Remotely Controlled Smart Noticeboard

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***Abstract*—In the modern era of digital communication, traditional notice boards are becoming inefficient due to their manual operation and limited accessibility. This project presents the design and implementation of a remotely controlled smart notice board using a Raspberry Pi Zero, HC-05 Bluetooth module, and a solar power system. The proposed system enables authorized users to wirelessly display and update notices in real time using a smartphone or computer via Bluetooth communication. The Raspberry Pi Zero acts as the central processing unit, receiving data from the HC-05 module and displaying the information on an electronic display unit. To ensure energy efficiency and uninterrupted operation, the system is powered by a solar panel with battery backup, making it suitable for remote and outdoor environments. This smart notice board reduces human effort, enhances information dissemination speed, and supports eco-friendly operation. The system is cost-effective, reliable, and applicable in educational institutions, offices, public places, and rural areas.**

***Index Terms*—Smart Noticeboard, LCD Display, Wireless Communication, Raspberry Pi Zero, Solar Power System, HC-05 Bluetooth Module, Embedded System.**

I. INTRODUCTION

The Remotely Controlled Smart Notice Board is a modern digital display system designed to show important messages on a monitor using wireless communication. In this project, the entire system is powered by a solar energy setup, making it both efficient and eco-friendly. A solar panel generates electricity, and a charge controller ensures that maximum power is extracted from the solar panel at all times. This power is then stored safely in a lead-acid battery, which supplies stable energy to the notice board even during low sunlight or nighttime.The main control of the system is handled by a Raspberry Pi Zero, which works like a mini- computer. It processes the received messages and displays them on the monitor. A Bluetooth module is connected to the Raspberry Pi Zero to enable wireless communication. Using a mobile phone, the user can send messages through Bluetooth, and the Raspberry Pi updates the notice board instantly.

The monitor serves as the digital display where all announcements, alerts, and information are shown. With this combination of renewable energy, wireless communication, and embedded technology, the project provides a smart, reliable, and energy-independent solution for modern communication needs. It is highly suitable for schools, colleges, offices, bus stations, and public places where information must be updated quickly and remotely.

II. LITERATURE SURVEY

The transition from traditional manually updated notice boards to automated digital systems has attracted significant research interest due to the need for real-time communication, reduced human intervention, and enhanced accessibility. Smart notice boards integrate embedded platforms, wireless communication modules, renewable energy sources, and multi-modal input methods to create systems that can be updated remotely and operate autonomously. This section reviews key research contributions in these areas, synthesize their findings and identifying relevant gaps. Bluetooth communication, particularly using low-cost serial modules such as the HC-05, has been widely adopted for short-range wireless control of embedded systems. Arun Karthik *et al.* implemented a Bluetooth-based notice board that allowed Android devices to send text messages to an HC-05 module connected to a micro controller, which then displayed the text on an LCD. This approach highlighted the potential of Bluetooth for remote data transmission without internet dependency; however, it supported only basic textual content, limiting flexibility. Yaswanth *et al.* extended Bluetooth-based notice boards to incorporate voice input by converting speech to text on the mobile application before transmitting the data to the embedded system via HC-05 . The study demonstrated improved accessibility and user convenience by integrating speech-to-text processing with Bluetooth communication, though the HC-05's limited communication range remained a constraint.Overall, Bluetooth communication provides a cost-effective and easy-to-implement solution for remote interaction, especially in offline settings

III. PROBLEM STATEMENT & OBJECTIVES

Managing conventional notice boards is a manual and labour-intensive process. It involves printing notices, physically reaching the notice board location, replacing old notices, and maintaining accessories such as pins and clips. This process consumes considerable time and human effort. The major problems associated with existing notice board systems include: Delays in updating important information, Dependence on physical presence for notice updates, Wastage of paper, ink, and printing resources and also increased manpower requirement for maintenance. Manual updating of notice boards can cause inconvenience to students, staff, and the public, especially when urgent information needs to be communicated. Therefore, there is a need for an automated and remotely controlled system that enables quick, efficient, and eco-friendly dissemination of information.

To overcome these challenges, this project aims to design a remotely controlled smart Noticeboard with the following objectives:

- Allow users to update the notice board remotely using a mobile app.
- Display messages, announcements, and notifications on the digital display.

IV. METHODOLOGY

1. The given block diagram represents the Remotely Controlled Smart Noticeboard. Here

- Raspberry Pi Zero: The Raspberry Pi Zero acts as the main processing and control unit of the system. It receives commands from the HC-05 Bluetooth module, processes them based on the programmed logic, and controls system operations accordingly.
- HC-05 Bluetooth Module: The HC-05 Bluetooth module provides wireless communication between the mobile application and the Raspberry Pi Zero. It receives text or voice-converted commands from the Android app and transmits the data serially to the Raspberry Pi.
- Solar Panel: The solar panel converts solar energy into electrical energy. It acts as the primary renewable power source for the system, making it suitable for outdoor and off-grid applications while reducing dependency on conventional power supplies.
- LCD Display: The LCD display provides a visual interface for displaying system outputs, status information, user commands, and graphical data processed by the Raspberry Pi.
- Text / Voice Control Mobile Application: The mobile application allows the user to interact with the system using text input or voice commands. Voice commands are converted into text by the app and sent via Bluetooth to the HC-05 module. This improves user convenience and enables hands-free operation.
- HDMI Cable: The HDMI cable is used to transmit audio and video signals from the Raspberry Pi Zero to the LCD display. It ensures high-quality visual output for system monitoring and user interaction.
- Power Supply Unit: The power supply unit integrates the solar panel, charge controller, and battery to deliver regulated power to the entire system. It ensures efficient energy management and reliable operation of all electronic components.

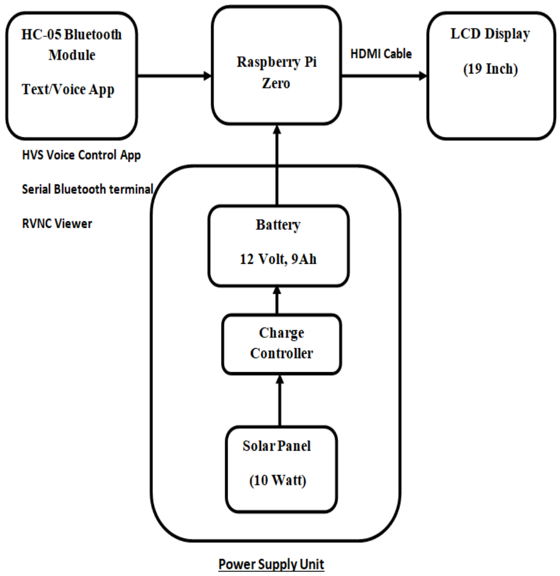

Fig.1 Block diagram of Remotely Controlled Smart Noticeboard

The methodology begins with user interaction through a mobile application. A Text/Voice-based Android application is used to send commands wirelessly via the HC-05 Bluetooth module. This Bluetooth module acts as the communication interface between the user and the Raspberry Pi Zero.

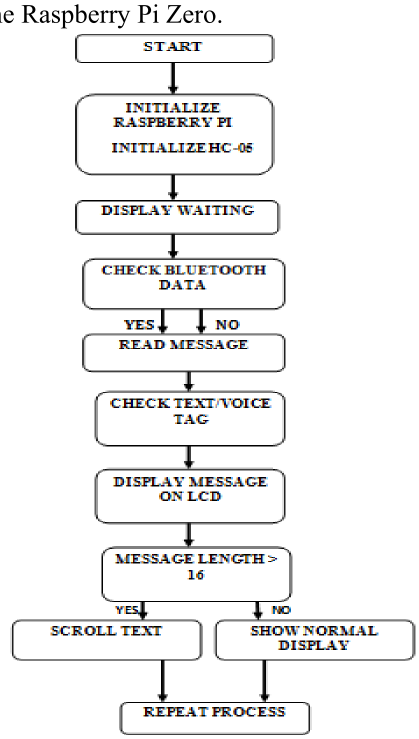

Fig 2. Flowchart of Remotely Controlled Smart Noticeboard

2. The Fig 2. explains the process of Remotely Controlled Smart Noticeboard.The flowchart explains the working of a Raspberry Pi–based smart display system using an HC-05 Bluetooth module. The process starts by initializing the Raspberry Pi and Bluetooth module, after which the LCD shows a waiting status. The system continuously checks for incoming Bluetooth data; if data is received, it is read and identified as text or voice. The message is then displayed on the LCD. If the message length exceeds 16 characters, the text is scrolled; otherwise, it is shown normally. Finally, the process repeats to continuously update new messages.

We can display in the Notices in the Notice board through three methods. Those are Voice Control method, Text method and Image displaying method. In that,

A. Voice Control method**:**with initializing the Raspberry Pi, Bluetooth module, and microphone interface. When a user gives a voice command through a paired Bluetooth device, the audio data is transmitted to the Raspberry Pi. The received voice input is then processed using a voice recognition module or software to convert speech into text. The system analyzes the recognized command and performs the corresponding action, such as displaying a message on the LCD or triggering a control function. This process runs continuously to allow real-time voice-based interaction with the system. We are using HVS app here.

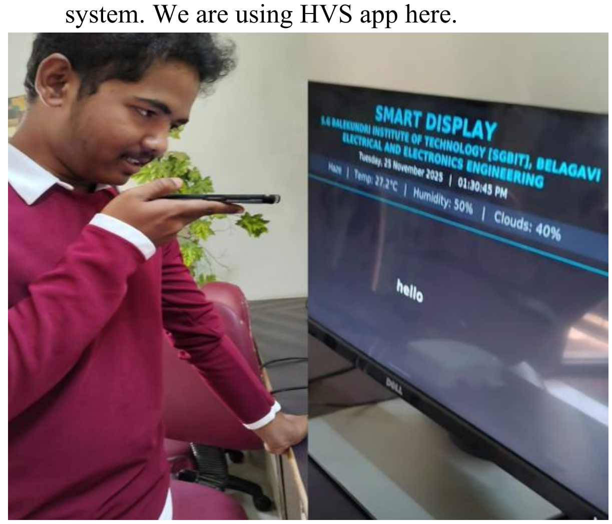

Fig 3. Displaying Notice through Voice Control Method

B. Text method: The text method begins by initializing the Raspberry Pi, Bluetooth module (HC-05), and LCD display. When a user sends a text message from a paired Bluetooth device, the system checks for incoming data and reads the received text. The Raspberry Pi then processes the message and displays it on the LCD screen. If the text length exceeds the display limit (for example, more than 16 characters), the message is scrolled; otherwise, it is shown normally. The system then returns to the waiting state to receive and display the next text message continuously. We are using Serial Bluetooth Terminal app here.

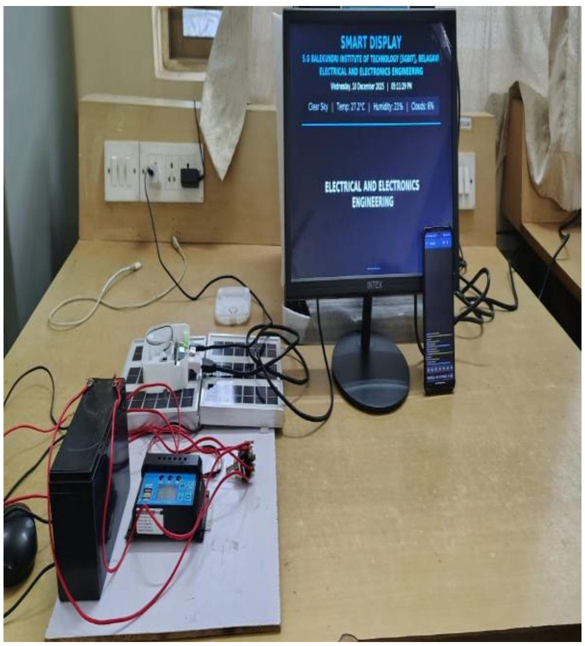

Fig.4 Displaying Notice through Text Method

C. Image display method:The image display method starts by initializing the Raspberry Pi, Bluetooth/Wi-Fi communication module, storage, and the LCD display. When an image is sent from a user's device, it is received by the Raspberry Pi and stored temporarily in memory or local storage. The system checks the image format and resolution, then processes it to match the LCD screen size. After processing, the image is rendered and displayed on the LCD. The system remains in a continuous loop, allowing new images to be received and updated on the display whenever required. We are using RVNC app here.

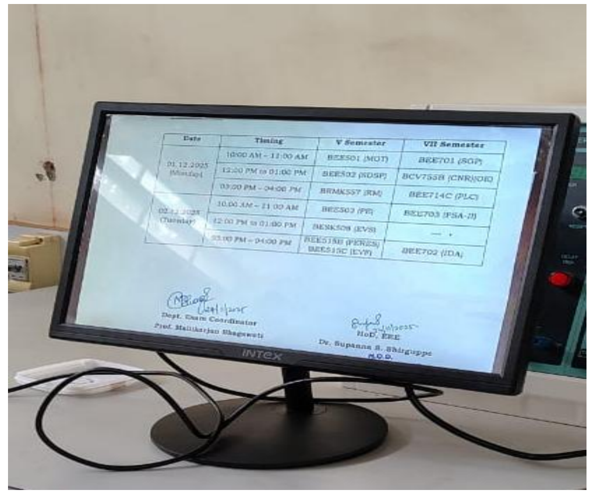

Fig.5. Displaying Image

V. PROPOSED ENHANCEMENTS

Beyond the basic implementation, several advanced features can be introduced for both online and offline exams. These include YOLOv5/YOLOv8 for more precise object detection, facial expression recognition, and multiple face or spoofing detection. A data science layer can assign cheating probability scores and provide dashboards for exam authorities. Ethical compliance features such as consent modules and bias auditing should also be integrated. Edge AI with TensorFlow Lite ensures functionality in low-bandwidth environments, while block-chain and encryption enhance data security. For online exams, behavioral biometric like keystroke dynamics, advanced gaze tracking, voice activity detection, and LMS integration can be implemented. Together, these enhancements provide a more robust, scalable, and ethical AI- based exam surveillance system. The proposed enhancements of the smart notice board project focus on improving functionality, accessibility, and efficiency. By integrating Wi-Fi and internet connectivity, notices can be updated from anywhere using cloud platforms or mobile applications. Adding multi-language support will make the system suitable for diverse users, while scheduled and priority-based notifications will ensure important messages are highlighted at the right time. Incorporating advanced voice recognition and touchscreen interaction can provide a more user-friendly interface.

VI. APPLICATIONS

Applications of this Remotely Controlled Noticeboard are,

i. Educational Institution
ii. Transportation Hubs
iii. Hospitals & Clinics
iv. Corporate Offices
v. Events & Conferences
vi. Community Centers & Libraries
vii. Smart Cities

VII. CONCLUSION

The remotely controlled smart notice board project successfully demonstrates an efficient, eco-friendly, and wireless solution for displaying information in real time. By integrating a Raspberry Pi Zero as the central processing unit, the system ensures reliable control, smooth data handling, and flexible content management. The HC-05 Bluetooth module enables easy and quick wireless communication, allowing authorized users to update notices remotely without the need for physical access to the notice board.Overall, the project offers a practical alternative to traditional notice boards by minimizing paper usage, reducing manual effort, and enabling instant updates. The smart notice board is scalable and can be further enhanced by adding internet connectivity, mobile applications, or cloud-based control in the future. Thus, this project proves to be a reliable, modern, and environmentally friendly communication system with wide real-world applications.

VIII. FUTURE SCOPE

- Cloud Integration
- Mobile App Enhancement
- Touch screen Display
- smart city and smart campus infrastructures
- Display of multimedia content

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