

RFID Based System for Pilgrim Management in Major Religions Phases and Festivals

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Abstract

Millions of pilgrims arrive every year to different places for religious reasons all over the countries. Managing this large number of pilgrims from different nations and various cultures in a short period of time is not easy at transport terminals like airports, railway stations and bus stations. In addition, due to the many steps that a pilgrim has to go over and the different agencies that he/she needs to deal with, pilgrims satisfaction for the services provided may not be at major religions phases and also their safety. Therefore, it is important to improve the current system in order to increase pilgrims' satisfaction and to increase the efficiency of the management system. It needs to utilize new technological solutions to increase the efficiency of the process of receiving, guiding, and managing pilgrims. We propose a system to manage pilgrims at pilgrimage using the RFID technology. In this system, each pilgrim is given an ID card with a unique number. This card is used to identify the pilgrim in different stages of the arrival process. The proposed system helps officials registering pilgrims, editing their information, and searching for them.

In this work, we use different modules at such as RFID module, LPC2148 as controller, mode selection switch, H-Bridge, DC Motor, a buzzer and 16X2 LCD is used to have the display of the person if he/she is authorized or unauthorized.

Keywords: H-Bridge converter, Micro controller LPC214, RFID, IR sensor, DC Motor.

I. Introduction

In major religions phase and festivals like Kumbhamela, Char Dham, Shabarimalayi and Ajmeer etc, where pilgrim all over the countries. There is likely that in their Airports, Railway stations and Bus Stations terminal encounter heavy pilgrims. Kumbh Mela is a major Hindu religious festival that is held every 3 years in 4 rotating places. The 2013 event is considered a Maha Kumbh Mela,



which comes around only once every 144 years. It lasts 55 days and is expected to be attended by 100 million pilgrims, making it the largest temporary gathering of people in the world. A temporary city covering an area larger than Athens was set up to accommodate the crowds. Sunday, 10 February was considered the most auspicious day and 30 million people descended to Allahabad to bathe at the confluence of the Yamuna and the Ganges rivers. Due to the huge number of attendees stampedes are relatively common during Kumbh Mela festivals. The Kumbh Mela stampede was the deadliest since India's independence, with an estimated more than

fifteen thousand deaths from 1954 to 2013. Kumbhamela, Char Dham, Shabarimalayi and Ajmeer etc, where pilgrim all over the countries. There is likely that in their Airports, Railway stations and Bus Stations terminal encounter heavy pilgrims. Managing this huge number of pilgrims from different nations, various cultures and various places in a short period of time is not easy at transport terminals and their safety and other organizations also. It needs to utilize new technological solutions to increase the efficiency of the process of receiving and managing pilgrims at transports (Airports or Railway Stations or Bus Stations).

In this RFID system, each pilgrim is given an ID card with a unique number. This card is used to identify the pilgrim in different stages of the arrival process. The proposed system helps officials registering pilgrims, editing their information, and searching for them and counting them at a certain areas of airports, railway stations and Bus stations. The proposed system also provides access controlling.

II. IR SENSOR

The principle of IR sensor is totally based on change in resistance of IR receiver which is similar to LDR (light dependent register) and reflection of light. Here in this sensor we connect IR receiver in reverse bias so it give very high resistance if it is not exposed to IR light. The resistance in this case is in range of Mega ohms but when IR light reflected back

and falls on IR receiver. The resistance of Rx it comes in range between Kilo ohms to hundred of ohms. We convert this change in resistance to change in voltage. Then this voltage is applied to a comparator IC which compare it with a threshold level if voltage of sensor is more than threshold then output is high else it is low which can be used directly for microcontroller.

IR transmitter and receiver

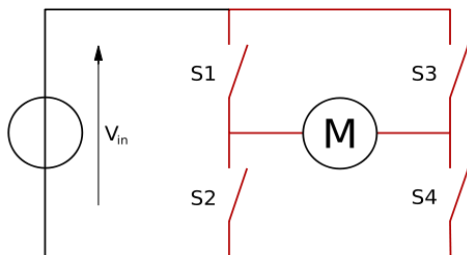
IR LED is used as a source of infrared rays. It comes in two packages 3mm or 5mm. 3mm is better as it requires less space. IR sensor is nothing but a diode, which is sensitive for infrared radiation. This infrared transmitter and receiver are called as IR TX-RX pair. Color of IR transmitter and receiver is different.

How to identify IR Tx and Rx

- Connect cathode of one LED to positive terminal of DMM (digital multi-meter)
 - Connect anode of the same LED to common terminal of DMM
 - Set DMM to measure resistance up to 2M Ohm. Check the reading.
 - Repeat above procedure with second LED.
- In above process, when you get the reading of the few hundred Kilo Ohms on DMM, then it indicated that LED that you are testing is IR sensor.
- In case of IR transmitter DMM will not show any reading

III. H-BRIDGE CONVERTER

An H-bridge is an electronic circuit which enables DC electric motors to be run forwards or backwards.



These circuits are often used in robotics. H-bridges are available as integrated circuits, or can be built from discrete components. The two basic states of a H-bridge. The term "H-bridge" is derived from the typical graphical representation of such a circuit. An H-bridge is built with four switches (solid-state or mechanical). When the switches S1 and S4 (according to the first figure) are closed (and S2 and S3 are open) a positive voltage will be applied across the motor by opening (S1 and S4).When the switches S1 and S4 (according to the first figure) are closed (and S2 and S3 are open) a positive voltage will be applied across the motor. By opening S1 and S4

switches and closing S2 and S3 switches, this voltage is reversed, allowing reverse operation of the motor. Using the nomenclature above, the switches S1 and S2 should never be closed at the same time, as this would cause a short circuit on the input voltage source. The same applies to the switches S3 and S4. This condition is known as shoot-through.

Operation

The H-Bridge arrangement is generally used to reverse the polarity of the motor, but can also be used to 'brake' the motor, where the motor comes to a sudden stop, as the motors terminals are shorted, or to let the motor 'free run' to a stop, as the motor is effectively disconnected from the circuit. The following table summarizes operation.

Table no 1 H-Bridge Truth Table

S1	S2	S3	S4	Result
1	0	0	1	Motor moves right
0	1	1	0	Motor moves left
0	0	0	0	Motor free runs
0	1	0	1	Motor brakes

Speed Control by Full H Bridge

A simple motor circuit connects power supply through a switch MOSFET. A pulse with fixed frequency is generated by the microcontroller, which is fed to the base of transistor. Transistor acts here as a switch. The output voltage of the motor is dependent on the amount of the ON time of the transistor. The more time transistor remains ON, more the voltage will produce. A Freewheeling diode is used for back e.m.f. protection. When the switch Q1 is closed, 12 Volts is applied to the motor, and when it is open, 0 Volts is applied. If the switch is open for the same amount of time as it is closed, the motor will see an average of 6 Volts.

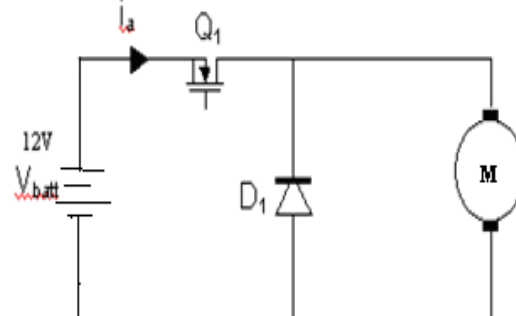


Fig 3.1 Simple Motor Circuit

The on-off switching is performed by a power MOSFET, a device that can turn very large currents on and off under the control of a low signal level voltage As the amount of time that the voltage is

on increases compared with the amount of time that it is off, the average speed of motor increases and vice versa.

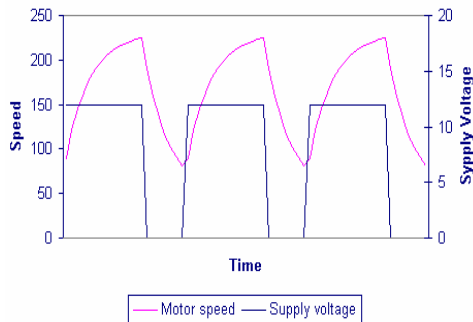


Fig 3.2 Relation of Supply Voltage with Motor Speed

IV. Micro Controller

The data received from RFID reader is interfaced to pin 11 of LPC2148. The received input is checked and verified according to stored data in EEPROM in-built memory. The LPC2148 is based on a 32-bit ARM7TDMI-CPU with real-time emulation and embedded trace support that combine microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate.

The 16-bit Thumb mode reduces code by more than 30 %. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, In-system programming flash memory, SPI, SSP to I2C-bus and on-chip SRAM of 8 kB up to 40 kB, various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make this microcontroller suitable for industrial control and medical systems. The ARM7TDMI-S is a general purpose 32-bit microcontroller, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles.

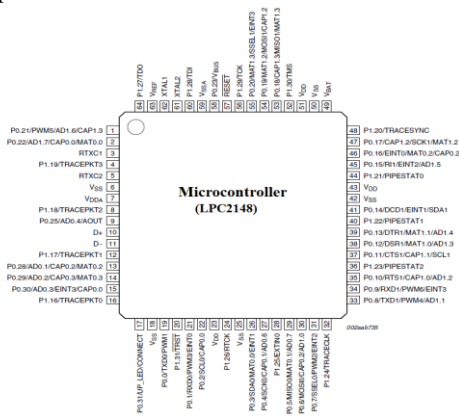


Fig 4.1 LPC2148 Microcontroller

Pipeline techniques are employed so that all parts of the processing and memory systems can

operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory.

V. RFID BLOCK DIAGRAM

The RFID based system requires much functionality that has to be coordinated for efficient operation. The RFID reader must interrogate the RFID tag and RFID tag respond for RFID reader signal. Then verify the RFID tag data for pilgrim identification with in-built EEPROM memory data by microcontroller. A visual display of pilgrim information and sound of a buzzer must be provided. Sensor unit for counting the number of pilgrims at transport terminals and drive section unit should process access control of gates at transport terminals.

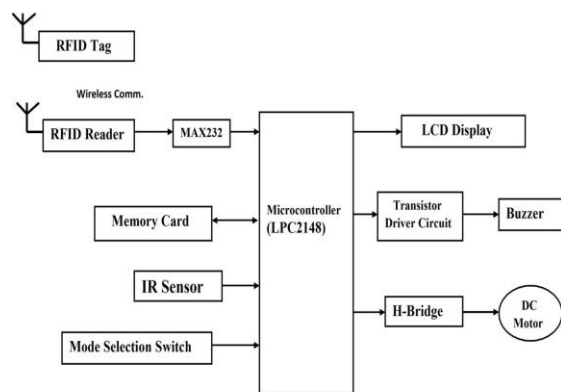


Fig.5.1. Block Diagram of RFID Based System

Keeping in view the above considerations, the RFID based system for the pilgrim management is designed with the power supply is required for RFID based system. RFID tag and RFID reader for identification of the pilgrim at transport terminals. DC Geared Motor with 60 RPM for access control at transport terminals gates. H-bridge motor driver IC is used to drive the DC motor in different directions. LCD HD44780 16-character, 2-line (16X2) is used to display the information about pilgrims. IR sensor is used to counting the number of pilgrims at transport terminals. Buzzer is used to indicate the unauthorized pilgrims. Mode selection switch is used to selects the operation.

PILGRIM IDENTIFICATION

In this proposed system, a radio-frequency identification system uses tags for identification. RFID reader transmits an encoded radio signal to interrogate the tag, when tag near to the RFID reader. The tag receives the message and responds with its identification information.

RFID reader sends this identification information to microcontroller and according to the signal received by microcontroller and it will send a signal to LCD display, which displays welcome message and pilgrim's name else to the buzzer to indicates unauthorized person. Because RFID readers

signal information verifies with the data of in-built EEPROM memory prestored information about pilgrim. This verification is done by microcontroller.

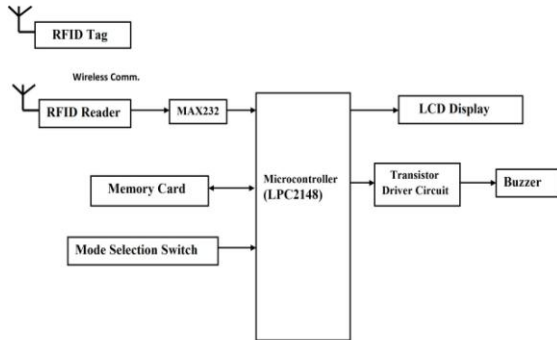


Fig 5.2 RFID Based System for Pilgrim Identification

Access Control

If mode selection switch selects for RFID system operation. RFID reader sends the identification information to microcontroller, which is response of the RFID tag. Microcontroller verifies received signal from RFID reader with the data of in-built memory and it gives output to LCD display as well as DC motor. DC motor receives the signal from microcontroller through H-bridge circuit.

Microcontroller controls DC motor through h-bridge circuit according to its received signal from RFID reader. H-bridge circuit has four switches. All switches will open then DC motor rotates in ante - clockwise direction (opening the door) and .any two of four switches will close then DC motor rotates in clockwise direction (closing the door) .

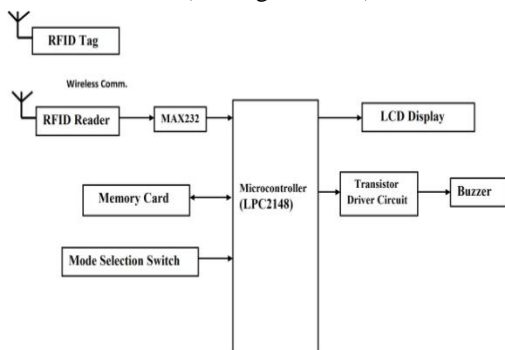


Fig 5.3 RFID Based System for Access Control.

Counting the pilgrims

IF mode selection switch selects counting mode. An IR sensor detects the number of pilgrims, who are entriesor leaves the pilgrimage. IR sensor has one transmitter and receiver. IR transmitter emits the LED signal continously. If LED signal crossed by pilgrim, then it reflects back. Reflected signal received by IR receiver. IR receiver gives reflected signal to microcontroller. Microcontroller controls the reflected signal and it sends a signal to LCD display, which displays number of pilgrims.

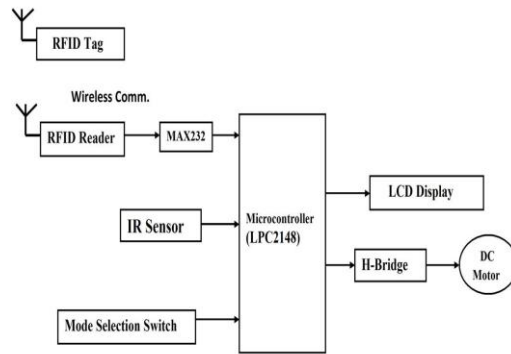
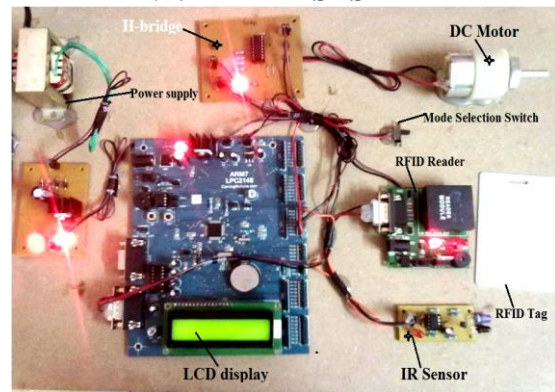


Fig 5.4 IR Sensor for counting the number of pilgrims

VI. RFID SYSTEM



6.1 Fig. RFID designed system for pilgrim identification.

Radio-frequency identification (RFID) is an automatic detection method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The technology requires some extent of cooperation of an RFID reader and an RFID tag.



Fig. 6.2 RFID System

Working of RFID system

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. The readers generally transmit their observations to a computer system running RFID software or RFID middleware. The tag's information is stored electronically in a non-volatile memory. The RFID tag includes a small RF transmitter and receiver.

RFID reader transmits an encoded radio signal to interrogate the tag. The tag receives the message and responds with its identification 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. The interrogator must be close for RF field to be strong enough to transfer sufficient power to the tag. Since tags have individual serial numbers, the RFID system design can discriminate several tags that might be within the range of the RFID reader and read them simultaneously.



Fig.6.3 RFID Tag

The tag is the basic building block of RFID. Each tag consists of an antenna and a small silicon chip that contains a radio receiver, a radio modulator for sending a response back to the reader, control logic, some amount of memory and a power system. The power system can be completely powered by the incoming RF signal, in which case the tag is known as a passive tag. Alternatively, the tag's power system can have a battery, in which case the tag is known as an active tag.

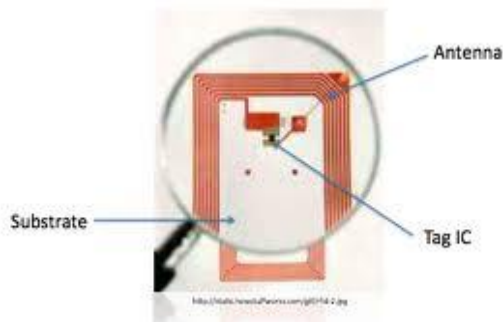


Fig.6.4 .RFID tag

Passive tags, on the other hand, can be much smaller and cheaper than active ones because they don't have batteries. Another advantage is their longer shelf life: Whereas an active tag's batteries may last only a few years, a passive tag could in principle be read many decades after the chip was manufactured.

Tags come in all shapes and sizes. The smallest tag that has ever been produced is the Hitachi mu-chip, which is less than 0.4mm on a side. Designed to be embedded in a piece of paper and used for tracking documents printed in an office environment, the mu-chip can be read only at a

distance of a few centimeters. Of course, the mu-chip is a passive tag. With a larger antenna it could have a significantly longer reading range.

Other small tags are the implantable tags the size of a grain of rice manufactured by VeriChip. Like the mu-chip, these passive tags have a very limited reading range; their intended application is to give machine-readable serial numbers to people. The chips can be used to authenticate people in high-security environments—unlike passwords, the implanted chips can't be easily shared.

RFID tags can be promiscuous, in which case they will communicate with any reader. Alternatively, they can be secure, requiring that the reader provide a password or other kind of authentication credential before the tags respond. The vast majority of RFID tags that have been deployed are promiscuous. Not only are these tags cheaper, but the systems also are much easier to manage. Systems that employ passwords or encryption codes require that the codes be distributed in advance and properly controlled. This is an exceedingly difficult management problem.

EPC Data Standard- 96 bit

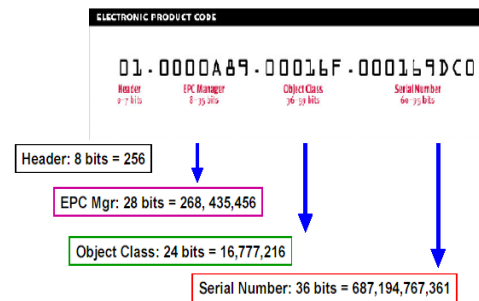


Fig.6.5 Electronic Product Code of a Tag

An Electronic Product Code (EPC) is one common type of data stored in a tag. When written into the tag by an RFID printer, the tag contains a 96-bit string of data. The first eight bits are a header which identifies the version of the protocol. The next 28 bits identify the organization that manages the data for this tag; the organization number is assigned by the EPC Global consortium. The next 24 bits are an object class, identifying the kind of product; the last 36 bits are a unique serial number for a particular tag. Identify a particular product.

RFID tags can interfere with each other. When multiple tags are present in a reader's field, the reader may be unable to decipher the signals from the tags. The systems are optimized so that only one tag is within range at a time. However, for other applications, reading multiple tags at once is essential. For these applications, the tags need to support either an anticollision protocol or, more commonly, a singulation protocol. A singulation protocol allows a reader to determine that multiple tags are visible and to iterate through the tags, getting them to take turns

responding so that each may be read without interference from the others.

RFID Readers

The RFID reader sends a pulse of radio energy to the tag and listens for the tag's response. The tag detects this energy and sends back a response that contains the tag's serial number and possibly other information as well. In simple RFID systems, the reader's pulse of energy functioned as an on-off switch; in more sophisticated systems, the reader's RF signal can contain commands to the tag, instructions to read or write memory that the tag contains, and even passwords. RFID readers were designed to read only a particular kind of tag, but so-called multimode readers that can read many different kinds of tags are becoming increasingly popular.

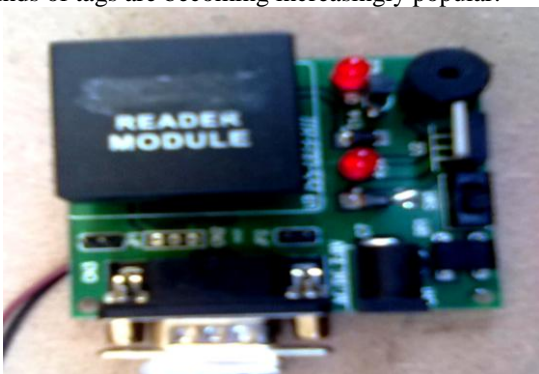


Fig.6.6 RFID Reader

RFID readers are usually on, continually transmitting radio energy and awaiting any tags that enter their field of operation. However, for some applications, this is unnecessary and could be undesirable in battery-powered devices that need to conserve energy. Thus, it is possible to configure an RFID reader so that it sends the radio pulse only in response to an external event.

Like the tags themselves, RFID readers come in many sizes. The largest readers might consist of a desktop personal computer with a special card and multiple antennas connected to the card through shielded cable. Such a reader would typically have a network connection as well so that it could report tags that it reads to other computers. The smallest readers are the size of a postage stamp and are designed to be embedded in mobile telephones.

VII. RESULT

Pilgrim identification, which can be guided by RF communication, was developed. The pilgrim management by counting them using IR sensor and access controlling them uses DC motor at transport terminals. The result obtained clearly demonstrates that the system is easy to handle by the pilgrimage officers.

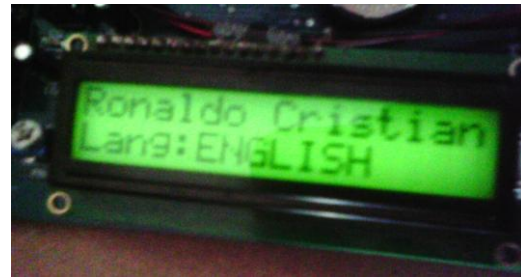


Fig.7.1 Identification of pilgrim

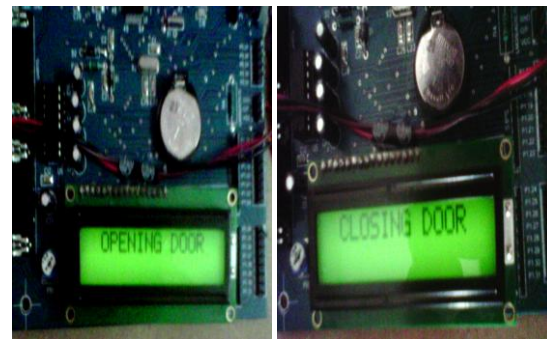


Fig. 7.2. Access control of RFID based System



Fig 7.3. Identification of Unauthorized Pilgrim

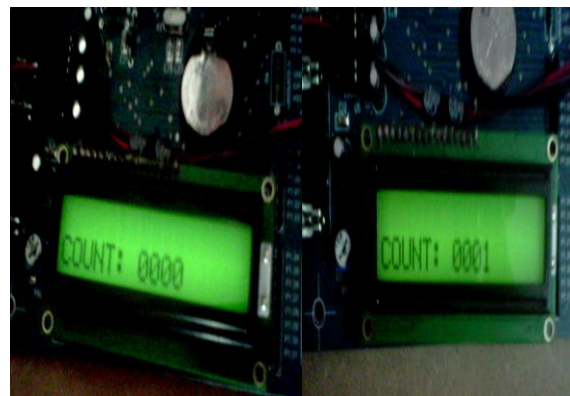


Fig.7.4 .Counting the Number of pilgrims

Table no 2 Observations of RFID Based System

No. of pilgrims	Pilgrim Identification	language	Tag Serial number
1	John pasha	Urdu	0007044836 107,32490
2	Ramu	Telugu	0008740192 133,23904
3	Robinson	English	0005628646 085,58086
-	Unauthorized person	-	0007044836 107,32484
-	Unauthorized person	-	0005671270 438,45383

VIII. Conclusion

The implementation of RFID Based System for Pilgrim Management in Major Religions and Festivals” was achieved by integrating various features of hardware components. With careful selection and signal interface design, every module has been integrated into the controller enabling it to work optimally and with low power consumption, thereby increasing the time between charging of the battery and extending usage intervals. The main goal of this proposed system to allow officials in major events to identify, search and group pilgrims to facilitate transporting them to the pilgrimage.

The presented system can be adapted with necessary modification for pilgrim identification, counting and managing them.

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