

RFID Reader using Arduino

M.Yashaswini

Student B.Tech, Department of EEE
SRMIST

Sundram Sharma

Student B.Tech, Department of EEE
SRMIST

Prerna Pandey

Student B.Tech, Department of EEE
SRMIST

Abstract:- Radio-Frequency Identification (RFID) makes utilization of EM waves to differentiate and track labels joined to objects naturally. It uses labels or tags in the object which are to be tracked or identified. Readers (transmitter and receiver which can work both the ways) send a signal directed towards the tag and then read its response. These tags have data or information stored in them electronically. These tags receive the signal and then in turn respond back to it with information. They are different in relation to standardized tag like barcodes because they don't require being inside the viewable pathway of the reader. As of late, RFID has begun to play role in many of the applications that help in accelerating the process of handling goods. These RFID tags not being big in size can be incorporated in the consumer products and also implanted inside pets. A RFID tag could likewise be appended to a vehicle amid its creation and afterward it can be used to keep check on its development through this system. An RFID tag may also be incorporated within an automobile during its production and then it can track the progress of the automobile. This proposed RFID using Arduino has multiple applications, scope of which has been described further.

Keywords :- Microcontrollers, Transceivers, Transponders, Arduino Software.

I. INTRODUCTION

RFID utilization has expanded at a gigantic rate as of because of the fact that it could be connected to different fields. It is a technology that first came into existence in the beginning of 20th century. The real benefit of utilizing RFID is its diminished cost over the previous years. The working of RFID reader involves a tag and a reader. It has an antenna which captures the radio frequency signals and response is perceived by the reader. RFID readers are brilliant gadgets whose memory can incorporate an extensive variety of data. This device is used over large distances without needing viewable pathway communication and because of this it has started replacing the traditional barcode system. Moreover it could be embedded to a physical product [1] [2].

Latest progressions in this innovation have made it conceivable to be utilized as a part of Visas and animal identification. It reduces human work load. It has an incorporated circuit which sends and receives signal. This could be incorporated in aeroplanes where the signals bounce back to and fro. An additional advantage of this technology is that it is easily available and hence is used all around the world. RFID innovation has recently gained popularity among the R&D sectors of various organisations the main reason being its functional potential in supply chain. It is often argued as the new revolution in supply chain.

Here we have explored the idea of using RFID technology for automatic door lock system application. This system would verify the tags on the doorway and if the intruder has the appropriate tag, the servomotor attached to the door will operate paving way for the person entering. At the same time a text can be displayed on the LCD screen like if the entry tag is verified "Access granted" and otherwise it can be displayed as "Access denied". This could also be further extended by connecting an alarm in the circuit. If the person without access is trying to enter the alarm could be made to ring. This coding could be done using arduino. This can be used in hotels, colleges, seminars etc. to eliminate the need of manual checking of persons entering the place. A basic RFID framework comprises of three basic components [1]:

- Antenna
- Transceiver (transmitted + receiver)
- Transponder (Radio Frequency tags) electronically modified with data.

A. Antenna

Radio frequency signals emitted by antenna are required to activate the tag. Antennas are the specialized gadget between the tag and the handset by which information securing and correspondence is controlled. Antennas could be made in different shapes and size; they could be incorporated with a door jamb to detect tag from people or things going through the entryway. In the availability of multiple tags electromagnetic field is being produced. If consistent cross examination isn't required, a field could be actuated by a sensor gadget. The antenna is joined with the transceiver and decoder to make up a reader that could be utilized either as a handheld or a settled mount gadget.

Radio waves are being transmitted between read distance of within 100 feet or more, based on the power yield and the radio frequency utilized. At the point when a RFID tag goes through the EM zone, it recognizes the user's signal. The information is being decoded by the user in the tag's coordinated circuit and the information is being prepared in the host PC [2].

B. Tags (transponders)

A RFID tag has a microchip that contains data and it has an antenna which will transmits the obtained information remotely to the reader. Generally, the chip will contain a serial identifier, or tag number, that particularly distinguishes that thing, like the way numerous standardized tags like barcodes are utilized today. The key contrast between these is that these tags have a greater information limit than their standardized identification partners i.e. barcodes. This expands the kind of information that is recorded on the tag, including the producer,

group or parcel number, weight and history, (for example, the temperature range to which a thing has been exposed).

In fact, there is a boundless rundown of different sorts of data can be put away on RFID tags, contingent upon what the application demands. A RFID tag could be set on singular things, cases for ID purposes, and additionally on fixed resources.

There are majorly three categories of tags which are: Passive tags, active tags and passive tags which are supported by batteries. Passive tags are low cost out of all three types. They operate without battery. The other type which is active tags supply power to a tag and have a built in battery. The Passive tags communicate or transfer their data only when they are activated by a reader. "Active" tags are capable of broadcasting their data with the use of their own battery. This means that these active tags will definitely have a larger reading range than the passive tags. They have approximate read range of 100 feet or more as compared to the read range of passive tags which is only 15feet. But since active tags have this advantage they are costlier than the passive tags. The active tags are considerably more prone to be utilized for high-esteem things or fixed resources, for example, trailers, where the cost is insignificant contrasted with value of the item, and long read ranges are required. Applications like supply chain etc make use of the passive tags because of their reduced cost [3].

C. RF Transceiver

The RF transceiver is component which produces the RF energy. This energy is given to the tags for activating them and this power is also provided to the passive tags. The RF transceiver and reader are kept within a single cabinet. Whenever they are used as separate equipment, then the transceiver is also termed to as an RF module. The RF is controlled and modulated by the RF transceivers and the antenna can be used to both transmit the signals and receive them.

II. BLOCK DIAGRAM

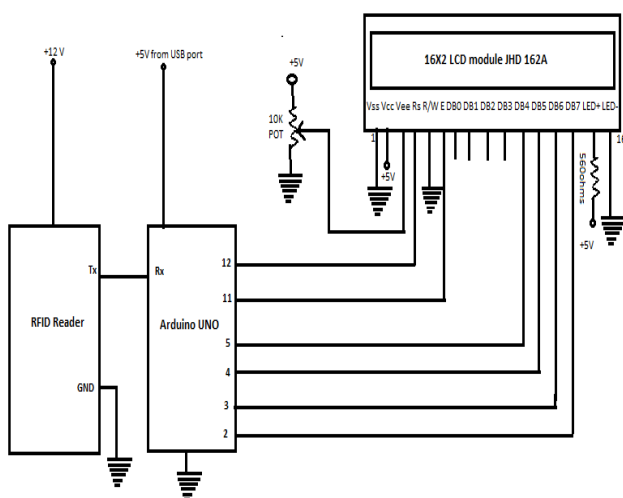


Fig 1:- Block Diagram

III. EXPLANATION OF BLOCK DIAGRAM

A. ARDUINO UNO

Here we have used an Arduino Uno in this. It is actually a microcontroller which is in accordance with the datasheet of ATmega328P. This has 14 input/output pins which are digital, from which 6 pins could be used as Pulse Width Modulation outputs, 6 of them are analog inputs. It also has a quartz crystal (16 MHz). It has a port for USB connection. It also has button for reset.

B. RFID Reader

These are the device which use RF signals to transfer the information between a RFID tag and itself wirelessly. It is mainly used to identify, classify and track the assets. If it is combined with the right software the reader could identify the objects quickly and accurately also at decreased cost. This RFID reader can be categorized based on the type of reader and tag. This reader which is passive receives the signals from the tags which are active. The approximate read range of this is between 1-2000 feet [4].

C. Tag

An ordinary RFID tag contains mainly three parts. It is a coordinated circuit with the main goal of controlling the data that can balance the radio range frequency signals. A dc source of power is used by the antenna for receiving and transmitting. The main job of RFID reader is to transmit and encode the signal to the tag. These tags have a unique serial number that is provided to them by the manufacturer due to which the RFID readers are able to differentiate between different tags [4].

D. Liquid-crystal display (LCD)

Liquid-crystal display abbreviated as LCD, is a flat display device. It is an electronically adjusted optical gadget which makes use of the property of these crystals to modulate light. These liquid crystals do not specially radiate any light, instead they use aback light to create images. They are widely used because during its operation less heat is generated and it also it uses less power for its operation.

E. Servomotor

Thesis basically a linear actuator or rotary actuator that helps us to accurately control linear position or angular position. It comprises of inappropriate motor connected to a sensor which gives feedback about the position.

IV. DRAWBACKS IN RFID

It is difficult for the RFID tags to differentiate between different readers. The distance from which RFID tags are readable is within the range of inches to yards. They are not at all easy to remove because of relatively small size. They can be hidden inside a product because of which the consumer cannot see it. The tag collision of readers could take place if the distance between tags is very less [5].

V. FUTURE SCOPE

RFID technology could be implemented in many applications to reduce human work and increase the efficiency. Moreover their advantageous features encourages us to explore more on this field. Some of the areas where RFID could be applied are given below:

A. Tracking of Items

Tracking of items on is necessary in retail sector; especially in large scale this becomes very much beneficial by the usage of RFID. One more added benefit is that the store employees can count inventory within minutes with a handheld RFID reader [5].

B. Race timing

RFID has always been used in race timing since long, but often the race participants don't realize that they're being tracked using RFID's. This makes RFID to provide a great consumer experience [5].

C. Tracking of IT Assets

IT resources, for example, PCs, tablets, and different varieties of gear are exorbitant ventures for any organization and the data put away on these things are more significant. The IT resource tags gives the IT group, capacity to rapidly complete a stock check and make sure everything is set [5] [6].

D. Logistics & Supply Chain

In the supply chain increasing efficiency, reducing errors, and improving quality are the main requirements. In complex manufacturing processes, shipping, and distribution environments, real time data on the status of individual items is necessary. By using RFID this process becomes easier [6].

E. Library Management Systems

An RFID innovation could be utilized as library solution to improve the effectiveness of circulation operations. The checkout and check-in process can be done faster as RFID does not require observable pathway communication.

F. Materials management

In development and other similar ventures, materials take up for the most part the expenditure. Especially on large scale job sites, finding of apparatus can be hectic. RFID technology could be put to use in such situations [6].

G. Tracking of Attendee

RFID innovation could be put to use in substantial meetings, where we have to monitor individuals moving at a consistent pace, and particularly all through meetings. With RFID being used for attendee tracking, we can eliminate the need for registration lines at entrances [6].

H. Access Control

This is an already used common application of RFID. Some places require a level of security for accessing doors, parking lots, conference rooms etc. RFID tags which control the access can restrict the only pre-approved personnel in such places [7].

I. RTLS (Real Time Location System)

In some applications, we might require to follow the real-time location of employees, customers or even some objects in many large scale Industries. RFID's make tracking the location of employees, location of resources etc. efficient and easier.

J. Tracking of Tools

For industries that depend largely on different tools, fasteners, and other items for them managing the availability of those tools is a hectic job. Keeping in mind the quality level, RFID instrument can do the job of tracking like which devices have been taken, which representatives have taken those apparatuses, and which devices have not yet given back to the industry[7].

K. Kiosks

Many kiosks apply RFID to either manage resources or interact with the users. For instance a DVD rental booths makes utilization of RFID DVD tags to ensure clients get their chose film rental. This can be used for other booths/kiosks too [5] [7].

L. Laundry Management Systems

Large companies which manage uniforms of hundreds of staffs could implement this technology in that scenario. This could help to track the number of uniforms given to different staffs, how many times it was ironed, and figure out the missing uniforms. With RFID technology this process becomes less complicated and convenient.

VI. CONCLUSION

In a nut shell this RFID innovation could be implemented in several places like libraries, various organisations management systems. Due to constant progress in the field, the communities are beginning to get involved in its development. It is not difficult to imagine that the RFID tags will increment in control, costs are anticipated to reduce and tag will significantly enhance its effectiveness, security, and exactness. Also major concerns should be tended for successfully implementing this technology so that it will change our personal and work lives and adorns the conventional management for a better outlook and usher for a better tomorrow.

REFERENCES

- [1]. K. Finkenzeller, “RFID Handbook” 2nd Edition, John Wiley & Sons, Ltd., 2003.
- [2]. K. E. Bite, “Improving on passenger and baggage processes at airports with RFID,” in Sustainable Radio Frequency Identification Solutions, C. Turcu, Ed. Rijeka, Croatia: InTech, 2010.
- [3]. Ab.Aziz. M.Z.A, Hadi.N.A.A, Hashim.N.M.Z, Mohamad.N.R and Salleh.A, ‘Development of High Performance and Low Cost Automatic Toll Payment using RFID Technology for Malaysia Environment’, International journal for advance research in engineering and technology, Vol.2, pp.1-7, 2014.
- [4]. Symbol Corporation, XR480 RFID reader data sheet, 2006.
- [5]. D. M. Dobkin, “The RF in RFID: Passive UHF RFID in Practice” Amsterdam, The Netherlands: Elsevier, 2008.
- [6]. Paper on “RFID Based Shopping Cart” by S Jai Ganesh, S Sahithi, S Akhita - International Journal of Innovative Research in Engineering & Management, Volume 2, issue 3, May 2015.
- [7]. J. Choi, H. Lee, D. W. Engels, and R. Elmasri, “Passive UHF RFIDBased Localization Using Detection of Tag Interference on Smart Shelf”, IEEE Transactions on System, Man, and Cybernetics—Part C: Applications and Reviews, Vol. 42, No. 2, pp 268-275, 2012.