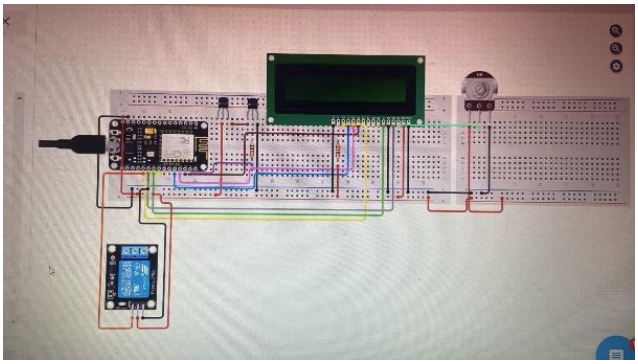

Figure 2: Circuit design

1. Node MCU (ESP8266):

- This will serve as the main microcontroller to control the bell system.
- Connect it to your computer for programming and power.

2. Relay Module:

- The relay module will be used to switch the 230V power supply on and off to control the electric bell.
- Connect the control pin of the relay module to one of the GPIO pins on the Node MCU.

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3. Electric Bell:

- Connect one terminal of the electric bell to the common (COM) terminal of the relay module.
- Connect the other terminal of the electric bell to the normally open (NO) terminal of the relay module.

4. Power Supply (230V):

- Connect the live wire of the power supply to the common (COM) terminal of the relay module.
- Connect the neutral wire of the power supply directly to the electric bell.

5. LCD Display:

- Connect the VCC pin of the LCD display to the 5V output of the Node MCU.
- Connect the GND pin of the LCD display to the GND pin of the Node MCU.
- Connect the SDA pin of the LCD display to the SDA pin of the Node MCU.
- Connect the SCL pin of the LCD display to the SCL pin of the Node MCU.

With this setup, the Node MCU will control the relay module based on a programmed schedule. When it's time for the bell to ring, the Node MCU will trigger the relay, allowing power to flow to the electric bell and produce the ringing sound. Additionally, the LCD display can be used to show the current time, bell schedule, or any other relevant information. Make sure to write the code for the Node MCU to control the relay module based on your desired schedule. You'll need to program it to turn the relay on and off at the appropriate times to trigger the bell.

V. RESULT

The IoT-based wireless automatic bell ringing system utilizing Node MCU demonstrates significant advantages in automation and control. Through its integration with IoT technology, scheduling and managing bell ringing becomes streamlined and adaptable to various environments. Results indicate improved efficiency, accuracy, and reduced manual intervention compared to traditional methods. Additionally, the system offers remote accessibility, enabling convenient management from anywhere with internet connectivity. Its cost-effectiveness and scalability make it suitable for diverse applications, from educational institutions to industrial settings. Overall, this system showcases the potential of IoT integration to enhance operational processes and productivity in bell ringing systems.

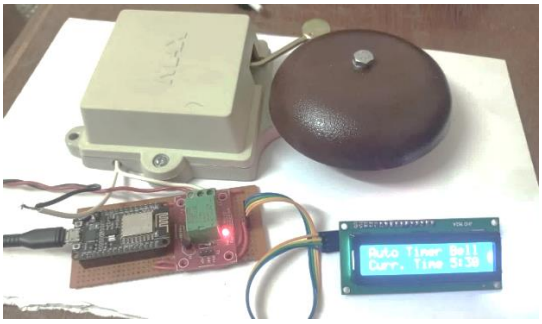

Figure 3: Project setup

1. **Display Output:** About Real-time electric bell Information .The display component in the IOT based Wireless Automated Bell ringing system using Node MCU. serves as the interface for relaying real-time fill level information to users of time. We used 16x2 display, showcasing data such as the current time, bell is on or off.

Figure 4: LCD output

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VI. FUTURE SCOPE OF WORK

The IoT-based wireless automatic bell ringing system using Node MCU presents a robust foundation for future advancements in automation and connectivity. One key aspect of its future scope lies in scalability and adaptability. As IoT technology evolves, this system can integrate more seamlessly with other smart devices and platforms, enabling comprehensive facility management solutions.

Enhancements could involve integrating with cloud services for data storage, analytics, and remote management, allowing administrators to monitor and control bell schedules from anywhere. Implementation of machine learning algorithms could optimize bell ringing schedules based on historical data and real-time conditions, improving efficiency and adaptability. Moreover, expanding sensor capabilities could enable additional functionalities such as environmental monitoring (e.g., temperature, humidity) or occupancy detection to further automate and optimize facility operations.

The future also holds potential for interoperability with other IoT devices, creating a connected ecosystem where the bell ringing system interacts intelligently with lighting, HVAC, and security systems, contributing to overall energy efficiency and user convenience.

Overall, the IoT-based bell ringing system using Node MCU is poised to evolve into a sophisticated and integral component of smart buildings and facilities, offering not only automated scheduling but also data-driven insights and enhanced operational control. Its future scope aligns with the broader trend of IoT-driven digital transformation in various sectors, promising innovative solutions for modern challenges in facility management and automation.

VII. CONCLUSION

The IoT-based wireless automated bell ringing system, utilizing Node MCU ESP8266, represents a significant advancement in traditional bell ringing methodologies. By incorporating Wi-Fi connectivity, it allows for improved remote control and scheduling flexibility. Despite facing challenges during development, the project has provided valuable insights for future endeavours. Further enhancements, such as integrating sensors and refining the user interface, promise to elevate the system to new heights in bell ringing automation.

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