

Secured Intelligent Locker System Using Wireless Sensor Networks

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Abstract-

Remote Sensor Networks have restricted assets with conventional information gathering methods. One of the impediments of remote sensor hubs is its natural constrained vitality asset. In this way, planning a viable remote sensor system to augmenting the lifetime of sensor hub so as to limit support and amplify in general framework execution gets significant. In this article, we have sketched out the configuration factors and difficulties in sensor systems. In this paper, we propose a versatile way to protect a valuable locker with help of wireless sensor network. Thus, the arrange expends less vitality and expands the lifetime of the system. WSNs have small sources with existing data collecting techniques. With that we're going to design a safe locker with sensors to report that to the headquarters. One of the demerits of wireless sensor nodes is it can't take energy from limited energy resources. So, a low maintenance and highly effective with low consumption of power kind of sensors should be introduced. Here, we figured out the challenges and working conditions. In this paper we use some of basic sensors to detect our environment, and then we transfer those data to the cloud. The notable sensors are ultra-sonic sensor, proximity sensor, IR sensor and temperature sensor to detect the surroundings and also the places where human's hands cannot go.

I. INTRODUCTION:

Overview:

One of the Intelligent Safe's champion highlights is that it includes various electronically controlled and checked wellbeing compartments with customizable time defer locks, which drastic-cally slows down any burglary endeavor. Putting away stock in isolated compartments lessens the retailers' hazard and presentation to expected misfortunes. While the Intelligent Safe gives unshakable fortress to retailers' most important stock, it will likewise fight off and even assistance discover burglars attempting to get to it. Throughout the decade, everybody is worried about the wellbeing of their assets like gems, cash, significant archives and so on. For guaranteeing the well-being of these assets bank can be a viable arrangement. Be that as it may, due to the expanding pace of criminal methodology it gets hard to guarantee security of the resources. Banks are considered as a vulnerable objective of hoodlums. In this condition, guaranteeing security of bank storage spaces ought to be taken into thought. In this way, in a paper we propose a brilliant storage, which is mostly, a sensor-based locker .Wherever around us, sensors and cloud processing innovation are making achievements by presenting computerization and usability applications for our day by day lives.

One such issue we face each day is the the board of simple manual storage frameworks. Absence of room assuming a significant job in this current, it's progressively critical to use to existing storage spaces productively than to include new ones. Other issues which we face in this conventional framework incorporate wellbeing, security and dependability of use. The answer for this is to move the methodology

from simple to advanced and interfacing the system to the web utilizing basics of IOT and Cloud Computing. Alongside utilizing distinctive electronic gadgets and microcontrollers for the equivalent.

This shrewd storage the executives framework gives highlights like simple task of new storage spaces to clients, the executives of existing storage spaces and support for the equivalent. The greater part of the capacities included are computerized so the procedure is quicker, simpler and increasingly proficient. There are likewise a few difficulties looked in the framework like loss of enrolled telephone, camera and GPS. In this paper, a keen storage framework model utilizing sensors will be introduced to investigate the consistency of the storage being utilized and remotely utilize the storage spaces for streamlining the condition of current assets and accommodation of the client. In this storage framework Solenoid will be utilized for made sure about locking and reed transfers to check the recurrence.

Existing system

The conventional locking framework incorporates keeping up a 'lock what's more, key' based component for every one of its storage spaces. Overseeing such a storage framework is likewise a hard errand on the grounds that the individual in control needs to truly check and keep up a rundown of storage spaces being used which isn't a proficient strategy and can make a great deal of issues. The issue happens in keeping up different keys for numerous storage spaces and to ensure every single one of them is utilized productively.

This conventional storage framework as we as a whole know has been there for longer than a century and its execution hasn't changed a lot thus hasn't the lock which doesn't meet the security prerequisites required for the present world.

Another downside which is centered around is with the key card based storage framework which is the loss of the card and ordinary charging of the card. Everyone of these frameworks are costly and furthermore give insignificant security when contrasted with the framework proposed in this paper. In this day and age where we are moving a long ways ahead from simple things to progressively helpful and computerized executions, it's the need of great importance to make things around us progressively savvy and proficient for our own utilization.

II. BACKGROUND STUDY

Intelligent locker using IOT

Throughout the decade, everybody is worried about the security of their resources like adornments, cash, significant archives and so on. For guaranteeing the security of these resources bank can be a compelling arrangement. Nonetheless, due to the expanding pace of criminal methodology it gets hard to guarantee security of the resources. Banks are considered as an easy objective of hoodlums. In this condition, guaranteeing security of bank storage spaces ought to be taken into thought. Along these lines, in a paper we propose a savvy storage, which is chiefly, an IOT based astute storage. We likewise introduce secret phrase and face location approach.

In this work, we think about one-time secret phrase (OTP). OTP is a unique secret word, which is substantial just for one login meeting. OTP beats various deficiencies of customary or static secret key-based validation. As we propose a shrewd storage for guaranteeing security, guaranteeing approved access and conquering all the abuses. This framework can be relevant in banking part or for any close to home reason.

Thus, we use OTP to conquer unapproved get to. In our framework, an enlisted client can send demand for OTP to open the craving storage. At that point the secret key is send to the client through mail.

The meeting of OTP is set for 20 minutes. OTP has a significant bit of leeway as opposed to static secret word is that they are not defenceless against replay assaults. As OTP has a predefined meeting of legitimacy, so it gets hard to manhandle it by programmers or any sort of interloper. Another significant favourable position of OTP is that it doesn't make defenceless on every one of them, an individual who utilize the equivalent secret key for different framework.

Smart locker using Biometric and GSM technology

We are implementing this bank storage security framework utilizing RFID, biometric unique mark, secret word and GSM Innovation based security framework which give most proficient and solid security framework than the customary framework. A RFID framework comprises of a reception apparatus or loop, a handset (with decoder) and a transponder (RF tag) electronically customized with one of a kind data. There are a wide range of sorts of RFID frameworks in the market.

These are arranged based on their recurrence ranges. Probably the most normally utilized RFID packs are low recurrence (30-300Khz), mid recurrence (900Khz-1500Mhz) furthermore, high recurrence (2.4-2.5Ghz). The aloof labels are lighter and more affordable than the dynamic labels. Biometrics measure individual's novel physical or conduct qualities to perceive or confirm their character.

The physical qualities are unique mark hand, face, iris and so on. furthermore, conduct qualities are mark, voice keystroke designs and so forth. Biometric framework is works in check mode or distinguishing proof mode. In the check mode framework approves individual's character by looking at the caught biometric format which is pre-put away in the framework information base. In the distinguishing proof mode the framework perceive an individual via scanning whole format information base for coordinate.

What's more, the framework is perform one to numerous correlations with build up the individual personality or comes up short if the subject isn't taken a crack at the framework information base. So in our task we are utilizing unique mark biometric security framework. Worldwide framework for versatile correspondence (GSM) is for the most part utilized for sending or on the other hand accepting information, for example, voice and message. In our security framework GSM assumes significant job.

Using the GSM the client will get the message if an unapproved individual will attempt to open the lock. The unique mark sensor utilized here is R305 sensor is having incredible execution, low force utilization, ease, little in size.

The ARMLPC2138 microcontroller is utilized here on the grounds that it plays out various quantities of activities one after another. We are utilizing SIM900A GSM modem to send the message on approved individual versatile.

III. Implementation

Approach

The approach followed for intelligent locker is based on client-server based architecture

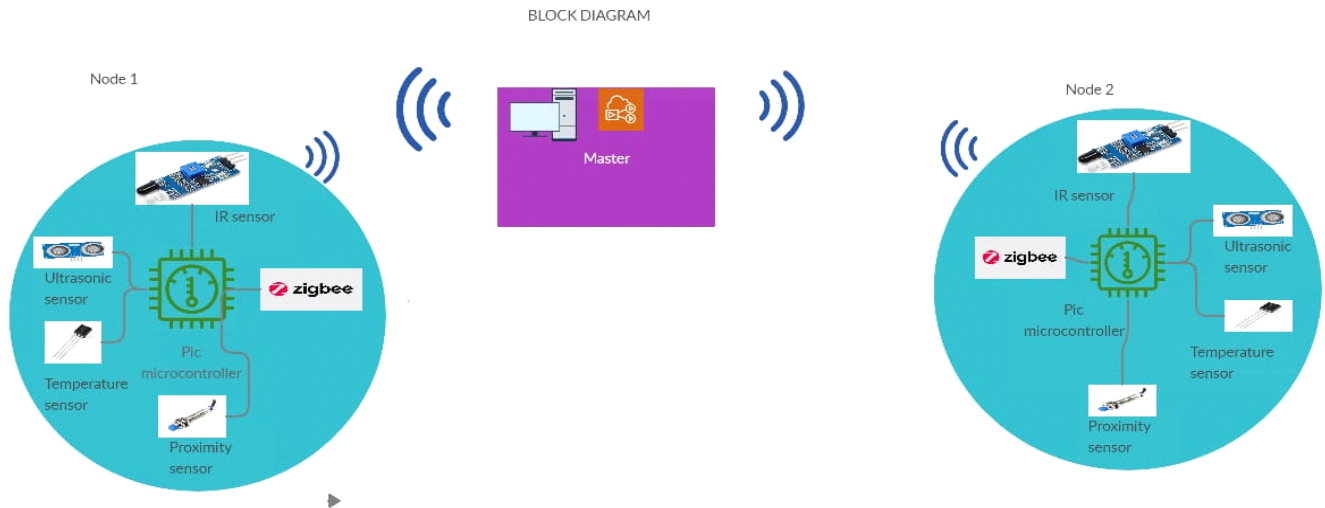


Figure 1 Client-server based architecture

About the architecture

Client-server engineering is a design of a PC organize in which numerous customers ask for and get administration from an incorporated server. Customer PCs give an interface to permit a PC client to demand administrations of the server and to show the outcomes the server returns. Servers trust that solicitations will show up from customers and afterward react to them. In a perfect world, a server gives a normalized straightforward interface to customers with the goal that customers need not know about the particulars of the framework that is offering the assistance. Customers are regularly arranged at workstations or on PCs, while servers are found somewhere else on the system, for the most part on progressively incredible machines. This registering model is particularly powerful when customers and the server each have unmistakable errands that they routinely perform. In emergency clinic information preparing, for instance, a customer PC can be running an application program for entering tolerant data while the server PC is running another program that deals with the database wherein the data is forever put away. Numerous customers can get to the server's data at the same time, and, simultaneously, a customer PC can perform different undertakings, for example, sending information. Since both customer and server PCs are viewed as astute gadgets.

About Wireless sensor networks(WSNs)

A sensor hub in a Wireless Sensor Networks (WSNs) is ordinarily outfitted with a transducer, a radio handset, little small scale controller and a force source (typically batteries) sent in marvel expected to screen at assorted areas. Sensor hubs are fit for detecting numerous kinds of data from nature including temperature, light, moistness, pressure, wind bearing and so on. They ordinarily transmit the obtained information through RF channel to the base station or door. Presently, WSNs has a wide scope of application territories, for example, mechanical procedure observing and control, robot control, ecological checking, environment observing, human services applications, home computerization, object following, traffic control and so on. In any case, WSN has its own structure and asset imperatives issues in rehearses. Asset requirements incorporate a restricted vitality, low range correspondence, low data transfer capacity, and restricted handling power and capacity limit.

The ongoing exploration in WSNs expect to meet these imperatives by presenting new structure ideas, making or improving existing conventions, building new applications, and growing new calculations. Numerous scientists are right now occupied with creating plans that achieve these prerequisites.

A sensor hub in a Wireless Sensor Networks (WSNs) is ordinarily outfitted with a transducer, a radio handset, little smaller scale controller and a force source (generally batteries) conveyed in marvel planned to screen at various areas. Sensor hubs are equipped for detecting numerous kinds of data from the earth including temperature, light, dampness, pressure, wind heading and so on.

They for the most part transmit the procured information through RF channel to the base station or entryway. Presently, WSNs has a wide scope of application zones, for example, mechanical procedure checking and control, robot control, natural observing, living space checking, social insurance applications, home computerization, object following, traffic control and so on. In any case, WSN has its own structure and asset imperatives issues in rehearses. Asset limitations incorporate a restricted vitality, low range correspondence, low transfer speed, and restricted handling power and capacity limit. The ongoing exploration in WSNs expect to assemble these imperatives by presenting new structure ideas, making or improving existing conventions.

About the controller

The microcontroller that has been utilized for this venture is from PIC arrangement. PIC microcontroller is the primary RISC based microcontroller created in CMOS (complimentary metal oxide semiconductor) that utilizations separate transport for guidance and information permitting synchronous access of program and information memory.

The principle preferred position of CMOS and RISC blend is low force utilization bringing about a little chip size with a little pin tally. The principle bit of leeway of CMOS is that it has invulnerability to commotion than other manufacture methods.

Different microcontrollers offer various types of recollections. EEPROM, EPROM, FLASH and so forth are a portion of the recollections of which FLASH is the most as of late created. Innovation that is utilized in pic16F877 is streak innovation, so information is held in any event, when the force is turned off. Simple Programming and Erasing are different highlights of PIC 16F877.

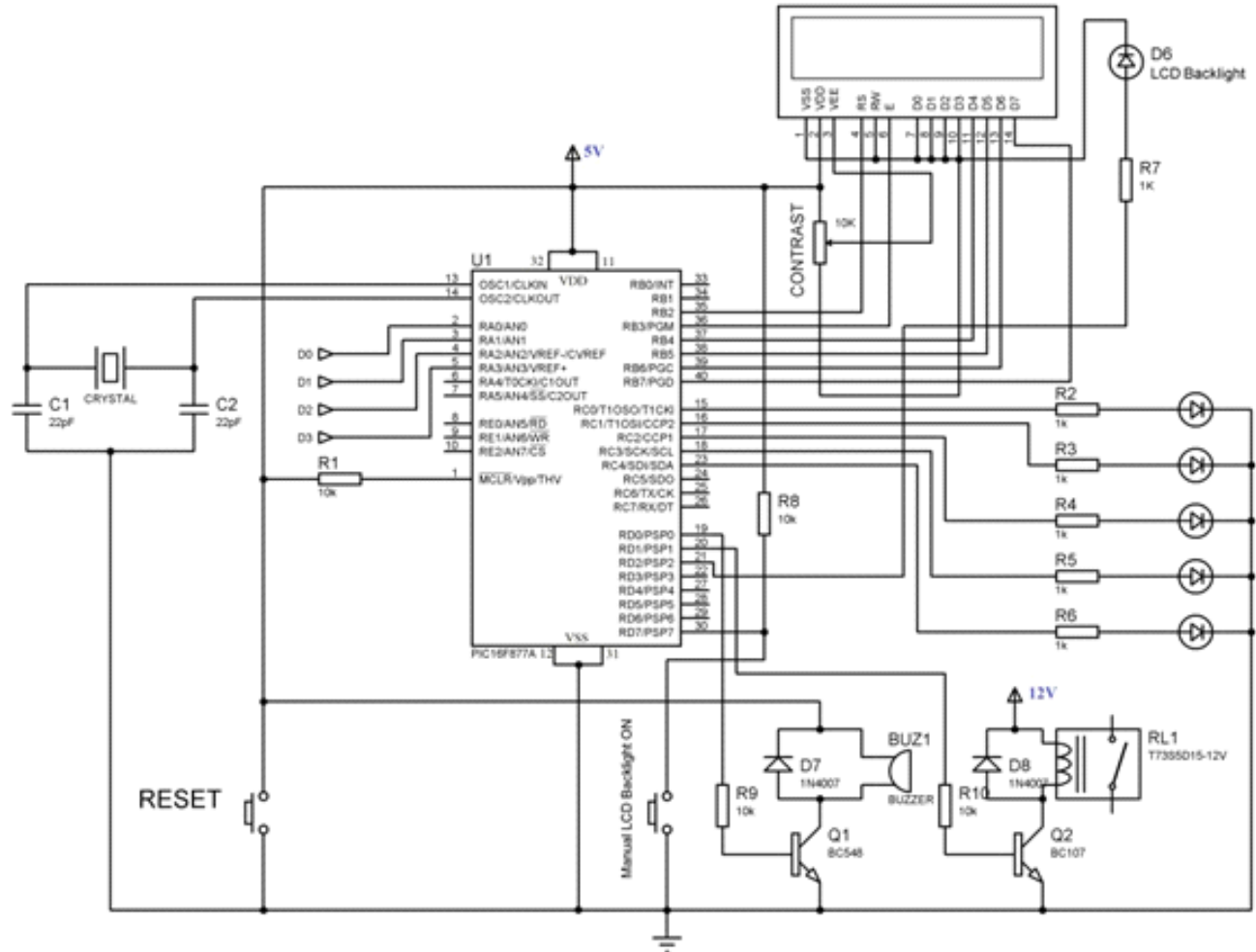


Figure 2 Microcontroller with LED display

About the sensors

IR sensor

We have utilized IR sensor for distinguish the objects. Infrared transmitter is one sort of LED which emanates infrared beams for the most part called as IR Transmitter. Correspondingly IR Receiver (photograph diode) is utilized to get the IR beams sent by the IR transmitter. One significant point is both IR transmitter and recipient ought to be put straight line to one another.

We have utilized IR sensor for identify the objects. Infrared transmitter is one kind of LED which produces infrared beams for the most part called as IR Transmitter. Thus IR Receiver (photograph diode) is utilized to get the IR beams communicated by the IR transmitter. One significant point is both IR transmitter and recipient ought to be set straight line to one another.

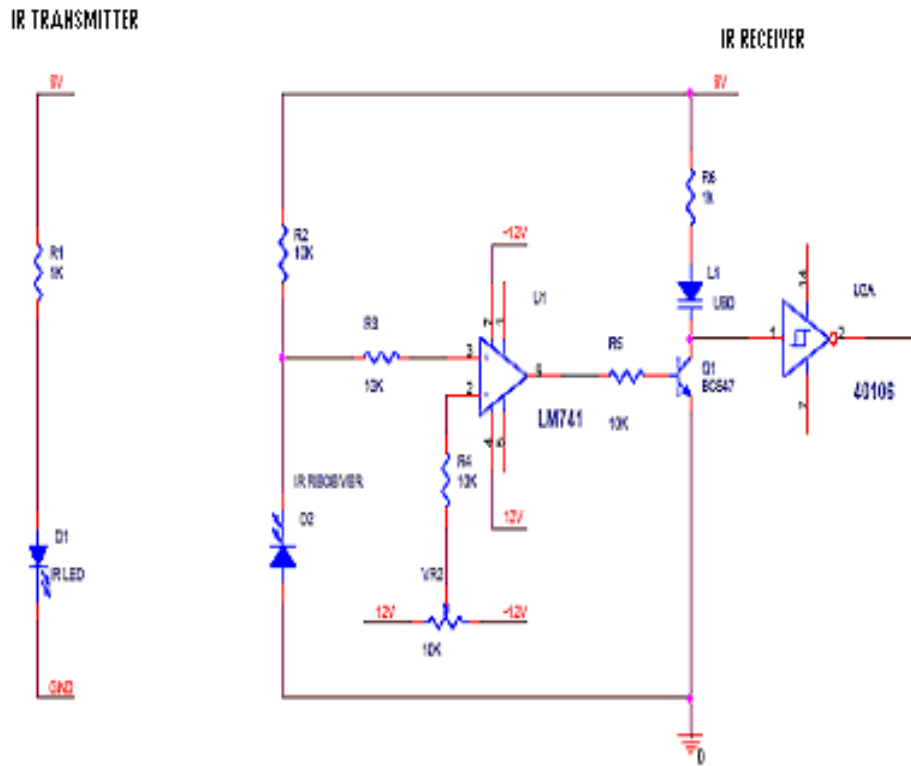


Figure 3 IR sensor

Temperature sensor

The LM35 arrangement area unit truth incorporated circuit temperature sensors, whose yield voltage is directly resembling the Anders Celsius (Centigrade) temperature. The LM35 during this manner features a little bit of leeway over direct temperature sensors adjusted in ° Kelvin, because the shopper is not needed to require away a colossal consistent voltage from its yield to accumulate useful Centigrade scaling. The LM35 does not need any outside alignment or cutting to grant average correctnesses of $\pm 1/4^{\circ}\text{C}$ at temperature temperature over a full -55 to $+150^{\circ}\text{C}$ temperature extend.

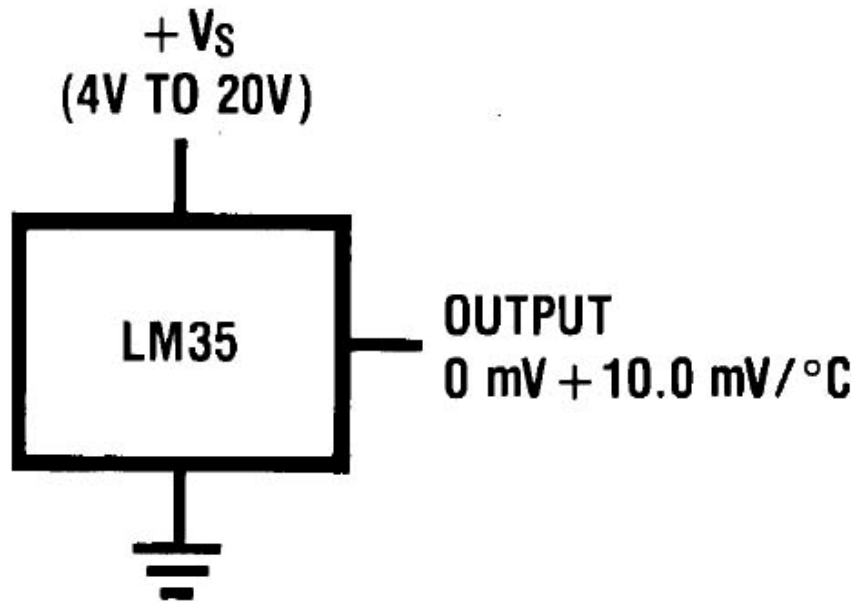


Figure 4 Temperature sensor

Proximity sensor

Proximity sensors will be sensors ready to recognize the nearness of close by objects with no physical contact. A proximity sensor frequently discharges an electromagnetic or electrostatic field, or a light emission radiation (infrared, for example), and searches for changes in the field or bring signal back. The item being detected is regularly alluded to as the vicinity sensor's objective. Diverse nearness sensor targets request various sensors. For instance, a capacitive or photoelectric sensor may be appropriate for a plastic objective; an inductive nearness sensor requires a metal objective.

SPEED MEASUREMENT USING PROXIMITY SENSOR

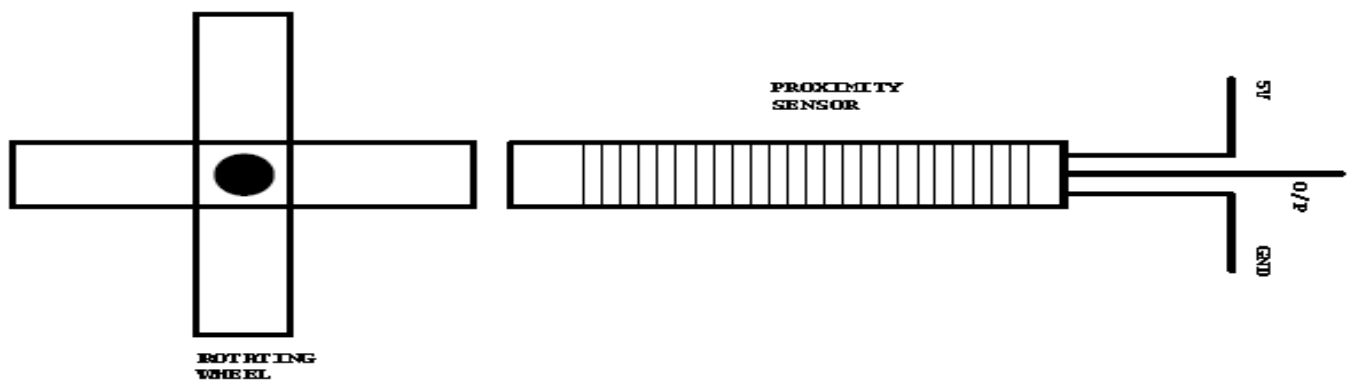


Figure 5 Proximity sensor

Ultrasonic sensor

In ultrasonic sensor the transmitter continually passing the beams noticeable all around and the beneficiary consistently get the signs from the reflected waves. The ultrasonic wave is spread noticeable all around and hit the closest item and reflected from the article which is gotten by the ultrasonic beneficiary.

The got wave is provided to speaker so as to intensify the got frail sign. After the intensification the enhanced wave is given to zero modification enhancer on the grounds that the enhanced wave is in the scope of above 6v level. At that point the yield is given to comparator in which the wave signal is changed over into relating square wave signal. At that point the square wave signal is given to contribution of the microcontroller.

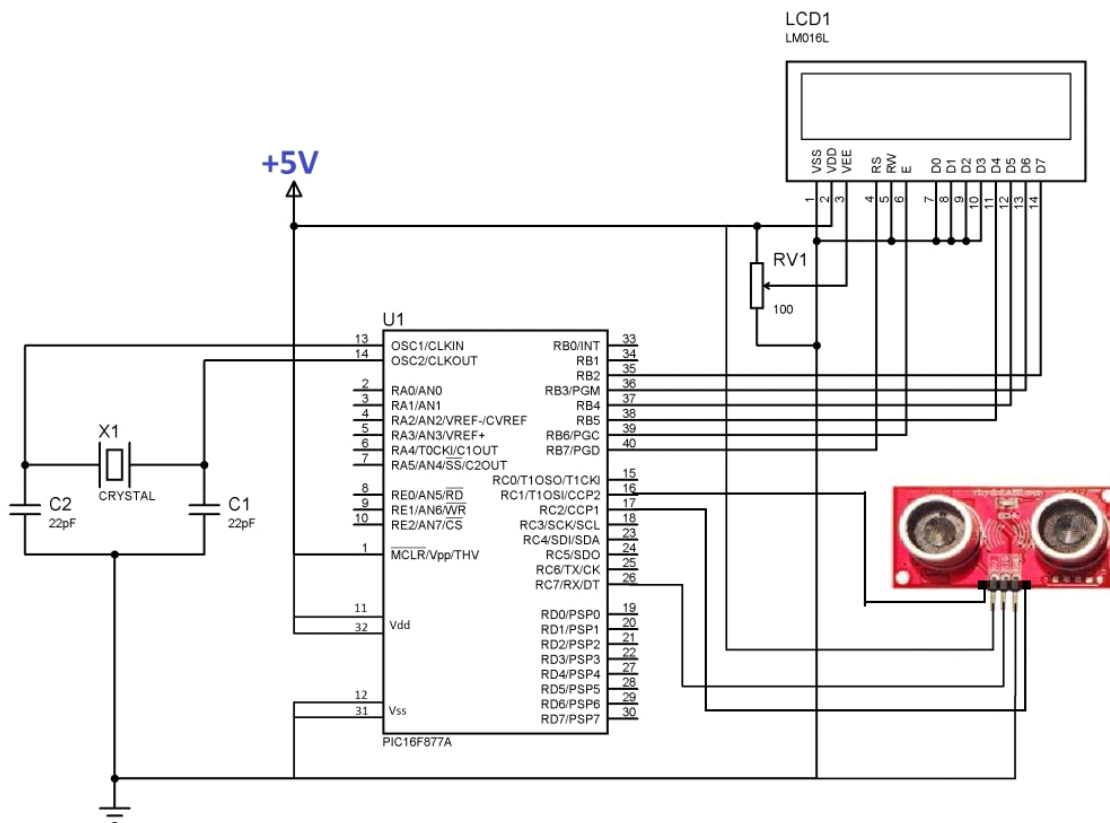


Figure 6 Ultrasonic sensor

ZIG BEE

ZigBee module. The €1 coin, appeared for size reference, is about a similar size as a US quarter.

ZigBee is a particular for a set-up of significant level correspondence conventions utilizing little, low-power advanced radios dependent on an IEEE 802 norm for individual zone systems. ZigBee gadgets are frequently utilized in work arrange structure to communicate information over longer separations, going information through middle of the road gadgets to arrive at progressively far off ones. This permits ZigBee systems to be shaped specially appointed, with no brought together control or high-power transmitter/recipient ready to arrive at all of the gadgets. Any ZigBee gadget can be entrusted with running the system



Figure 7 ZIGBEE module

ZigBee is focused at applications that require a low information rate, long battery life, and secure systems administration. ZigBee has a characterized pace of 250 kbit/s, most appropriate for occasional or discontinuous information or a solitary sign transmission from a sensor or info gadget. Applications incorporate remote light switches, electrical meters with in-home-shows, traffic the board frameworks, and other buyer and mechanical hardware that requires short-extend remote exchange of information at generally low rates. The innovation characterized by the ZigBee particular is planned to be less difficult and more affordable than different WPANs, for example, Bluetooth.

ZIGBEE technology

ZigBee is a minimal effort, low-power, remote work arrange standard. The ease permits the innovation to be broadly conveyed in remote control and checking applications. Low force utilization permits longer existence with littler batteries. Work organizing gives high dependability and increasingly broad range. ZigBee chip merchants regularly sell incorporated radios and microcontrollers with somewhere in the range of 60 KB and 256 KB blaze memory. ZigBee works in the mechanical, logical and clinical (ISM) radio groups; 868 MHz in Europe, 915 MHz in the USA and Australia, and 2.4 GHz in many locales around the world. Information transmission rates shift from 20 to 900 kilobits/second.

The ZigBee organize layer locally bolsters both star and tree normal systems, and nonexclusive work systems. Each system must have one organizer gadget, entrusted with its creation, the control of its boundaries and fundamental upkeep. Inside star organizes, the organizer must be the focal hub. The two trees and networks permits the utilization of ZigBee switches to expand correspondence at the system level.

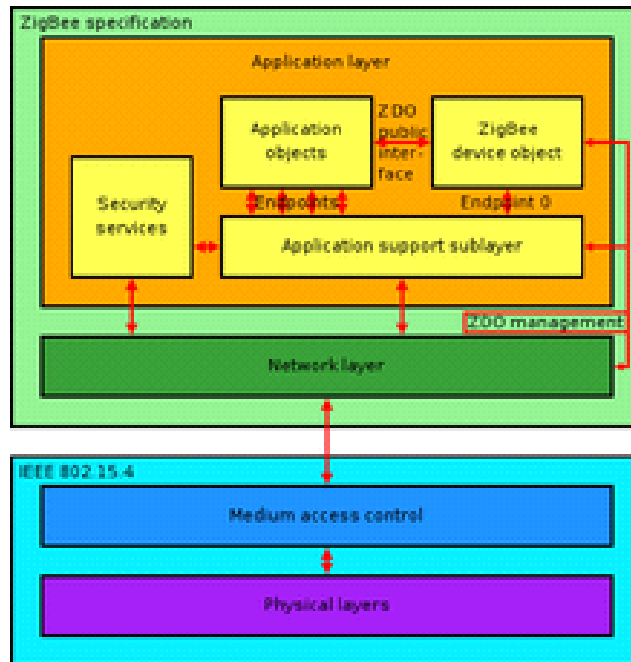


Figure 8 ZIGBEE layers

Security techniques

We are using AES and Diffie Hellman key exchange algorithm for security purpose.

Sharing information safely in cloud is a significant undertaking. This segment clarifies how information are safely, proficiently and deftly put away in cloud. The proposed framework depicts the open key cryptosystems that gives fixed size figure messages classes that speaks to superior of unscrambling of keys are accessible for all the figure text that are made. The information Owner can discharge a fixed-size of single key and the rest of the records that are encoded stays secret. These single key can be sent to others in any case put away in a card with set number of capacity gadgets. AES and Diffie Hellman Key Exchange Algorithm are utilized to improve the security of the strategy.

Steps

- Sender will encode all the documents from the cloud utilizing a solitary key and the individual keys are given straightforwardly to the collector.
- Sender will encode each record with unmistakable key and send the mystery keys to the beneficiary.

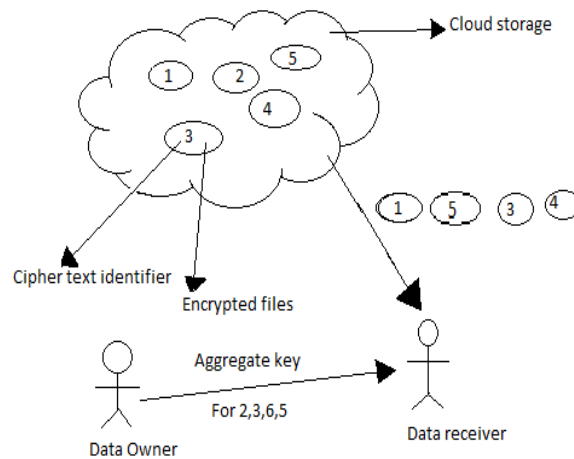


Figure 9 Data Sender shares files with id 2,3and 8 with Data Receiver by sending him an aggregate key

Algorithm

- Arrangement: Files are encoded and kept in cloud.
- KeyGen: Generating the keys to the client. It will deliver the Output as open and experts mystery key pair.
- Encode: For Message and the record $I \{1, 2, \dots, n\}$, the qualities are arbitrarily chosen and the figure text are created. AES calculation is utilized for scrambling the records
- Concentrate: For the set S of files the total key is processed as KS . Since S does exclude 0, can AES encode is the ideal apparatus for any individual who consistently be recovered from param.
- Decode ($KS, S, C = c1, c2, c3$): If S , yield. Something else, return the message: m for the information proprietor.

DES WORKING

The encryption procedure is made of two changes (P-boxes), which we call introductory and last stages, and sixteen Feistel adjusts. Each round uses an alternate 48-bit round key produced from the code key as indicated by a predefined calculation shows the components of DES figure at the encryption site.

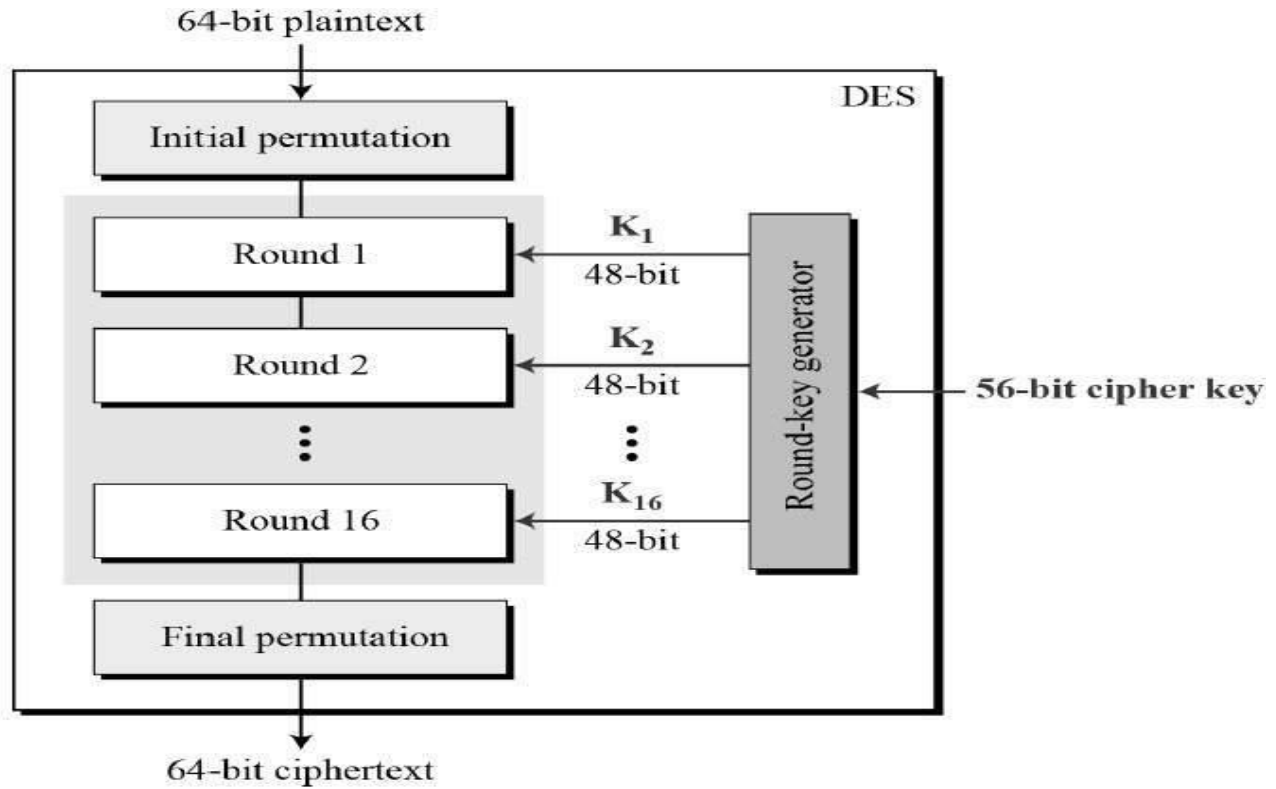


FIG 10 DES Structure

Initial and Final permutation

The underlying and last changes (P-boxes). Every one of these changes takes a 64-bits input and permutes them as per a predefined rule. We have demonstrated just a couple of info ports and the comparing yield ports. For instance, in the underlying stage, the 58bits in the info turns into the principal bit in the yield. Thus, in the last stage, the primary bit in the information turns into the 58bits in the yield. As it were, if the rounds between these two changes don't exist, the 58bits entering the underlying stage is equivalent to the 58bits leaving the last change.

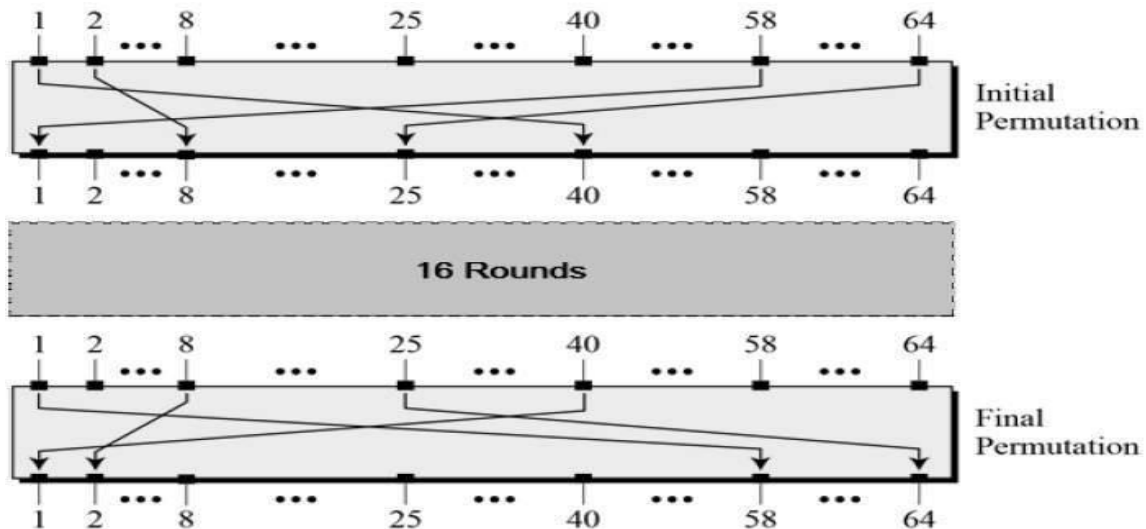


FIG 11 Initial and Final Permutation.

The change rules for these P-confines are demonstrated Each side of the table can be thought of as a 64-element array. Note that, similarly as with any change table we have examined up until now, the estimation of every component characterizes the information port number, and the request (file) of the component characterizes the yield port number

<i>Initial Permutation</i>	<i>Final Permutation</i>
58 50 42 34 26 18 10 02	40 08 48 16 56 24 64 32
60 52 44 36 28 20 12 04	39 07 47 15 55 23 63 31
62 54 46 38 30 22 14 06	38 06 46 14 54 22 62 30
64 56 48 40 32 24 16 08	37 05 45 13 53 21 61 29
57 49 41 33 25 17 09 01	36 04 44 12 52 20 60 28
59 51 43 35 27 19 11 03	35 03 43 11 51 19 59 27
61 53 45 37 29 21 13 05	34 02 42 10 50 18 58 26
63 55 47 39 31 23 15 07	33 01 41 09 49 17 57 25

FIG 12 Permutation Table of the mechanism

These two stages have no cryptography importance in DES. The two changes are keyless and foreordained. The explanation they are remembered for DES isn't clear and has not been uncovered by the DES creators. The speculation is that DES was intended to be actualized in equipment (on chips) and that these two complex changes may ruin a product recreation of the system.

IV. RESULT

From this system, we can easily monitor the valuable things through the applications. Sensors will updates the signal inputs to the application for every seconds. If any changes appeared in the output, we can easily alert the police and no false data will be showed in the locker system.

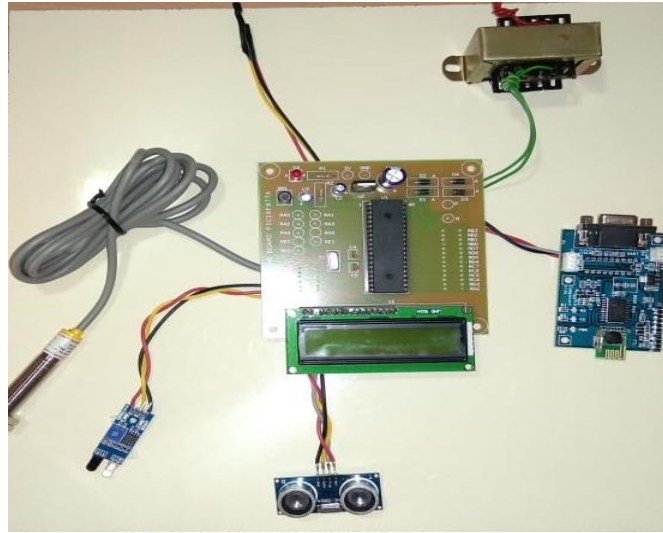


FIG 13 Controller connected to sensors with zigbee module.

Show 10 entries Search:

LogID	DATA	Logdate	LogTime
20	-DATA__T:030_P:N_IR:N_D:4__	06/27/2020	13:02:50
63	2-DATA__T:030_P:N_IR:Y_D:46__	07/08/2020	11:40:56
67	:030_P:N_IR:N_D:1__	07/08/2020	11:41:47
62	S	07/08/2020	11:40:53
10	S1-DATA__T:030_P:__IR:__D:7__	06/27/2020	12:59:59
23	S1-DATA__T:030_P:N_IR:__D:9__S1-DATA__T:030_P:__IR: D: __S1-DATA__T:030_P:I_IR:D:D: __	07/08/2020	11:32:01
18	S1-DATA__T:030_P:N_IR:N_D:66__	06/27/2020	13:02:20
22	S1-DATA__T:030_P:N_IR:N_D:66__	06/27/2020	13:03:08
6	S1-DATA__T:030_P:N_IR:N_D:6__	06/27/2020	12:59:08
34	S1-DATA__T:030_P:N_IR:Y_D:86__	07/08/2020	11:34:35

Showing 1 to 10 of 24 entries

Previous 1 2 3 Next

FIG 14 Data output of all sensors.

V. CONCLUSION

Intelligent locker system uses fully wireless, Bluetooth enabled lock which is far more secured. There are many industries which requires fast access to locker. This system are supplied with transmitter with an durability for 1.5 years with its ease of installation and use, minimum complexity, strong flexibility and wide applicability options. Therefore after examining the detailed evaluation and explanation of this phase, the project really tackles the security concerns to eliminates all worries which might cause a threat to a systems success and prosperity.

REFERENCES

- [1] Divya Sharma, Sandeep Verma, Kanika Sharma, "Network Topologies in Wireless Sensor Networks: A Review", International Journal of Electronics & Communication Technology, IJECT Vol. 4, Issue Spl - 3, April - June 2013
- [2] KazemSohraby, Danielminoli ,TaiebZnati,“WIRELESS SENSOR NETWORKS :Technology, Protocols, and Applications”, published by John Wiley & Sons, Inc., Hoboken ew Jersey, 2007.
- [3] Al-Karaki, J.N.; Kamal, A.E.,“AI-Routing techniques in wireless sensor networks: a survey”, Wireless Communications, IEEE International Conference, Vol. 11, No. 6, pp. 6 - 28, 2004.
- [4] Kazemsohraby, Daniel Minoli, Taieb Znati,“Wireless Sensor Networks”, Technology, Protocols and applications, 2007.
- [5] Hongbin Chen, Chi K. Tse, and JiuchaoFeng," Impact of Topology on Performance and Energy Efficiency in Wireless Sensor Networks for SourceExtraction", IEEE Transactions on Parallel AndDistributed Systems, Vol. 20, No. 6, June 2009
- [6] Divya Sharma, Sandeep Verma, Kanika Sharma, "Network Topologies in Wireless Sensor Networks: A Review", International Journal of Electronics & Communication Technology, Vol. 4, Issue Spl - 3, April - June 2013
- [7] MohamedYounis, Kemal Akkaya, "Strategies and techniques for node placement in wireless sensor networks: A survey", Adhoc Networks 6 (2008) 621–655.