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IOT Based College Bell Using NodeMCU

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Abstract:- The application of conventional methods for bell-ringing in schools and colleges remains prevalent in modern times. However, this document presents a proposal for a more effective and automated solution in the form of an IoT-based automatic college bell system. The system employs NodeMCU as the primary controller, coupled with a set of sensors to identify the current time and trigger the bells to ring automatically. This negates the possibility of inaccuracies and delays associated with manual bell ringing. The IoT technology embedded in the system ensures high reliability and customization, permitting users to program the ringing times and frequencies to suit their unique needs. The RTC module ensures precise time tracking, and the NodeMCU controller dispatches signals to the relay module to initiate the bell ringing process. By automating the bell-ringing procedure, educational institutions can enjoy a more efficient and flexible solution for their bell ringing requirements.

Keywords **:** IoT,NodeMCU,RTC,IDE,Relay,Bell.

1. INTRODUCTION

An automatic college bell system can efficiently and effectively manage activities across a college campus. The NodeMCU platform has become a popular choice for developing such systems due to its flexibility and affordability. Being open-source, NodeMCU has a broad range of capabilities and features that make it an ideal platform for building custom automated college bell systems. This paper outlines the advantages and challenges of using NodeMCU and the key considerations for selecting a suitable bell system. One significant benefit of NodeMCU is its ability to integrate seamlessly with WiFi, enabling wireless connectivity to the bell system. This eliminates the need for manual bells and disruptive noises and allows multiple devices to access the same bell system, promoting coordination between different college departments. NodeMCU's scalability and user-friendly interface make it perfect for creating customized automated college bell systems that meet various needs. The system includes NodeMCU, relay, and an electric bell, which operate based on an internet connection. It continuously sends signals to the database to check for inputs at fixed time intervals. When the interval matches the database, the system provides a high input to the electric bell, triggering it to ring automatically.

Unlike manual bell ringing, this system provides accurate outputs without human interference, significantly reducing the chances of errors. The system includes a dot matrix display that can be used to troubleshoot errors and display notifications or other event-related information. Users can log in using their admin ID to the website and enter any information they wish to display on the dot matrix display. The system is also connected with Google Calendar, enabling it to fetch information about festivals and other events automatically. The NodeMCU platform is a secure cloud-based environment that supports several external devices, such as motion sensors, LED lights, and audio systems, enabling users to integrate their projects seamlessly into their existing systems. In summary, the NodeMCU platform offers a versatile, efficient, and customizable solution for creating automated college bell systems. Its ability to integrate with WiFi and external devices makes it a reliable choice for educational institutions seeking an automated and efficient solution to their bell ringing needs. An IoT-based automatic college bell system can be a valuable investment for educational institutions as it saves time, reduces human error, and streamlines operations. The system can be customized according to the specific needs of the institution, such as adjusting the bell ringing intervals and frequencies to suit their schedules. Additionally, the system can be integrated with other devices, such as a public address system, to

broadcast announcements or reminders to the students and staff.

Apart from being useful for educational institutions, an automatic college bell system can also benefit the environment by reducing electricity consumption and noise pollution. Using IoT technology, the system can be designed to conserve energy and reduce waste. One of the major advantages of an automatic college bell system is its ease of use, requiring minimal training for users. The system can also be remotely monitored and controlled, which can be helpful in case of emergencies or unexpected situations. The system can also be programmed to send alerts to concerned authorities in case of any malfunctions or errors. Overall, an IoT-based automatic college bell system can provide numerous benefits for educational institutions, including increased efficiency, reduced errors, and improved sustainability, making it a cost-effective and reliable solution for regulating activities throughout the college campus.An automatic college bell system can also help promote punctuality and discipline among students and staff. By ringing the bells at precise intervals, the system can ensure that classes start and end on time, helping students develop good time management skills. This can lead to better academic performance and improved learning outcomes. Similarly, the system can help instill a sense of discipline among staff members, encouraging them to adhere to their schedules and complete their tasks on time.

In addition, an automatic college bell system can be beneficial for security purposes. The system can be programmed to trigger alarms or emergency alerts in case of any security breaches or safety hazards. This can help ensure the safety and well-being of students, staff, and visitors on the college campus.

Another advantage of an automated bell system is that it can provide real-time data and analytics about the usage patterns and performance of the system. This information can be used to optimize the system's performance, identify areas for improvement, and make data-driven decisions about future upgrades or modifications. It can also help identify any issues or errors in the system, allowing for prompt troubleshooting and resolution.

Overall, an automatic college bell system can provide numerous benefits for educational institutions, including increased efficiency, improved punctuality and discipline, enhanced security, and real-time data and analytics. As technology continues to evolve, these systems are likely to become even more sophisticated and customizable, offering even greater benefits to educational institutions.

2. Related Work :-

Numerous research studies have investigated the development of automatic electric bells using current technology. Nalini et al. proposed an "Automated Bell Ringing System using wireless technology," which consisted of a microcontroller, a wireless module, and a relay. However, this project had limitations, including the inability to operate the system from anywhere and the absence of different modes.

Another study by Khedekar Kavita dilip and Ms. Rinku Chavan developed an "Arduino Controller Automatic College Bell System" that utilized an Arduino microcontroller, a relay, and a power supply. While this project provided a convenient and efficient solution to traditional bell ringing systems, users needed to be in a specific position to operate the system.

Sameer Deshpande and Anamika Majumdar proposed a "Smart Bell Notification System Using IoT" that utilized IoT technology to overcome some of these limitations. The system utilized a microcontroller, a relay, and a wireless module that communicated with a server. However, the system did not allow users to customize it.

Prof. S.B. Sahu et al. proposed an "IoT & AI Based Smart Doorbell System" that utilized IoT and AI technology to overcome the limitations of traditional doorbell systems. This system utilized a microcontroller, a relay, a wireless module, and a camera. The authors designed and implemented a smart doorbell system that utilized IoT and AI technology, providing a convenient and efficient solution to traditional doorbell systems.

Syed Naveed Uddin and Mohd Omer Nawaz proposed an "Automatic Electric Bell with User-controlled time schedule" that overcame the limitations of other projects. The authors designed and implemented the system, including a user-friendly interface for remote management of the ringing schedule. However, the system still required users to be within the campus range to use it.

Abyash Gautam et al. proposed a "Microcontroller Controlled Automated College Bell" that included a user-friendly interface for remote management of the ringing

schedule. However, this system depended on a direct supply, making it unusable during power outages.

Sheenu Choudhary, Shrikant, and Priyanka Sharma proposed an "Automatic College Bell System" that overcame the limitations of other projects. This system featured a user-friendly interface for remote management of the ringing schedule, increased efficiency, convenience, and reduced maintenance costs. However, the system could not be modified once implemented.

M.K. Hossain and M.A. Islam proposed an automated bell system using a 8051 microcontroller to improve the limitations of traditional manual systems. The system utilized a real-time clock (RTC) module and a relay module to trigger the bell ringing mechanism. The authors conducted several experiments to test the system's functionality, accuracy, and reliability. The proposed system was found to be efficient, reliable, and cost-effective. However, the authors suggested that the system could be further improved by adding more advanced features, such as wireless connectivity and remote monitoring.

Owoyele and Oyewole (2015) proposed an automatic school bell system using a PLC, which was found to be significantly more efficient and reliable than manual systems. The system comprised a PLC, an RTC module, and a set of relays and sirens. The authors suggest that this system is a cost-effective and reliable solution for schools seeking an automated bell ringing system.

Lastly, Rajesh Kannan Megalingam and Venkat Krishnan Balasubramanian proposed a "Power Aware Automatic Microcontroller-Based Smart College Electric Bell System with Time Display" that utilized microcontroller technology and was designed to be power efficient. The system comprised a microcontroller, a relay, and a time display that communicated with a server.

In conclusion, after analyzing these research studies, it is evident that each project has unique strengths and limitations in the development of an automatic electric bell system. However, there is still room for improvement and customization to create a more innovative and efficient solution. Our project aims to address these limitations and offer a unique and effective approach to the automatic electric bell system.

Problem statement :-

Automated bell-ringing systems have become increasingly popular in schools and colleges due to their ability to overcome the limitations of traditional manual bell-ringing systems, which are often prone to errors and delays that can disrupt academic activities. To address this issue, this paper proposes an IoT-based automatic college bell system that utilizes NodeMCU and sensors to detect the current time and trigger the bells to ring, providing educational institutions with a flexible and efficient solution for their bell-ringing needs. However, it is important to investigate and evaluate the feasibility, effectiveness, usability, and user satisfaction of this system in real-world scenarios to determine its potential benefits and limitations.

3. Our contribution :-

The proposed automatic college bell system is an innovative solution that utilizes IoT technology to overcome the limitations of traditional manual bell-ringing systems. By accurately detecting the current time and triggering the bells to ring at programmed intervals, the system provides a more efficient and customizable alternative that can significantly improve daily schedules and academic activities in schools and colleges. The primary controller, NodeMCU, and sensors eliminate the potential for errors and delays associated with manual bell ringing, and the system's reliability and flexibility make it a promising solution for educational institutions seeking a more efficient and reliable bell ringing solution.

This paper's contribution is to provide a detailed description and evaluation of the IoT-based automatic college bell system's feasibility, effectiveness, and usability. The system's potential benefits and limitations are discussed, and its ability to improve the bell-ringing process in educational institutions is demonstrated. The proposed system's adaptability to different schedules and frequencies makes it a valuable addition to schools and colleges seeking to optimize their daily activities. Overall, the paper highlights the potential of the IoT-based automatic college bell system to revolutionize the way bells are rung in educational institutions.

4. Block Diagram :-

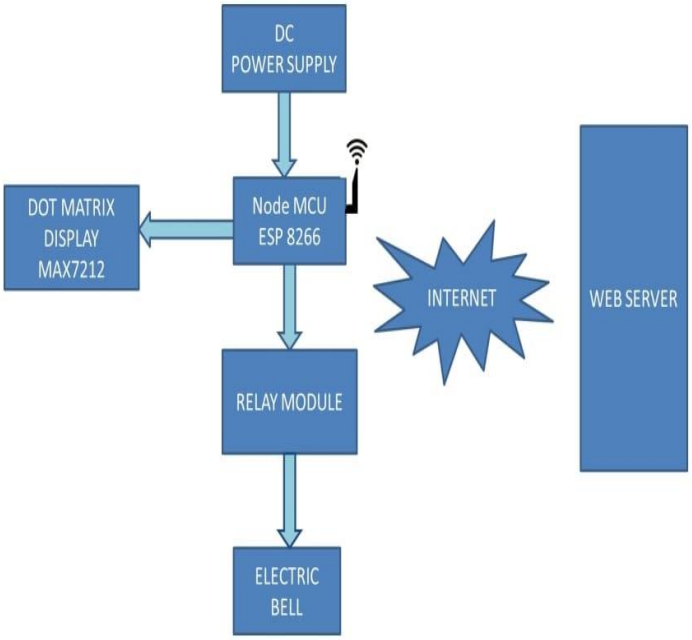


Fig:- Block Diagram of System.

5. Working :-

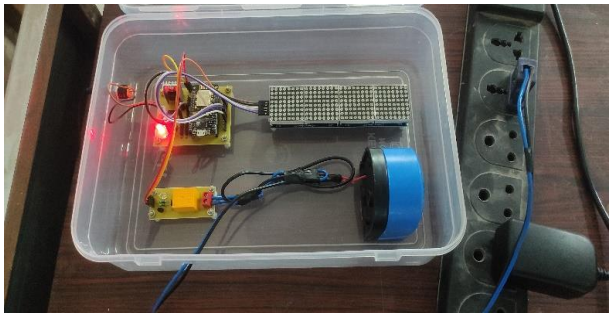
1. NodeMCU: The NodeMCU is the microcontroller that runs the bell system. It is responsible for fetching the current time from the NTP server, triggering the buzzer, and updating the matrix display.
2. Matrix Display: The matrix display shows the current time and other relevant information. It can be controlled by the NodeMCU using the MAX7219 driver chip.
3. Buzzer: The buzzer produces a sound when triggered by the NodeMCU. The NodeMCU sends a signal to the buzzer at the desired times to play the bell sound.
4. Network Time Protocol (NTP) Server: The NTP server provides the current time to the NodeMCU, which is used to trigger the bell at the correct times.
5. Server: The server is a computer that runs the website used to control the bell system. The server stores the bell timings and communicates with the NodeMCU to update the timings as needed.
6. Website: The website is used to control the bell system. Administrators can log in to the website and set the bell timings, which are then stored on the server.The NodeMCU retrieves the bell timings from the server and uses them to trigger the bell.

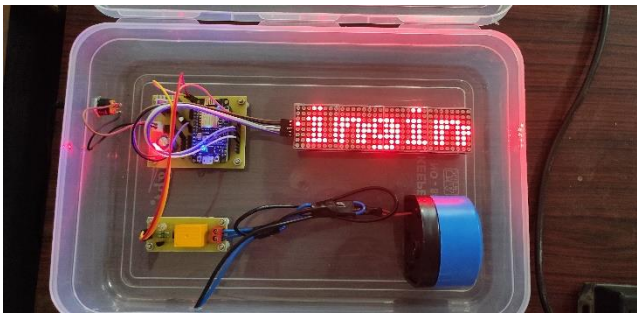
Here is a summary of how the components work together:

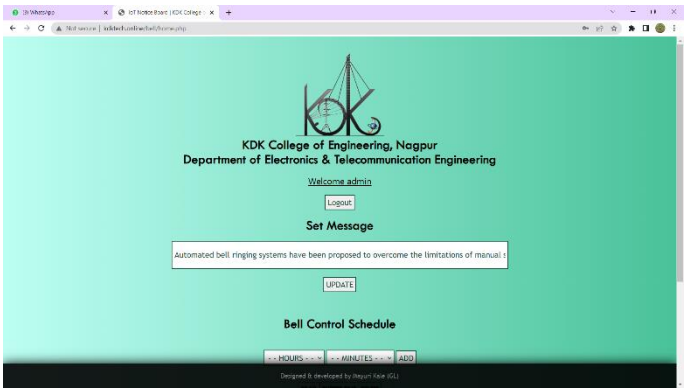
1. The NodeMCU connects to the internet and fetches the current time from the NTP server.The NodeMCU checks the current time against the bell timings stored on the server.
2. If the current time matches a bell timing, the NodeMCU triggers the buzzer to play the bell sound and updates the matrix display with the current time.
3. Administrators can log in to the website and update the bell timings, which are stored on the server.
4. The NodeMCU retrieves the updated timings and uses them to trigger the bell.The server communicates with the NodeMCU and website to ensure that the bell timings are up to date and that the system is functioning properly.

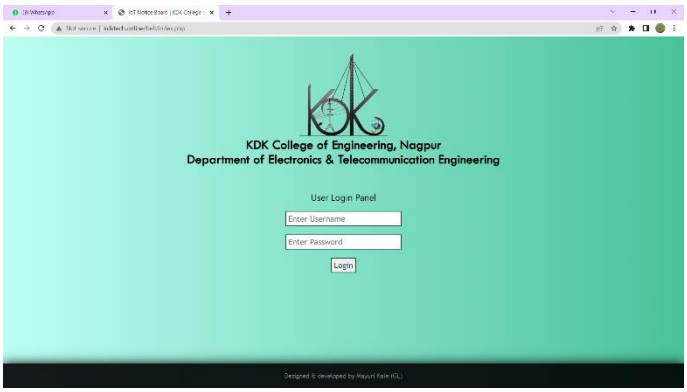
This is the basic working of the automatic college bell system with a matrix display, server, and website for controlling the system. The exact implementation may vary based on the specific requirements and the code used to control the components.

6. Final Output :-









7. CONCLUSION

An IoT-based automatic college bell system has the potential to simplify the process of scheduling and ringing bells in colleges. The system can be programmed to ring bells at predetermined times throughout the day, eliminating the need for manual intervention. The use of sensors allows the system to be aware of the current time and other environmental factors, such as temperature and humidity, ensuring that the bell rings at the appropriate time. The Wi-Fi module allows the system to be remotely controlled and monitored, providing administrators with real-time updates on the status of the system. Overall, an IoT-based automatic college bell system is an effective way to streamline bell ringing operations in colleges, freeing up valuable time for administrators to focus on other tasks.

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