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RFID and GSM based home applications to overcome the personal presence

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***Abstract*--**As the time moves the life style of the persons has completely changed and there is no time for the people for micro management of every issue personally. So, this is right time to provide some space to the technology into our lives for monitoring the issues which requires personal presence for the things to happen. In case of courier delivery if the personal presence is not there the courier may sent back if we are not there when courier boy comes to our house. This may lead to delay in receiving the courier. As we know the advancements in the Radio Frequency and GSM technologies and making use of those existing technologies we can design a device which is capable of identifying the arrival of courier and forward the same to the receiver and also provide the details of the goods so that they do not require to tracking the item from online. And the another usage of this system is making the notification the EB bill through GSM. By this even when the person is not there in home they will get the notification of their bill regarding amount and last date of paying amount. This will display in the LCD screen. This system can also make use of the notification during delivery of the gas cylinder and displayed in the LCD and also message will send to the receiver mobile.

Keywords*: RFID, GSM, Tracking, RFID Reader, RFID Tag, LCD.*

1. INTRODUCTION

RFID is the future technology for postal, courier and high volume light logistics. Though the percentage of mail delivery errors in postal services is relatively small, most of us have encountered them now and then. Mail arrives late, to the wrong address or does not show up at all. The Finnish national post office "Itella" reports that their delivery error rate is about 1%. Customers make about 18,000 missing item inquires annually of which about half can be solved. What if the other half could be resolved with the help of RFID? As soon as the RFID Tag detected then RF reader reads the identity number of the tag, courier details and informs the same to GSM modem and it will transfer the courier arrival details to customer. To design the entire system we require a microcontroller which acts as a medium of communication between the RF reader and the GSM modem. The major advantage of this system is the presence of the GSM modem enables the device to communicate with the receiver no matter where ever he was present on the globe.

In the EB bill system the officer from EB department take down the reading and mention the amount in paper only. Because of this many people did not notify whether the reading is taken or not and they get suffer during last date paying. So this system will overcome that by displaying in LCD and also by sending message to the receiver mobile through GSM whenever the reading is taken.

Like this in delivery of cylinder also people were suffering without knowing when the cylinder will deliver. So to overcome that, if the gas agency gave the notification to GSM it will display it in the LCD screen and also send a message to the receiver mobile.

NuTiny-SDK-NUC140 uses the NUC140VE3AN as the target microcontroller. Figure 2-1 is NuTiny-SDK-NUC140 for NUC140 series, the left portion is called NuTiny-EVB-NUC140 and the right portion is Debug Adaptor called Nu-LinkMe. NuTiny-EVB-NUC140 is similar to other development boards. Users can use it to develop and verify applications to emulate the real behavior. The on board chip covers NUC140 series features. The NuTiny-EVB-NUC140 can be a real system controller to design users' target systems. Nu-Link-Me is a Debug Adaptor. The Nu-Link-Me Debug Adaptor connects your PC's USB port to your target system (via Serial Wired Debug Port) and allows you to program and debug embedded programs on the target hardware. To use Nu-Link-Me Debug adaptor with IAR or Keil, please refer to "Nuvoton NuMicro™ IAR ICE driver user manual "or Nuvoton NuMicro™ Keil ICE driver user manual" in detail. These two documents will be stored in the local hard disk when the user installs each driver.

2. RELATED WORKS

Deepak mishra, 1] There are lots of efforts being made by public transport corporations to improve public vehicle occupancy by requesting the public to use public transport over others modes of transportation. It can be noted that if the passenger knows with high confidence that the bus is going to, he/she definitely will wait rather than opting for other modes of transport. Efficient information can therefore help the users to choose faster and more easier connections which says their time. Trends in wireless technology like global system for mobile communication(GSM) and Radio Frequency Identification(RFID) have resulted in easier and faster communication. This paper presents the vehicle tracking system by integrating both of the above mentioned technologies. The central server uses geographic information system(GIS) to track vehicles to display the position information on the electronic map.

Bindu Sebastian, the project aim is intelligent mail box system which is capable of automatically sending information about mail to user and delivery notification to courier officials using GSM and RFID technology. The efficient use of DC motor for opening and closing of mailbox can provide security to the system.

Anoop sattineni, academicians and industry professionals have demonstrated use of radio frequency identification RFID tags in construction application in the past few years recently building information modeling BIM technology as the industry standard in the architecture, engineering and construction AEC sector. This paper combine the two technologies to monitor the moment of RFID tags in a BIM environment. Real time monitoring of RFID tags in building information model is an improvement over other methods of tracking construction workers, equipment and materials job site. Strategies for combining the two technologies are explored. This method of monitoring are used to improve the safety and productivity of the construction works on the construction job site. This techniques of monitoring RFID tags can also be used to track equipment and construction materials on job site. Autodesk revit BIM software environment was used for tracking RFID tags. This paper includes discussion about the choice of RFID tags available for this paper.

3. THIS PROJECT PROVIDES EXPOSURE TO THE FOLLOWING TECHNOLOGIES

1. RFID tags.
2. GSM modem.
3. Interfacing GSM modem and microcontroller.
4. Embedded C programming for microcontroller.
5. Design of PCB.
6. RF reader.

4. ARM Cortex

ARM Cortex M0 Core The Cortex M0 processor is a configurable, multistage, 32-bit RISC processor. It has an AMBA AHB-Lite interface and includes an NVIC component. It also has optional hardware debug functionality. The processor can execute Thumb code and is compatible with other Cortex-M profile processor. The profile supports two modes -Thread mode and Handler mode. Handler mode is entered as a result of an exception. An exception return can only be issued in Handler mode. Thread mode is entered on Reset, and can be entered as a result of an exception return.

5. THE MAJOR BUILDING BLOCKS OF THIS PROJECT ARE

1. Regulated power supply with voltage regulator.
2. RF reader.
3. RF tag.
4. Microcontroller.
5. GSM modem.
6. LCD display.
7. Buzzer.

6. SYSTEM CONFIGURATION

- **POWER ON Setting**
  CON5 : Power Jack + 5V DC IN
  VCC: VCC power in/out
  VCC5: 5VCC power in/out
  VCC33:3VCC power in/out
- **JP3: System voltage**
  The LB board is support 3V for system.
- **Debug Connect**
  ICECON: USB connect to PC for debug NUC1XX.
- **USB Connect**
  J3 mini USB Connector for NCU1XX USB function.
- **Reset**
  SW RESET:Reset NCU140(low reset)

7. BLOCK DIAGRAM

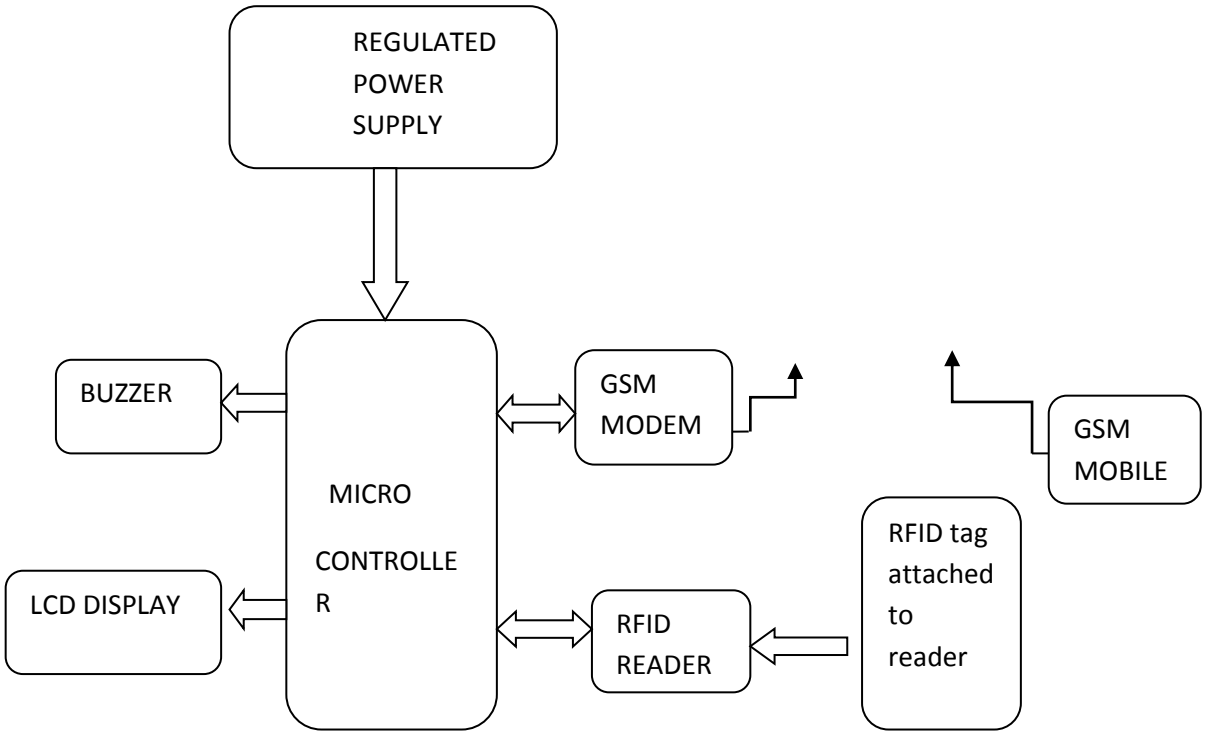

Fig.1: block diagram

- **REGULATED POWER SUPPLY:**

The power supply to the controller should not exceed 4.5 and greater than 3.

- **GSM MODEM:**

GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer. The MODEM is the soul of such modules.

- **RFID:**

Radio Frequency Identification (RFID) systems use radio frequency to identify, locate and track people, assets, and animals. Passive RFID systems are composed of three components – an interrogator (reader), a passive tag, and a host computer. The tag is composed of an antenna coil and a silicon chip that includes basic modulation circuitry and non-volatile memory. The tag is energized by a tome-varying electromagnetic radio frequency wave that is transmitted by the reader. This RF signal is called a carrier signal. When the RF field passes through an antenna coil, there is an AC voltage generated across the coil. This voltage is rectified to supply power to the tag. The information stored in the tag is transmitted back to the reader. This is often called as backscattering. By detecting the backscattering signal, the information stored in the tag can be fully identified.

- **READER:**

Usually a microcontroller-based unit with a wound output coil, peak detector hardware, comparators, and firmware designed to transmit energy to a tag and read information back from it by detecting the backscatter modulation.

The DT125R series RFID Proximity OEM Reader Module has a built-in antenna in minimized form factor. It is designed to work on the industry standard carrier frequency of 125 kHz. This LF reader module with an internal or an external antenna facilitates communication with Read-Only transponders—type UNIQUE or TK5530 via the air interface. The tag data is sent to the host systems via the wired communication interface with a protocol selected from the module pinout. The LF DT125R module is best suited for applications in Access Control, Time and Attendance, Asset Management, Handheld Readers, Immobilizers, and other RFID enabled applications.

8. FEATURES

1. Selectable UART or Wigand26.
2. Plug-and-Play, needs +5V to become a reader.
3. No repeat reads .
4. LED/Beeper indicates tag reading operation .
5. Excellent read performance without an external circuit .
6. Compact size and cost-effective .
7. A very efficient module for portable readers.

- **TAG:**

An RFID device incorporating a silicon memory chip, a wounded printed input/output coil, and a tuning capacitor.

8. LIQUID CRYSTAL DISPLAY

Recenty, a number of projects using liquid crystal display modules have been featured in EPE. Their ability to display not just numbers, but also letters, words and all manner of symbols, makes them a good deal more versatile than the familiar 7-segment light emitting diode displays. Although still quite expensive when purchased new , the large number of surplus modules finding their way into the hands of the “bargain” electronics suppliers, offers the hobbyist a low cost opportunity to carry out some fascinating experiment and realize some very sophisticated electronic display projects.

The liquid crystal display driver circuit consists of 16 common signal drivers and 40 segment drivers. When the character font and number of lines are selected by a program, the required common signal drivers automatically output drive waveforms, while the other common signal drivers continue to output non-selection waveforms.

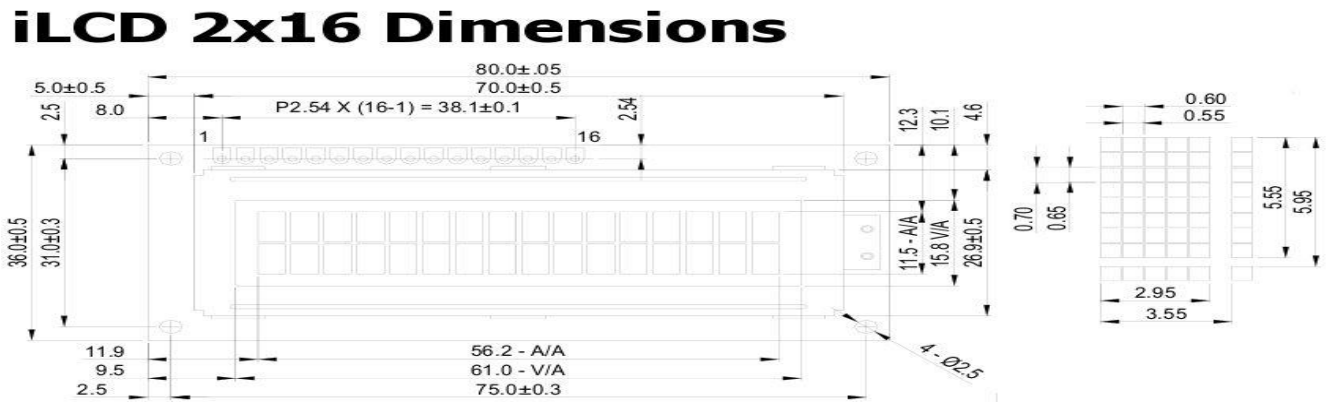

Fig.2:LCD layout

Sending serial data always starts at the display data character pattern corresponding to the last address of the display data RAM(DDRAM).

- **Power supply for LCD:**

Various voltage levels must be applied to pins V1 to V5 of the HD44780U to obtain the liquid crystal display drive waveforms. The voltage should be varied according to the duty cycle.

VLCD is the peak value for the liquid crystal drive waveforms, and resistance dividing provides voltages V1 to V5.

- **Cursor/blink control circuit:**

The cursor /blink control circuit generates the cursor or character blinking. The cursor or the blinking will appear with the digit located at the display data RAM(DDRAM) address set in the address counter(AC).

Normally , instructios that perform data transfer with internal RAM are used ye most. However, auto incrementation by 1 of internal HD44780U RAM addresses after each data wrte cam lighten the program load of the MPU. Since the display shift information can perform concurrently with display dat write, the user can minimize system development time with maximum programming efficiency.

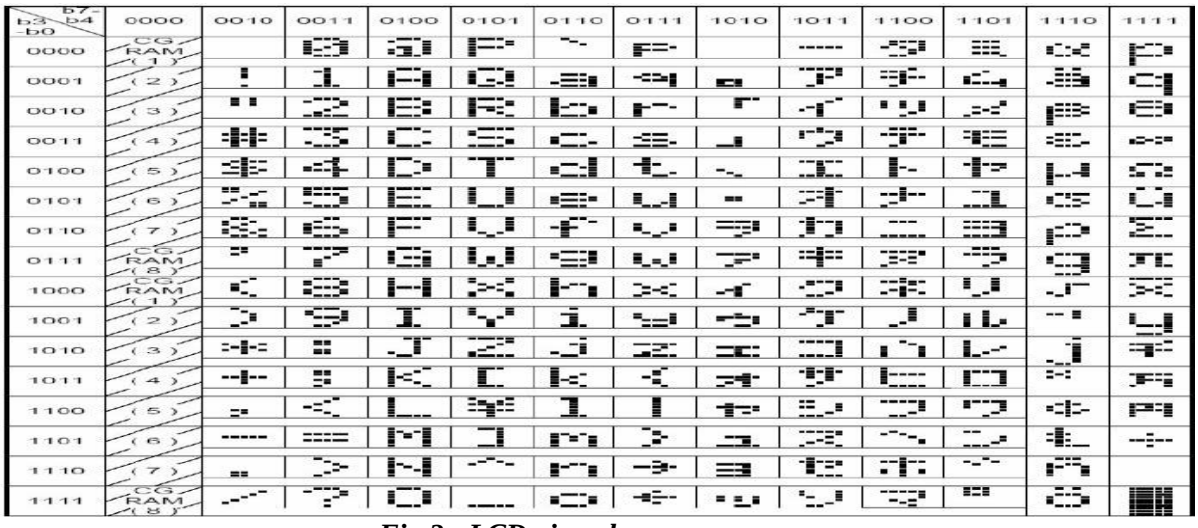

Fig.3: LCD pin values

Since serial data latched when the display data character pattern corresponding to the starting address enters the internal shift register, the HD44780U drives from the head display.

- **Pin assignment**

Pin NO.	Symbol	Function		Remark
1	GND	Power supply	0V	
2	Vdd		+5V	
3	V5		For LCD	Variable
4	RS	Register Select(H=Data,L=Instruction)		
5	R/W	Read/Write L=MPU to LCM,H=LCM to MPU		
6	E	Enable		
7	DB0	Data bus bit 0		
8	DB1	Data bus bit 1		
9	DB2	Data bus bit 2		
10	DB3	Data bus bit 3		
11	DB4	Data bus bit 4		
12	DB5	Data bus bit 5		
13	DB6	Data bus bit 6		
14	DB7	Data bus bit 7		
15	A	Anode of LED Unit		
16	K	Cathode of LED Unit		

Fig.4: Pin assignment of LCD

10.GSM

One of the most important conclusions from the early tests of the new GSM technology was that the new standard should employ Time Division Multiple Access (TDMA) technology. This ensured the support of major corporate players like Nokia, Ericsson and Siemens, and the flexibility of having access to a broad range of suppliers and the potential to get product faster into the marketplace. After a series of tests, the GSM digital standard was proven to work in 1988. With global coverage goals in mind, being compatible with GSM from day one is a prerequisite for any new system that would add functionality to GSM. As with other 2G systems, GSM handles voice efficiently, but the support for data and Internet applications is limited.

A data connection is established in just the same way as for a regular voice call; the user dials in and a circuit-switched connection continues during the entire session. If the user disconnects and wants to re-connect, the dial-in sequence has to be repeated. This issue, coupled with the limitation that users are billed for the time that they are connected, creates a need for packet data for GSM. The digital nature of GSM allows the transmission of data (both synchronous and asynchronous) to or from ISDN terminals, although the most basic service support by GSM is telephony.17 Speech, which is inherently analog, has to be digitized. The method employed by ISDN, and by current telephone systems for multiplexing voice lines over high-speed trunks and optical fiber lines, is Pulse Coded Modulation (PCM). From the start, planners of GSM wanted to ensure ISDN compatibility in services offered, although the attainment of the standard ISDN bit rate of 64 Kbit/s was difficult to achieve, thereby belying some of the limitations of a radio link.

The 64 Kbit/s signal, although simple to implement, contains significant redundancy. Since its inception, GSM was destined to employ digital rather than analog technology and operate in the 900 MHz frequency band. Most GSM systems operate in the 900 MHz and 1.8 GHz frequency bands, except in North America where they operate in the 1.9 GHz band. GSM divides up the radio spectrum bandwidth by using a combination of Time- and Frequency Division Multiple Access (TDMA/FDMA) schemes on its 25 MHz wide frequency spectrum, dividing it into 124 carrier frequencies (spaced 200 Khz apart).

Each frequency is then divided into eight time slots using TDMA, and one or more carrier frequencies are assigned to each base station. The fundamental unit of time in this TDMA scheme is called a 'burst period' and it lasts 15/26 ms (or approx. 0.577 ms). Therefore the eight 'time slots' are actually 'burst periods', which are grouped into a TDMA frame, which subsequently form the basic unit for the definition of logical channels.

One physical channel is one burst period per TDMA frame.18 The development of standards and systems spans well beyond the technical realm and often into the political; this is best exemplified by what happened with GSM. Shortly after the suitability of TDMA for GSM was determined, a political battle erupted over the question of whether to adopt a wide-band or narrow-band TDMA solution. Whereas France and Germany supported a wide-band solution, the Scandinavian countries favored a narrow-band alternative. These governmental preferences were clearly a reflection of the respective countries' domestic equipment manufacturers as German and French manufacturers SEL and Alcatel had invested substantially into wide-band technology, whereas their Scandinavian counterparts Ericsson and Nokia poured resources into the narrow-band alternative. Italy and the UK, in turn, were the

- **FEATURES OF GSM:**
  1. GSM based wireless courier detection.
  2. Low power consumption.
  3. Automatic courier reception notification.

11. CONCLUSION

RFID has been active in the postal business area for a long time, though rather in truck, box and pallet tracking than item-level tracking. It all started with tests that were aimed to pointing out inefficiencies in the value chain. Letters and packages were randomly equipped with RFID and send off to different destinations in the world. The tracking results showed where the system needed improvements. The courier will be received without fail and message delivered to the receiver and courier office. In phone bill system the bill information is delivered to the receiver and displayed in the LCD screen.

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