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BUS SAFETY SYSTEM FOR SCHOOL CHILDREN USING RFID AND SIM900 GSM MODEM

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Abstract— *This project presents a system to monitor pickup/drop-off of school children to enhance the safety of children during the daily transportation from and to school.* ***A lot of children need to commute between homes to school every day. In recent days safer transportation of school children has been a critical issue as it is often observed that, the child is forgotten in the bus and also find that the bus being diverted from actual route. It intends to find yet another solution to solve these problems by developing a bus safety system that will control the entry and exit of students from the buses through an advanced methodology.*** *A complete prototype of the proposed system was implemented and tested to validate the system functionality. The results show that the system is promising for daily transportation safety.*

Keywords—Bus Safety System, RFID (Radio Frequency Identification), GSM modem.

I. INTRODUCTION

School buses transfer millions of children daily in various countries around the world. While there are many issues that might disturb the parents regarding the safety transportation of school going children, the paper intends to look into introducing access safety in respect of School buses through bus tracking system that will help the school Children transportation in a secure and safer way. This system does several tasks, including identifying personal information of each student using RFID tag, which will exchange the data with the RFID reader via radio waves and displaying each student name into LCD display. This project, through entry and exit recordings, aims to create a suitable environment by following certain set of criteria of security and safety for school bus that will have a positive impact on the student and their family.

II. EXISTING SYSTEM

This system is proposed to track the children using a child module that transmits the tracking information to a database and a mobile device. The disadvantages of this system are that the module may not be convenient for children and wide-scale deployment is expensive. This reports tracking system that utilizes Android terminals that communicate among themselves using Bluetooth technology to form clusters. The clusters communicate the relevant information using WLAN. The major drawback of this system is that the deployment cost is high. There are commercial systems for tracking children such as Bluetooth-based tracking devices which are designed to be worn by children as a bracelet or a necklace. In this type of tracking, these devices can be connected with a mobile application and can alert the parents if their child went outside a range specified by them. If the Child walked outside this range, the device will send an alert to the parent. In addition, the application sends the location of the child by using a geographical map. One disadvantage of this type of applications is that they work only in a limited range. Other products may rely on biometric features such as the Kid track biometric system in which the children scan their palms across a palm reader when they enter the bus. It uses an infrared light to image the palm unique pattern. It uses green and red LEDs to ensure the scan works. Then, the scans are sent for cross-referencing against a secure database of preregistered users' patterns. Based on this, the administration can find the information of that bus, where and when it tracked the child, and where the bus was at that time. The disadvantage of this approach is that it is not automatic and difficult for young children to place their palms correctly on the scanner.

III. PROPOSED SYSTEM

The system has a developed application that facilities its management and provides useful information about the children to authorized personal. A complete prototype of the proposed system was implemented and tested to validate the system functionality. The results show that the system is promising for daily transportation safety. This project is mastered with ATMEGA328 for which RFID module is interfaced to identify a child with unique ID card. Immediately an SMS will be sent to the parent while entering and leaving the bus when card was shown. So that parent can know the details of children's presence/absence with ease. Parent can also know about the bus location. Upon request an SMS will be sent to the parent about the bus location. Any accident occurred to the vehicle will also be identified using vibration sensor. In that case vehicle stops with a buzzer alert and SMS will be sent in this situation. Here the vehicle is represented with DC motor. This tracking system is composed of a ATMEGA328 and a GSM modem. The ATMEGA328 processes this information and this processed information is sent to the user/owner using GSM modem. This application is a low cost solution for automobile position and status, very useful in case of car theft situations, for monitoring adolescent drivers by their parents as well as in car tracking system applications. This can be used in other types of application, where the information needed is requested rarely and at irregular period of time (when requested).

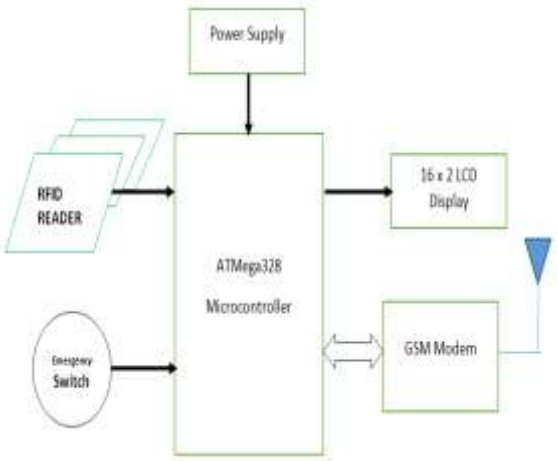

Figure 1. Block Diagram

The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D

converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.

KEY PARAMETERS: PARAMETER	**VALUE**
CPU type	8-bit AVR
Performance	20 MIPS at 20 MHz
Flash memory	32 Kb
SRAM	2 kB
EEPROM	1 kB
Pin count	28-pin PDIP, MLF, 32-pin TQFP, MLF
Maximum operating frequency	20 MHz
Number of touch channels	16
Hardware QTouch Acquisition	No
Maximum I/O pins	26
External interrupts	24
USB Interface	No
USB Speed	No

IV. HARDWARE MODULES USED

• High Performance, Low Power AVR® 8-Bit Microcontroller
• Advanced RISC Architecture
– 131 Powerful Instructions – Most Single Clock Cycle Execution
– 32 x 8 General Purpose Working Registers
– Fully Static Operation
– Up to 20 MIPS Throughput at 20 MHz
– On-chip 2-cycle Multiplier
• High Endurance Non-volatile Memory Segments
– 4/8/16/32K Bytes of In-System Self-Programmable Flash program memory
– 256/512/512/1K Bytes EEPROM
– 512/1K/1K/2K Bytes Internal SRAM
– Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
– Data retention: 20 years at 85°C/100 years at 25°C(1)
– Optional Boot Code Section with Independent Lock Bits
In-System Programming by On-chip Boot Program
True Read-While-Write Operation
– Programming Lock for Software Security
• Peripheral Features
– Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode
– One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture
Mode
– Real Time Counter with Separate Oscillator
– Six PWM Channels
– 8-channel 10-bit ADC in TQFP and QFN/MLF package
Temperature Measurement
– 6-channel 10-bit ADC in PDIP Package
Temperature Measurement
– Programmable Serial USART
– Master/Slave SPI Serial Interface
– Byte-oriented 2-wire Serial Interface (Philips I2C compatible)
– Programmable Watchdog Timer with Separate On-chip Oscillator
– On-chip Analog Comparator
– Interrupt and Wake-up on Pin Change
• Special Microcontroller Features
– Power-on Reset and Programmable Brown-out Detection
– Internal Calibrated Oscillator
– External and Internal Interrupt Sources
– Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby,
and Extended Standby
• I/O and Packages
– 23 Programmable I/O Lines
– 28-pin PDIP, 32-lead TQFP, 28-pad QFN/MLF and 32-pad QFN/MLF
• Operating Voltage:
– 1.8 - 5.5V
• Temperature Range:
– -40°C to 85°C
• Speed Grade:
– 0 - 4 MHz@1.8 - 5.5V, 0 - 10 MHz@2.7 - 5.5.V, 0 - 20 MHz @ 4.5 - 5.5V
• Power Consumption at 1 MHz, 1.8V, 25°C
– Active Mode: 0.2 mA
– Power-down Mode: 0.1 μA
– Power-save Mode: 0.75 μA (Including 32 kHz RTC)

A. RFID

Radio-frequency identification (RFID) is the use of a wireless non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag attached to an object, for the purposes of automatic identification and tracking. Some tags require no battery and are powered by the electromagnetic fields used to read them. Others use a local power source and emit radio waves (electromagnetic radiation at radio frequencies).

B. EM18 READER

The EM-18 RFID Reader module operating at 125 kHz is an inexpensive solution for your RFID based application. The Reader module comes with an on-chip antenna and can be powered up with a 5V power supply. Power-up the module and connect the transmit pin of the module to receive pin of your microcontroller. Show your card within the reading distance and the card number is thrown at the output. Optionally the module can be configured for also a weight and output.

C. RFID TAG

A radio-frequency identification system uses *tags*, or *labels* attached to the objects to be identified. Two-way radio transmitter-receivers called *interrogators* or *readers* send a signal to the tag and read its response.

RFID tags can be passive, active or battery-assisted passive. An active tag has an on-board battery and periodically transmits its ID signal. A battery-assisted passive (BAP) has a small battery on board and is activated when in the presence of an RFID reader. A passive tag is cheaper and smaller because it has no battery; instead, the tag uses the radio energy transmitted by the reader. However, to operate a passive tag, it must be illuminated with a power level roughly a thousand times stronger than for signal transmission. That makes a difference in interference and in exposure to radiation.

Tags may either be read-only, having a factory-assigned serial number that is used as a key into a database, or may be read/write, where object-specific data can be written into the tag by the system user. Field programmable tags may be writing-once, read-multiple; "blank" tags may be written with an electronic product code by the user.

RFID tags contain at least two parts: an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, collecting DC power from the incident reader signal, and other specialized functions; and an antenna for receiving and transmitting the signal. The tag information is stored in a non-volatile memory. The RFID tag includes either fixed or programmable logic for processing the transmission and sensor data, respectively.

An RFID reader transmits an encoded radio signal to interrogate the tag. The RFID tag receives the message and then responds with its identification and other information. This may be only a unique tag serial number, or may be product-related information such as a stock number, lot or batch number, production date, or other specific information. Since tags have individual serial numbers, the RFID system design can discriminate among several tags that might be within the range of the RFID reader and read them simultaneously.

D. CHARACTER LED

FEATURES
• 5 x 8 dots with cursor
• Built-in controller (KS 0066 or Equivalent)
• + 5V power supply (Also available for + 3V)
• 1/16 duty cycle
• B/L to be driven by pin 1, pin 2 or pin 15,
pin 16 or A.K (LED)
• N.V. optional for + 3V power supply

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

E. MODEM SPECIFICATIONS

The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry standard interface,

SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption.

With a tiny configuration of 24mm x 24mm x 3 mm, SIM900 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design.

SIM900 is designed with a very powerful single-chip processor integrating□AMR926EJ-S core.

Quad - band GSM/GPRS module with a size of 24mmx24mmx3mm□□□SMT type suit for customer application**.**

V. RESULTS

Figure 2. Picture of Real Time Operation

VI. CONCLUSION

In this research work, we have studied and implemented a complete working model using a Microcontroller. The programming and interfacing of microcontroller has been mastered during the implementation. This work includes the study of GSM & RFID modules.

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