

GSM Based Instant Message Scrolling Display

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Abstract - An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost conscious market. An embedded system is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a traditional business or scientific application. High-end embedded & lower end embedded systems. High-end embedded system - Generally 32, 64 Bit Controllers used with OS. Examples Personal Digital Assistant and Mobile phones etc. Lower end embedded systems - Generally 8,16 Bit Controllers used with an minimal operating systems and hardware layout designed for the specific purpose. Examples Small controllers and devices in our everyday life like Washing Machine, Microwave Ovens, where they are embedded in.

Keywords - Embedded, Microcontroller, Market, Software, Hardware, Controller.

I. INTRODUCTION

Recent breakthroughs in science and technological innovations have led to an unprecedented advancement in provisions of technological solutions for the numerous problems facing mankind. Researchers are busy leveraging on modern technology to provide better and improved solutions commensurate to the ever increasing demands. In the last couple of decades, communication technology has developed by leaps and bounds. The use of “Embedded System in Communication” has given rise to many interesting applications. Everything around us is becoming smart such as smart phones, smart refrigerators, so why not smart notice boards. At present, when information has to be updated in a LED board, it has to be done manually. To change message on display, it needs to change microcontroller program code again. By adding GSM wireless communication interface to this system, we can make smart message board to overcome these limitations. So we have interfaced GSM Modem with microcontroller and implemented a SMS transmission and reception technique. The message on display is easily changed by sending SMS to it. Wireless message display board is a means of wireless data transfer for quick display of messages in real time. Being GSM- based system, it offers flexibility to display flash news or announcements faster than the programmable system. GSM-based display system can be used at other public places like schools, hospitals, railway stations, colleges, banks etc. This system is easy, robust, to use in normal life by anyone at anyplace with less errors and maintenance.

II. BLOCK DIAGRAM AND DESCRIPTION

A. Block Diagram Description

The system required for this purpose is nothing but, a Arduino Uno based SMS box. The main components of the kit includes Arduino Uno, GSM modem. These components are integrated with the LED display board and thus incorporate the wireless features. The GSM modem receives the SMS. The AT commands are serially transferred to the modem through Arduino Uno which has ATMEGA328 microcontroller. In return the modem transmits the stored message through the COM port. The Arduino Uno validates the SMS and then displays the message in the LED display board. Various time division multiplexing techniques have been suggested to make the display boards function efficiently. The microcontroller used in this case is ATMEGA328, SIM900A is used as the GSM modem. In addition to address matching, data can be received only by the dedicated receiver, and this data is displayed on LED. It displays the same message until its receives another verified message.

III. METHODOLOGY

This chapter includes the methodology in detail, and the assumptions which are made before finalizing the circuit. Once the circuit and layout diagrams are constructed then the chapter goes to the component descriptions and its specifications where each component is justified. It also includes tools used in doing the project, list of various devices and tools used in the working project. The hardware design is based on an embedded system implementation using the microcontroller from Atmel. This system consists of Arduino Uno, Microcontroller, GSM module, LED board.

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IV. ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. The Arduino Uno is shown in Fig. No. 3.1 and pin configuration is shown in Fig. No. 3.2. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

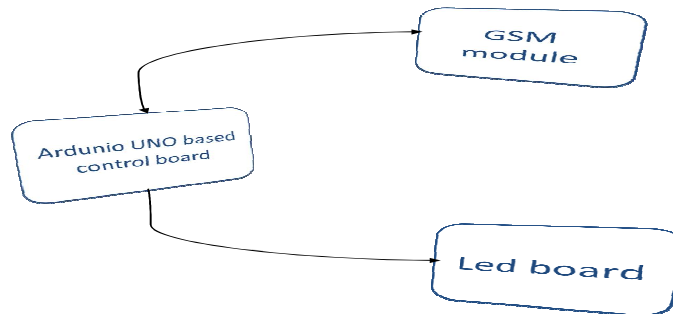


Fig. 1. Block diagram of the "GSM based Instant message scrolling display"

The power pins are as follows:

VIN. The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

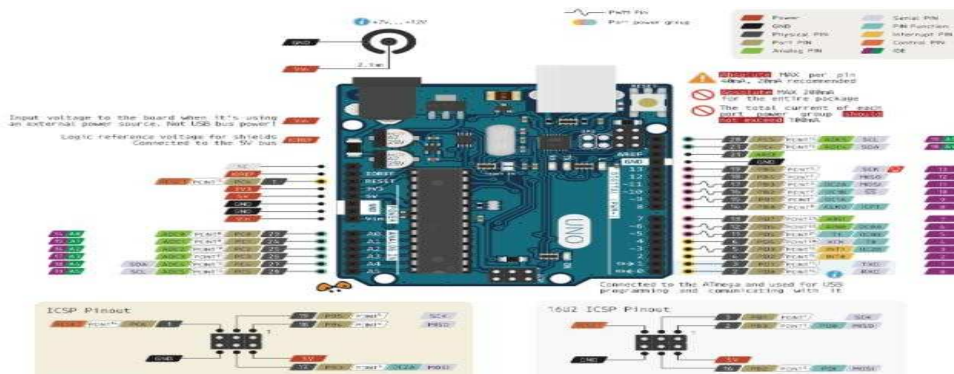
5V. This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it. **3V3.** A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA. **GND** is Ground pins.

A. Memory

The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

B. Input and Output

Each of the 14 digital pins on the Uno can be used as an input or output, using `pinMode()`, `digitalWrite()`, and `digitalRead()` functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 Kilo Ohms. In addition, some pins have specialized functions:



- **Serial:** 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- **External Interrupts:** 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.
- **PWM:** 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function.
- **SPI:** 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- **LED:** 13.

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- There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though it is possible to change the upper end of their range using the AREF pin and the analog Reference () function. Additionally, some pins have specialized functionality:
- TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.
- There are a couple of other pins on the board:
- AREF. Reference voltage for the analog inputs.Used with analog Reference().
- Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

C. Communication

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

V. CONCLUSION

GSM plays vital role in wireless technology, this project describes how a person can develop a LED matrix that can display scrolling message with support of GSM modem and other specified hardware. The multiplexing technique is used for displaying character on the matrix and the scrolling speed can be controlled by the microcontroller. This project can be used anywhere as it is based on wireless communication. Its dynamic messaging display nature makes it feasible for use in every field where the content keeps of changing like stock exchange, railways, airports, restaurants etc. the major advantage of this project is advertising as the display board can be placed at any height either in air or on earth there is no requirement of wires to communicate.

VI. FUTURE SCOPE

Currently we rely on putting up papers on notice boards but in future we can Currently we rely on putting up papers on notice boards to inform people for events. This method can be discarded by using wireless notice boards to display information in real time. It is a faster means of transferring information as there is no delay in transmission of information. Messages are displayed in a matter of seconds after typing. As long as we have the required network coverage we can send messages from any part of the world.This can be used in various places like for advertisement in shopping malls we get to hear the offers on various products from time to time. Instead we can continuously display the information regarding the products and related offers on electronic display.

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