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Automatic Coach Identification System

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Abstract: ***Automation plays a very important role in every day's life. The main objective of this paper is to provide automatic acquire of coach numbers and display them on the different display systems available in the station through RFID technology. This will help to reduce human errors and display information accurately.***

Keywords: RFID Technology, automation, coach position, RF technology, RF T_X-R_X pair

1. Introduction

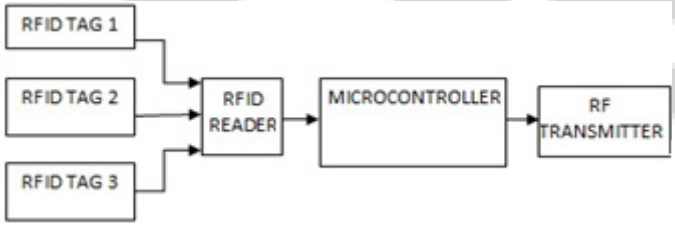
Indian Railways is the world's ninth largest commercial or utility employer, by number of employees, with over 1.4 million employees. As for rolling stock, IR holds over 239,281 Freight Wagons, 59,713 Passenger Coaches and 9,549 Locomotives (43 steam, 5,197 diesel and 4,309 electric locomotives). The trains have a 5 digit numbering system as the Indian Railways runs about 10,000 trains daily [1]. As of 31 March 2013, 23,541 km (14,628 mi) (36%) of the total 65,000 km (40,000 mi)route length was electrified [1].

RF technology plays major role in communication sector as it can transfer large number of data to long distance at high speeds without the use of wires or cables. In Indian Railways when a train leaves the station, the station manager makes a call to his counterpart of the next station and informs about the order of the coaches. So this is a long procedure, because it is done manually. Sometimes the Railway coaches arrive at different locations from where they are to be actually located. To avoid this type of problems and to make this process simpler we can utilize the RFID technology and implement the automation to the coach identification procedure which reduces human work.

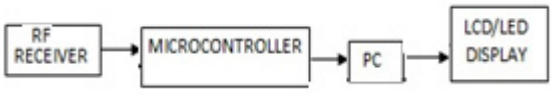
2. Proposed Method

The block diagram for the paper consists of two parts
1. At the signal post(transmitter)
2. At the station(receiver)

Transmitter section



Receiver section



As we can see the total paper requires the knowledge of different components such as:

1. Microcontroller
2. RFID system
3. RF T_X-R_X pair
4. LCD
5. PC

A. Microcontroller

A microcontroller is a computing device designed for embedded applications which has on-chip peripherals such as RAM, ROM, I/O pins, processor core etc., A microcontroller is chosen based on the requirements on our applications and is chosen from the following characteristics.

i. Program memory. Sufficient program memory is required to store the program
ii. Data memory. Sufficient data memory is required to store intermediate results.
iii. I/O pins. It has to get its inputs and provide outputs between different devices through I/O pins, so sufficient I/O pins must be supported
iv. Clock frequency. Sufficient clock frequency has to be provided so that the output is achieved in less amount of time.

These are only a few but main requirements when choosing a microcontroller. The microcontrollers used in this paper are:

i. Atmel AT89S52
ii. LPC2148

Different controllers are used as to show that communication can be provided between two different microcontrollers as well if they fulfil the requirements.

a. AT89S52

AT89S52 is an 8-bit microcontroller which has the following features:

- Compatible with MCS®-51 Products.

- 8K Bytes of In-System Programmable (ISP) Flash Memory.
- 4.0V to 5.5V Operating Range.
- Fully Static Operation: 0 Hz to 33 MHz
- 256 x 8-bit Internal RAM.
- 32 Programmable I/O Lines.
- Three 16-bit Timer/Counters.
- Eight Interrupt Sources.
- Full Duplex UART Serial Channel.

b. LPC2148

LPC2148 is a 32 bit ARM machine which has the following features:

- 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory.
- In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader software.
- Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.
- Multiple serial interfaces including two UARTs (16C550), two Fast I2C-bus (400 kbit/s), SPI and SSP with buffering and variable data length capabilities.
- Up to 45 of 5 V tolerant fast general purpose I/O pins in a tiny LQFP64 package.
- Up to 21 external interrupt pins available.

B. RFID system

RFID stands for Radio Frequency Identification. It uses radio frequency spectrum for the transmission of data. RFID system contains mainly 3 parts.

i. RFID tag
ii. RFID reader
iii. Controller

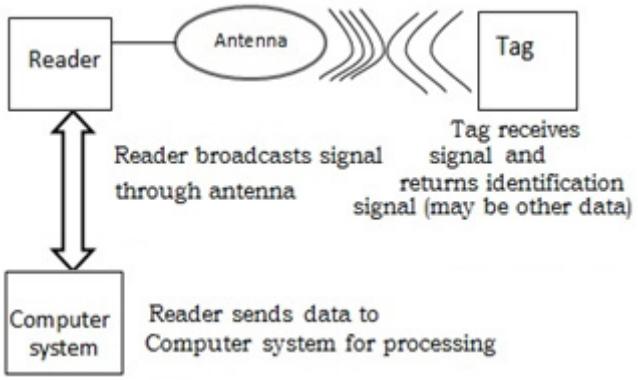
RFID tag contains information regarding the object which we want to track down. There are basically 3 types of tags available.

i. Passive
ii. Active
iii. Semi-passive

Passive tag obtains operating power from reader. The reader sends electromagnetic waves that induce current in the tags antenna, the tag reflects RF signal transmitted and adds information by modulating reflected signal. Active tags Powered by internal battery, used to run microchips circuitry and to broadcast signal to reader. Expensive than passive tags. Batteries must be replaced periodically. Semi-passive tags uses battery to maintain memory in the tag or power electronics that enable tag to module the reflected signal. Communicates same as passive tags. FID reader sends electromagnetic waves regularly into the space within its range. Whenever tag comes in its range it reflects the signal with the information back to the reader.

Controller reads the information given by the reader and process the information according to our requirement.

The total system is shown by the block diagram shown below;



C. RF T_X/R_X pair

The data we need to send is week signal and cannot be sent to long frequencies so we make use of modulating and demodulating it with a carrier signal of certain large frequency. RF transmitter – receiver pair is used to send and receive the data through long distances using RF frequency range. The main requirement of this pair to work is that they should be operated on same frequency. As far as this paper is concerned we use the frequency to be 434 MHz. To provide better safety to the sent data we use an encoder and decoder pair to encode and decode the information before modulating and demodulating.

D. LCD

LCD display is used to display the given information which is taken from the microcontroller. The LCD display used here is a 16x2 LCD which means it displays data in 2 lines with 16 characters in each line. It transforms each character code into a 5x7 matrix.

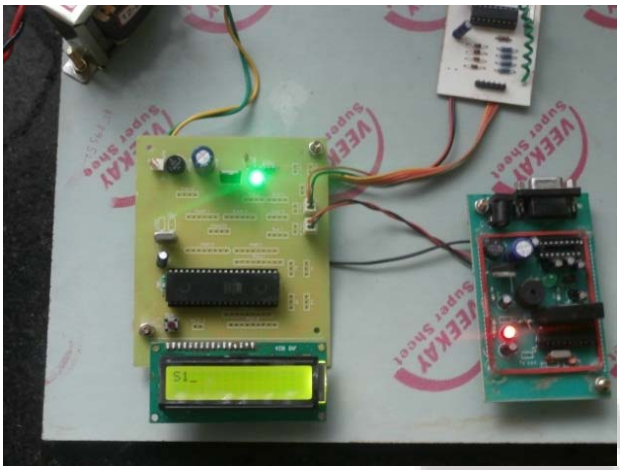
E. PC

PC (Personal Computer) is used to display the same data that is displayed on the LCD display. By using PC the data that is displayed can also be stored on the network by using software which takes the data from the microcontroller through RS232 and stores the data in its private database for future references.

3. Results

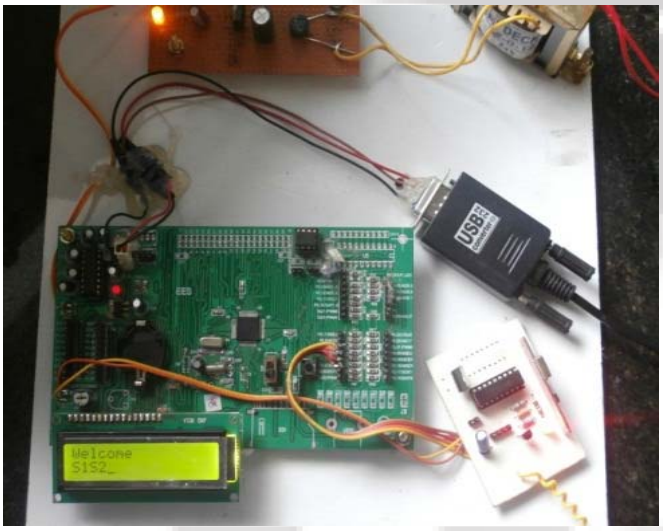
An RFID tag is placed on the train and the reader is placed at a signal post near the station. Whenever the train crosses the signal post the reader gets the information from the tag present on the train. The reader sends the information to the controller present in the system which sends to the receiver circuit present near the station master through RF communication. The receiver reads the information and sends them to the computer which is displayed on display boards. Consider for example the coach positions are S1, S2. RFID tag has a specific ID number so these numbers are saved with the values S1 and S2 such that whenever the tag is read by the reader, the coach values S1 and S2 are displayed on LCD as shown in fig below. And the data is sent to the receiver using RF transmitter which transmits the serial data wirelessly.

Output at Signal Post



At the receiver the values are stored in the microcontroller such that the data sent from the transmitter is same as displayed at the receiver. The output at the receiver which displays the coach positions S1 and S2 in the order first S1 and next S2 is shown in fig below.

Output at Station



4. Conclusion

This paper helps in providing automation to the present system that is present in railways. Thus this helps in reducing the errors that may happen by manual work and increase efficiently.

5. Scope

The main scope of the paper is the use of high range RFID system by which it can identify the coach numbers from long distances.

References

[1] ZigBee Alliance Official Site, [online].Available: www.zigbee.org.
[2] Electronics for you Magazine
[3] 8051 Microcontrollers by Mazidi & Mazidi
[4] RF ID technology in rfidjournal.com andessenrfid.com
[5] Ma Chao. Embedded GSM message interface hardware and software design [J]. Microcontroller and Embedded Systems, 2003,
[6] Rajesh, N.N.Ramesh and S.M.Prakhya 2010. Wireless vehicular accident detection and notification system. International conference on mechanical and electrical technology.
[7] The IEEE website. [Online]. Available: http://www.ieee.org/
[8] An Automated Traffic Accident Detection and Alarm Device. M.Rajendra Prasad, P.Aswani Kumari paper published in IJTEL.
[9] http://www.libelium.com/wireless_sensor_networks_to_detec_forest_fires/.
[10] http://en.wikipedia.org/wiki.
[11] The 8051 Microcontroller and Embedded Systems Using Assembly and C 2nd-edition by Muhammad Ali Maz.

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