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SMART ELECTRONIC NOTICING SYSTEM USING RASPBERRY PI

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Abstract:

In today's fast-paced environment, timely dissemination of information and alerts plays a vital role in enhancing communication efficiency and safety. This project proposes a Smart Electronic Noticing System based on Raspberry Pi, which integrates voice alerts to deliver important notices effectively. The system collects input from an authorized source and processes it through the Raspberry Pi, which acts as the central controller. Information is then transmitted in format as audio output via a speaker for immediate attention. This mode of communication ensures that notices reach the intended audience promptly. The system can be deployed in schools, offices, public institutions, and industrial environments to replace conventional notice boards and manual announcements. By automating the notice delivery process, the proposed system reduces delays, eliminates dependency on human intermediaries, and ensures reliable communication. The combination of IoT technology, real-time processing makes this solution highly efficient, user-friendly, and scalable for various applications.

Keywords: Raspberry Pi, Voice alerts,Timely dissemination.

INTRODUCTION

In the modern era of digital communication, the need for smart and automated systems has become essential in every sector, including education, industry, and public service. Traditional notice boards require manual updates and constant human intervention, which can be time-consuming and inefficient. As technology continues to advance, there is a growing shift toward automation and smart display systems that deliver information quickly and effectively. The Smart Electronic Noticing System using Raspberry Pi is one such innovation that aims to transform conventional notice boards into intelligent, automated, and voice-assisted systems.

This project is designed to automatically announce important information whenever a person approaches the notice board. The system uses a Passive Infrared (PIR) sensor to detect motion, and once motion is sensed, the Raspberry Pi activates and plays the pre-recorded notice through a speaker. The audio files are stored in an SD card, which acts as the memory unit of the system. This feature not only automates the notice process but also ensures that information reaches everyone, including those with visual impairments.

The Raspberry Pi functions as the heart of the system, processing input signals from the PIR sensor and managing audio output. Its compact size, low cost, and easy programmability make it ideal for real-time embedded applications. The regulated power supply ensures smooth and reliable operation of all components, while the use of open-source software allows easy customization for future improvements, such as adding new languages or remote control options. This combination of hardware and software delivers a practical, energy-efficient, and user-friendly system.

LITERATURE SURVEY

1.IoT Based LED Scrolling Display:

Nilam Pradhan (2020) proposed an IoT-enabled LED scrolling display system using Wi-Fi communication technology. The system integrates an Android application capable of converting speech into text, allowing users to send messages directly to the display board. On the receiver side, an 8051 microcontroller coupled with a Wi-Fi module controls the LED matrix. The study highlights an efficient method for real-time message updates and demonstrates the feasibility of combining speech-to-text features with IoT-based displays for enhanced user convenience.

2. IoT Based Smart Notice Board:

Sravanakumar (2020) introduced a smart notice board system built around an Arduino Uno and ESP8266 Wi-Fi module. The system enables users to remotely update messages via a server-connected web interface. By utilizing an LED matrix display, the solution minimizes manual effort and time in updating notices. The author emphasizes improved data transfer efficiency and the potential for remote management in academic or office environments.

3. IoT Based Notice Board Using Arduino ATmega328 :

Pawar (2019) developed a simple and low-cost wireless notice board using GSM technology and an Arduino ATmega328 controller. The system remotely receives textual messages through SMS, which are then displayed on LED boards. The design offers flexibility and instant dissemination of information, making it suitable for institutions requiring frequent message updates without dependence on internet connectivity.

4. IoT Based Message Scrolling LED Display :

Surendiran (2020) presented an IoT-enabled wireless scrolling LED display intended for notification and public information systems. The system was implemented using an Arduino Uno (ATmega328) integrated with both GSM and Wi-Fi modules. The dual-communication approach enhances reliability by ensuring that messages can be transmitted either via GSM or internet-based services. The work demonstrates an effective model for remote notice dissemination using hybrid IoT communication technologies.

5. Digital Notice Board :

Prakash (2017) explored an advanced digital notice board system powered by Raspberry Pi and an Android application. The system incorporates FIFO (First-In-First-Out) and priority-based scheduling algorithms to manage and display messages effectively. This research focuses on optimizing display order and improving task scheduling, making the notice board more intelligent and adaptable to varying message priorities.

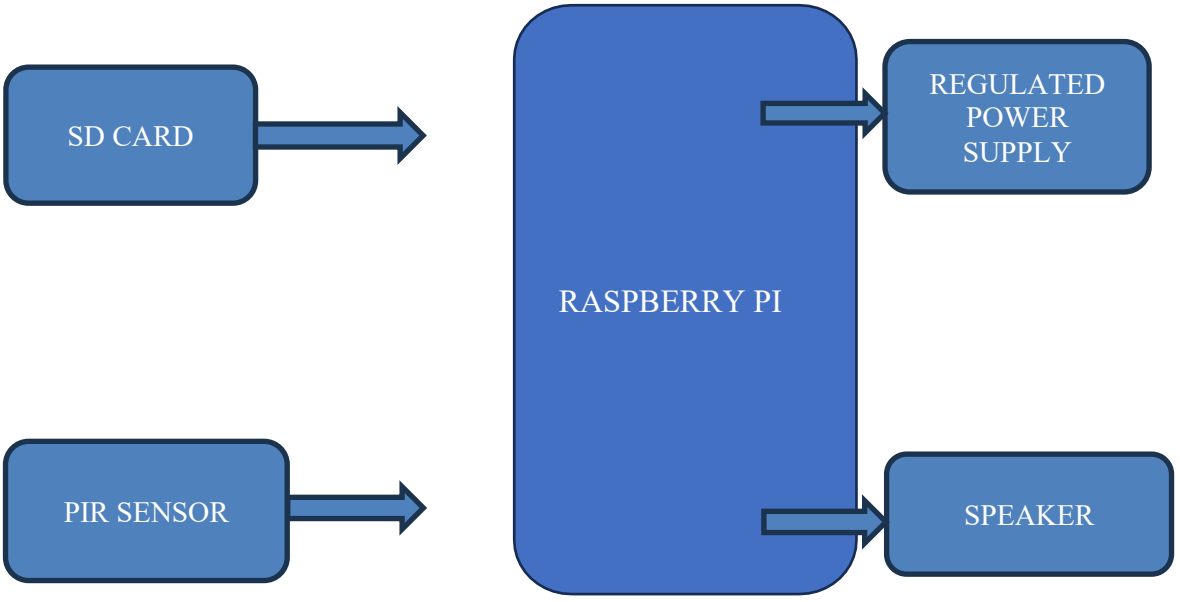
6. Wireless Electronics Notice Board :

Mawalkar (2022) designed a cost-effective wireless electronic notice board leveraging the NodeMCU Wi-Fi module. Notice messages are transmitted to the NodeMCU and then sent serially to an Arduino for display. The system aims to simplify the process of publishing notices and reduce reliance on traditional paper-based boards. The study highlights improved speed, simplicity, and user convenience through wireless communication.

PROPOSED SYSTEM

The Smart Electronic Noticing System is based on motion detection and audio output using Raspberry Pi. The system continuously monitors its surroundings using a PIR (Passive Infrared) sensor. This sensor detects infrared radiation emitted by the human body. Whenever a person enters the detection range, the PIR sensor senses the movement and generates a signal. This signal is sent to the Raspberry Pi, which acts as the central processing unit of the system. Upon receiving the signal, the Raspberry Pi executes the programmed instructions. It retrieves the corresponding notice or message stored in the SD card. These messages may either be pre-recorded audio files or text converted into speech using text-to-speech (TTS) technology. After processing the data, the Raspberry Pi sends an audio signal to the speaker. The speaker then converts this signal into sound and plays the announcement clearly. This process is automatic and requires no manual intervention. The system can also be programmed to handle multiple notices, play them sequentially, or repeat them at regular intervals. Thus, the system ensures efficient communication by automatically detecting human presence and delivering relevant audio announcements in real time.

BLOCK DIAGRAM



HARDWARE COMPONENTS

1. RASPBERRY PI :

The Raspberry Pi is a credit-card-sized single-board computer developed by the Raspberry Pi Foundation, a UK-based charity established in 2009. Its main goal was to promote the teaching of basic computer science and programming in schools and developing countries. However, due to its low cost, compact size, and high flexibility, it quickly gained popularity among hobbyists, researchers, engineers, and innovators around the world. Raspberry Pi works on the principle of a single-board computer where all essential components-processor, memory, input/output ports, and networking are integrated on one compact board. When power is supplied, the bootloader in the ROM activates and loads the operating system from the microSD card.

Fig: RASPBERRY PI

2. PIR SENSOR:

All objects emit infrared radiation based on their temperature. Human body emits IR in the wavelength range of 8–14 µm. PIR has two slots of pyroelectric material that generate electrical signals when IR changes.When a person moves across the sensor, one slot receives more IR than the other, creating a differential voltage. This change is amplified and processed to produce an output signal indicating motion detection. If there is no movement, the IR received by the two slots remains equal output.Works on the principle of detecting changes in IR energy rather than measuring absolute temperature.A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications.

Fig: PIR SENSOR

3. SPEAKER :

Works on the electromechanical energy conversion principle.Based on Faraday's Law of Electromagnetic Induction.Audio signal (AC current) passes through the voice coil.The coil is placed in a magnetic field created by a permanent magnet. Interaction between magnetic field and current produces a force (Lorentz force).This force causes the coil (attached to diaphragm/cone) to vibrate back and forth. Diaphragm vibrations create pressure waves (sound waves) in air. Frequency of input signal determines pitch; amplitude determines loudness. A speaker is a device that converts electrical signals into sound waves. It is an essential component of audio systems, such as stereo systems, home theaters, and public address systems. Speakers come in various shapes and sizes, ranging from small portable speakers to large floor-standing models. They play a crucial role in delivering high-quality audio for music, movies, and other forms of entertainment.

Fig: SPEAKER

4. SD CARD :

SD card works on the principle of flash memory (non-volatile storage). Stores data using floating-gate transistors that hold electric charges even without power.Data is written/erased by electron tunneling through the insulating layer of the memory cell. Uses standard SPI or SD bus interface for communication with microcontrollers. Read/write operations occur in blocks, not individual bytes.Ensures fast data transfer through serial communication (high-speed clock).Retains data even when power is removed → non-volatile memory. The SD card is a proprietary, non-volatile, flash memory card format developed by the SD Association (SDA). They come in three physical forms: the full-size SD, the smaller miniSD (now obsolete), and the smallest.

Fig: SD CARD

5. REGULATED POWER SUPPLY:

A regulated power supply transforms unregulated AC into a stable DC . It guarantees consistent output despite variations in input.A regulated DC power supply is also known as a linear power supply, it is an embedded circuit and consists of various blocks.A will step down the voltage from the ac mains to the required voltage level. The turn's ratio of the transformer is so adjusted such as to obtain the required voltage value. The output of the transformer is given as an input to the rectifier circuit. Rectifier is an electronic circuit consisting of diodes which carries out the rectification process. Converts AC mains voltage into a stable and constant DC output.AC is first stepped down using a transformer. Output is then converted to pulsating DC using a rectifier (diode bridge).

Fig :REGULATED POWER SUPPLY

WORKING PRINCIPLE:

The smart electronic notice system operates based on motion detection and automated message delivery using a Raspberry Pi as the central processing unit. The system primarily relies on a Passive Infrared (PIR) sensor to detect the presence of a human being. A PIR sensor works by sensing changes in infrared radiation emitted by objects such as the human body. When a person enters the detection range, the sensor detects the variation in heat energy and generates a digital output signal.This output signal is sent to the Raspberry Pi through its GPIO pins. The Raspberry Pi continuously monitors the input from the PIR sensor, and when motion is detected, it processes the signal and executes a predefined program. As the core controller, the Raspberry Pi manages all system operations and decides which message or notice should be delivered based on the trigger received.

After processing the signal, the Raspberry Pi retrieves the corresponding notice from the SD card. These notices may be stored either as pre-recorded audio files or as text data. If the message is in text form, it is converted into speech using text-to-speech (TTS) technology. This enables the system to dynamically generate audio announcements without requiring manual recording for every message.

Once the message is ready, the Raspberry Pi sends the audio signal to the speaker. The speaker converts the electrical signal into sound and plays the announcement clearly. This ensures that the information is delivered effectively to anyone present within the system's range.

The entire process is automatic and does not require human intervention. The system can be programmed to handle multiple notices, play them sequentially, or repeat them at specific intervals. Overall, the system follows a simple and efficient flow of detection, processing, and output, enabling real-time communication in environments such as colleges, offices, hospitals, and other public places.

RESULTS

This system is designed to announce notices only through audio, without using any screen. It is useful in places where visual display is not required. It enhances communication in public places and reduces dependency on manual methods. The system demonstrated reliable motion detection with minimal delay in triggering announcements. It successfully delivered clear and audible messages using both pre-recorded audio and text-to-speech conversion. The automation reduced the need for human involvement, making it efficient for continuous operation. It also proved to be cost-effective and easy to deploy in various environments. Overall, the system enhanced real-time communication and ensured timely dissemination of important notices.

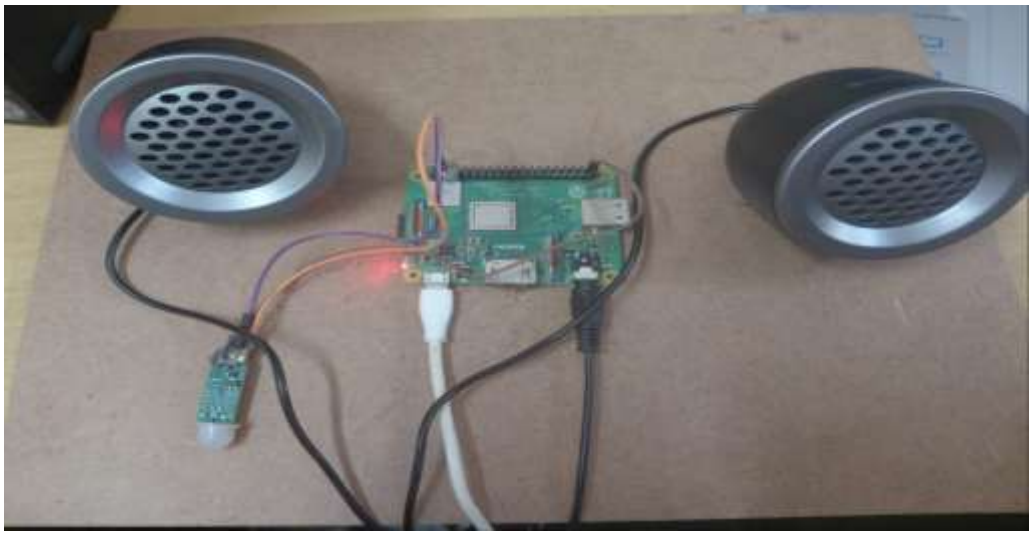


Fig: Smart Electronic Noticing System Using Raspberry Pi

CONCLUSION

The smart electronic noticing system based on Raspberry Pi successfully integrates both text and voice alerts to deliver important notices effectively. By combining digital display with audio announcements, the system ensures that information reaches a wider audience, including those who may miss or overlook visual notices. The use of Raspberry Pi makes the solution cost-effective, flexible, and easily scalable for institutions such as schools, offices, and public places. Overall, this system enhances communication efficiency, reduces dependency on traditional manual methods, and demonstrates how embedded systems can be applied to solve real-world notification challenges.

FUTURE SCOPE

The future scope of the Smart Electronic Noticing System using Raspberry Pi is highly significant as it can be further enhanced to provide faster, smarter, and more interactive communication. In the future, the system can be integrated with mobile applications to send real-time audio notifications directly to users' smartphones, ensuring wider reach beyond a single location. Cloud connectivity can be added to store and manage notices remotely, enabling centralized control and easy updates from anywhere. The speaker module can be improved with advanced text-to-speech technology to deliver clear, natural, and multilingual voice announcements, making it more accessible to diverse users. Additionally, the system can be expanded into an IoT-based smart communication network by connecting multiple devices across campuses, offices, or public areas for synchronized announcements. Security features such as user authentication and encrypted data transmission can be implemented to prevent unauthorized access. Future upgrades may also include AI-based scheduling and

priority alerts, where important messages are automatically broadcast based on urgency. Integration with digital displays can provide both audio and visual communication, enhancing effectiveness. Overall, these advancements can transform the system into a fully automated, intelligent, and scalable public announcement system suitable for smart environments.

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