

Smart Notice Board System Using GSM and Embedded Computing

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Abstract

The "GSM-Integrated Remote Notice Board" project aims to create a state-of-the-art communication system that makes use of GSM technology to allow for remote announcements and alerts. Traditional notice boards usually have trouble updating information quickly or reaching a wider audience. The main objective of this project is to create a wireless e-notice board that displays messages sent from the user's mobile device. User messages are received by a SIM card inserted into a GSM modem at the receiving unit. The GSM modem interfaced with the microcontroller's shift register integrated circuit. After receiving the message, the microcontroller sends it to an electronic notice board with a microcontroller-interfaced display unit. One of the primary benefits of the proposed system is its potential to operate in areas with GSM coverage, ensuring connectivity even in remote or challenging-to-reach locations. Administrators can easily modify and manage the displayed data by sending brief text messages thanks to the system's user-friendly architecture. The initiative also aims to lower power consumption and optimize the system for reliability. Public transportation, community centers, educational institutions, and businesses are just a few of the places where the remote notice board system might be useful.

Keywords : GSM, Remote Announcement, e- Notice board, Microcontroller, User friendly, Power consumption, Reliability

INTRODUCTION

The present work presents an integrated prototype wireless remote monitoring and control system to replace manual control and supervision in a plant. The system uses cellular telephony technologies like GSM-Short Message Service (SMS) to assist in controlling and monitoring a process plant [1]. The objective is to equip plant decision-makers with all possible plant information quickly and eliminate the need for wires. The system enables technical and maintenance personnel to supervise and control machinery and processes from a single mobile phone [2]. The operational range of the plant is expected to improve significantly with these new emerging data transfer techniques [3].

The main idea is to monitor and control any parameters in industries using GSM technology. The proposed system was tested for its effectiveness in remote monitoring and control of temperature, pressure, humidity,

and level parameters [4]. This can be customized to suit any other industrial requirement related to monitoring and controlling, provided industrial sensors are in use [5].

Industrial automation has become increasingly important due to the rapid development of information technologies. Combining emerging information technologies with traditional condition monitoring systems allows for continuous running status monitoring for essential equipment, comprehensive data processing, and centralized resource management, significantly enhancing the working efficiency of system operators and decision-makers [6].

Industrial automation heavily relies on Information Technology (IT) in areas such as simulation, design, analysis, optimization, real-time computing, communication and networking, control and signal processing, and database [7]. As automation systems become more sophisticated and integrate manufacturing with other business areas, the use of IT increases. However, lower-level automation systems make less use of IT and more rely on hardware, electronics, and embedded computing. Most industrial information systems must be real-time, producing accurate results in time [8]. Remote monitoring and control are a rapidly developing area of engineering and technology, becoming a strategic tool for managing distributed assets and equipment. Remote applications range from technical support to remote control of vehicles and military bomb disposal units. Challenges include high security, wireless networks, and shared use of equipment both locally and remotely [9].

The paper proposes an SMS-driven automatic display board that replaces traditional wooden notice boards in schools [10]. The system uses wireless GSM interfaced microcontrollers to transmit text data to electronic notice boards, displaying messages from the internet in public areas. The system includes a display unit configured from an authorized mobile phone and a GSM receiver, which receives the message and displays it on an LED or LCD display [11]. This technology improves security, raises awareness of emergency situations, and prevents industrial dangers.

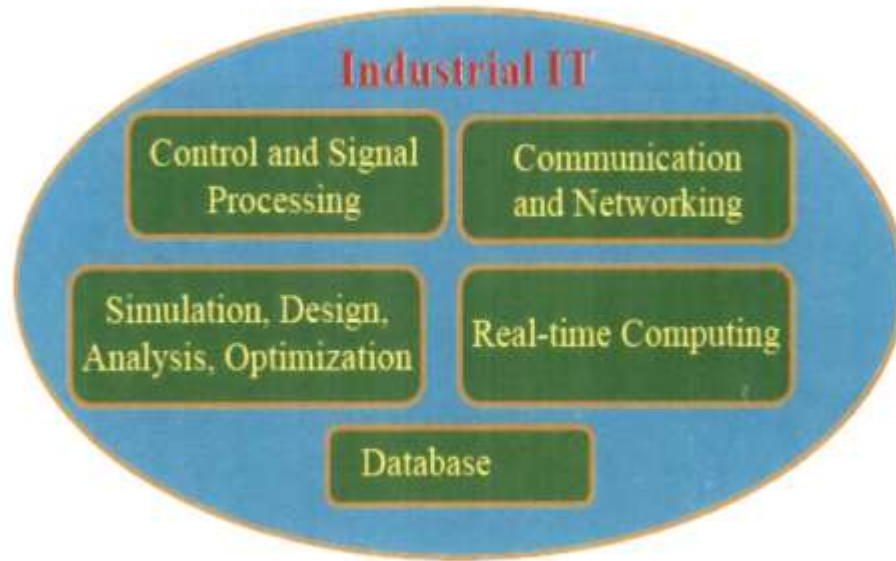


Fig-1 Major areas of IT which are used in the context of Industrial automation

An embedded system, such as a microwave oven, consists of computer hardware, software, and other components for specific tasks [12]. This work presents a wireless remote monitoring and control system that replaces manual control in plants using cellular telephony technologies like GSM-Short Message Service (SMS). The system provides plant decision-makers with quick plant information and eliminates the need for wires. It allows technical and maintenance personnel to supervise machinery and processes from a single mobile phone [13]. The system can be customized to suit other industrial requirements, provided industrial sensors are used. Industrial automation heavily relies on Information Technology (IT) in areas like simulation, design, analysis, optimization, real-time computing, communication, networking, control, signal processing, and database [14].

Objective of the proposed work

Installing a hardware system for a GSM integrated remote notice board, which are typically found in public spaces or organizations, could have the following objectives:

- By allowing real-time communication with the notice board through a remote connection, administrators or authorized users can update information without having to physically visit the board.
- **Accessibility:** Eliminate the need for in-person attendance by ensuring that administrators or users can remotely edit the notice board information from any location.
- **Cost-effectiveness:** Develop a hardware solution that is less costly to install and maintain than traditional notice boards, which may require manual updates.
- **Dependability:** Ascertain that the hardware system is reliable enough to operate continuously

without frequent malfunctions or technical issues, providing users with constant access to the most recent information posted on the notice board.

- **Security:** Implement security measures to ensure the accuracy of the displayed data and prevent unauthorized access to the notice board system.
- **Scalability:** Consider features or expansion when designing the hardware system to accommodate future advancements or shifting requirements.
- **Integration:** Permit integration with existing networks and systems, such as databases or content management systems, to facilitate content changes on the notice board.

EXISTING SYSTEM

Bluetooth-Based Wireless Electronic Notice Board for Android: The Android-Bluetooth Based Wireless Electronic Notice Board uses Bluetooth to connect an Android phone to an electronic display notice board. The user sends a message from the Android application device to the Bluetooth device at the display unit. The microcontroller then receives it and displays the user's notice on the LCD or LED display of the notice board [15].

REVIEW OF LITERATURE

In 2016, researchers proposed a remote notification sending system using a Raspberry Pi card and an approved PC for digital monitors [16]. The system uses Wi-Fi for data transfer and allows users to customize the text. This system is a significant resource-saving solution for managing advertising notice boards. The system uses Wi-Fi to broadcast notices, transmitting data across approximately 100 meters with a 1 or 2 Mbps data rate [17]. The system also supports other wireless technologies. In 2014, Dharmisht Dalsaniya provided instructions for a Wi-Fi-enabled digital signage system, allowing users to use a digital display wirelessly for effective advertising [18].

PROPOSED SYSTEM

The authorized mobile phone sends a message with the information to be displayed. The message is received by the GSM modem. The microcontroller then takes this message out of the GSM modem. Next, the LED display board shows the message.

A hardware system for a GSM integrated remote notice board must take into account a number of important factors. First and foremost, choosing a suitable microcontroller—like an Arduino—is essential to managing the board's functions. Incorporate a GSM module to facilitate connectivity between mobile devices and the notice board. The selection of a display type, including LCDs, is contingent upon the

demands of visibility and power consumption. Make sure the primary power source and any backup power sources, such as batteries, are steady. Incorporate sensors for other features like light or temperature sensing. Put in place user interface components for human input or setup, such as buttons or a touchscreen. Creating a unique PCB design is necessary to effectively connect every component. Create a protective design while taking the surroundings into account. Create a project to manage message parsing, display control, GSM communication, and any other aspects that need to be handled, such as scheduling or remote setup. Allow users to edit the notice board material remotely via a mobile application designed for public spaces or SMS commands. To protect communication, security procedures like authentication and encryption are used. Before putting the system into use, thoroughly test its security and functionality [19-20].

BLOCK DIAGRAM

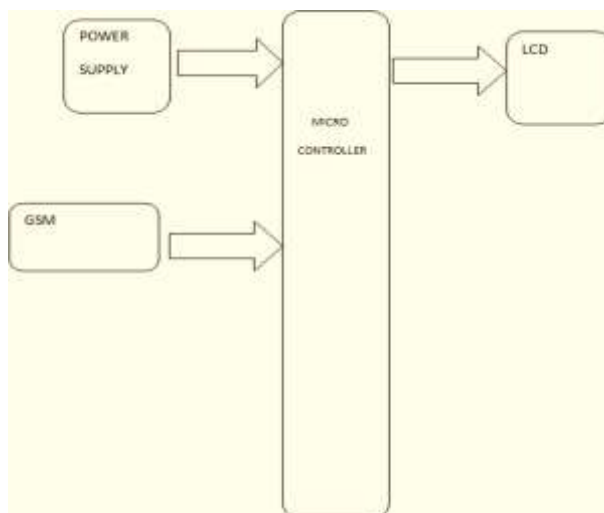


Fig.2 Block diagram of project and functioning

Arduino

A microcontroller board based on the ATmega328 is called the Arduino Uno (datasheet). It features a 16

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MHz ceramic resonator, 6 analog inputs, 14 digital input/output pins (six of which can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. It comes with everything required to support the microcontroller; all you need to do is power it with a battery or an AC-to-DC adapter or connect it to a computer via a USB cable to get going.



Fig 3: Aurdino UNO

LCD (Liquid Crystal Display)

Liquid Crystal Display, or LCD for short, is a very useful tool for debugging and providing user interface. Character-based LCDs based on Hitachi's HD44780 controller or other HD44580-compatible models are the most often used type. Today's most often used LCDs are 1 Line, 2 Line, and 4 Line LCDs, which each contain a single controller and can support up to 80 characters; LCDs that support more than 80 characters require two HD44780 controllers.



Fig 4: Pin Diagram of LCD

GSM

Global system for mobile communication, or GSM, is a type of mobile communication modem. At Bell Laboratories, the GSM concept was invented in 1970. It's a mobile communication system that's commonly used worldwide. GSM uses the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands to provide mobile voice and data services. It is an open, digital cellular technology.



Fig 5: GSM

A GSM integrated remote notice board uses a microcontroller, like an Arduino, to manage its functions and facilitate connectivity between mobile devices and the notice board. The board includes a GSM module, display type, and user interface components. The primary power source and backup power sources are stable, and sensors are used for light or temperature sensing. A unique PCB design is necessary to connect all components effectively. A project is created to manage message parsing, display control, GSM communication, and other aspects. Users can edit the notice board material remotely via a mobile application or SMS commands. Security procedures like authentication and encryption are used to protect communication. Before using the system, it is thoroughly tested for security and functionality. The Arduino Uno microcontroller board is a 16 MHz ceramic resonator board with 16 MHz ceramic resonator, 6 analog inputs, 14 digital input/output pins, USB port, power jack, ICSP header, and reset button.



Fig 6: Experimental results

CONCLUSION

Electronic notice boards are a crucial tool for providing timely information and saving time. They use GSM technology to integrate GSM connectivity, allowing users to send SMS messages that instantly post announcements, notifications, and updates. This feature is especially helpful for emergency alerts, event notifications, and operational announcements. Embedded systems, which use almost 99 percent of CPUs, are widely used in consumer electronics, office automation, and industrial automation. They are used in consumer appliances, office automation, industrial automation, medical electronics, computer networking, telecommunications, and wireless technologies. Industrial electronics, such as blood analysis, radiation, and endoscopy, use embedded systems for diagnosis. Computer networking products like bridges, routers, and Asynchronous Transfer Mode (ATM) carry out data transfer protocols. Telecommunications include subscriber terminals and network equipment. Wireless technologies, such as mobile phones, enable numerous intriguing embedded system applications. Dissemination relies on measuring and testing tools, and security is a top priority. Smart card and ATM transactions are gradually replacing cash and check transactions. The GSM-based wireless electronic notice board is a user-friendly and economical technology that replaces paper notices in emergency situations, public utility locations, and educational institutions. It has a maximum character count of 60 and can replace old notifications with new ones and display prior notices.

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