

SMART WAY TO CATCH THE THEFT VEHICLE ALONG WITH THE THEFT PERSON

Submitted in partial fulfillment of the requirements for
the award of
Bachelor of Engineering degree in Computer Science and Engineering
by
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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SCHOOL OF
COMPUTING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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BONAFIDE CERTIFICATE

This is to certify that this project report is the bonafide work of **Gudimetla Dhana Satya Manikanta Reddy (Reg. No. 36110420)** who carried out the project entitled **“SMART WAY TO CATCH THE THEFT VEHICLE ALONG WITH THE THEFT PERSON”** under our supervision from November 2019 to April 2020.

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SMART WAY TO CATCH THE THEFT VEHICLE ALONG WITH THE THEFT PERSON

ABSTRACT:

The existed ventures are mostly focused on the area following of the robbery vehicle and furthermore by the validation of the client, so they totally center around the vehicle area which was lost. Notwithstanding this we accompanied a thought in which we utilized RSSI(Received Signal Strength Indicator) which is utilized to follow the vehicle by utilizing the sign quality wonders which is interconnected with the client and the vehicle. The principle bit of leeway of the task isn't just getting the burglary vehicle yet in addition getting the hoodlum alongside the vehicle to ensure that the criminal is caught in the vehicle. Our main motto of the project is to catch the thief along with the theft vehicle. So in this we have taken Rssi used as a signal strength between the owner and the vehicle and then Arduino acts as the heart of the project in which all the components like Rssi, motor, buzzer, Lcd, Gsm etc are connected to it. Lcd is used to display the operations going on like connection of Rssi, Mobile connection etc. The switch is used to make the Rssi to on and off, If the switch is on and the Rssi is enabled then the owners phone can be connected and once the phone is connected then based on the signal strength between the phone and the Rssi the buzzer works if and only if the signal strength between the phone and Rssi is very low. Followed by the motor which stops working if the signal reduced so that very low.

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LIST OF ABBREVIATIONS

1.	LED	Light emitting diode
2.	RSSI	Received signal strength indicator
3.	DFL	Device-free localization
4.	COTS	Commercial-off-the-shelf
5.	CWT	Continuous wavelet transform
6.	RP	Reference points
7.	KNN	K-nearest neighbors
8.	IOT	Internet of Things
9.	LoRaWAN	Long Range Wide Area Network

1. INTRODUCTION

1.1 GENERAL :

Our main motto of the project is to catch the thief along with the theft vehicle. So in this we have taken Rssi used as a signal strength between the owner and the vehicle and then Arduino acts as the heart of the project in which all the components like Rssi, motor, buzzer, Lcd, Gsm etc are connected to it. Lcd is used to display the operations going on like connection of Rssi, Mobile connection etc. The switch is used to make the Rssi to on and off, If the switch is on and the Rssi is enabled then the owners phone can be connected and once the phone is connected then based on the signal strength between the phone and the Rssi the buzzer works if and only if the signal strength between the phone and Rssi is very low. Followed by the motor which stops working if the signal reduced so that very low. The existed ventures are mostly focused on the area following of the robbery vehicle and furthermore by the validation of the client, so they totally center around the vehicle area which was lost. Notwithstanding this we accompanied a thought in which we utilized RSSI(Received Signal Strength Indicator) which is utilized to follow the vehicle by utilizing the sign quality wonders which is interconnected with the client and the vehicle. The principle bit of leeway of the task isn't just getting the burglary vehicle yet in addition getting the hoodlum alongside the vehicle to ensure that the criminal is caught in the vehicle

1.2. OBJECTIVE :

In general, there are many techniques and procedures followed by the projects to make the vehicle security to increase but as we increase the security levels there is no decrease in theft so, my objective is to catch the theft vehicle along with the thief by making him to trap inside the car and not letting him to escape without the authentication of the user. The existed ventures are mostly focused on the area following of the robbery vehicle and furthermore by the validation of the client, so they totally center around the vehicle area which was lost. Notwithstanding this we accompanied a thought in which we utilized RSSI(Received Signal Strength Indicator) which is utilized to follow the vehicle by utilizing the sign quality wonders

which is interconnected with the client and the vehicle. The principle bit of leeway of the task isn't just getting the burglary vehicle yet in addition getting the hoodlum alongside the vehicle to ensure that the criminal is caught in the vehicle

2. LITERATURE SURVEY

[1] Device-free localization (DFL) algorithms using the received signal strength indicator (RSSI) metrics have become a popular research focus in recent years as they allow for location-based service using commercial-off-the-shelf(COTS)wireless equipment. However, most existing DFL approaches have limitedapplicability in realistic marthome environments as they typically require extensive offline calibration,large node densities, or use technology that is not readily available in commercial smart homes. In this paper, we introduce SpringLoc and a DFL algorithm that relies on simple parameter tuning and does not require offline measurements. It localizes and tracks an entity using an adaptive spring relaxation approach. The anchor points of the artificial springs are placed in regions containing the links that are affected by the entity. The affected links are determined by comparing the kernel-based histogram distance of successive RSSI values. SpringLoc is benchmarked against existing algorithms in two diverse and realistic environments, showing significant improvement over the state-of-the-art,especially insituations with low-noded employment density.

[2] The performance of localization methods based on the receiver signal strength (RSS) is significantly affected by the signal strength indicator's (RSSI) instability. To date, there is no adequate approach which significantly reduces the impact of such an instability on the localization accuracy. Hence, in this paper, we propose a continuous wavelet transform (CWT)-based feature extraction method for convolutionalneuralnetwork(CNN)-based indoor fingerprinting localization method.The proposed feature extraction method uses the continuous wavelet transform to extract the joint time-frequency representation of each raw RSSI data

which provides more discriminative information. The extracted features are used with a CNN model to efficiently predict the closest reference points (RPs). Then, a K-nearest neighbors (KNN) model is used to compute the target location. The proposed feature extraction method can be used with a generic deep neural network model to increase the performance where the computing node is not powerful. The proposed method has been evaluated on different datasets and has achieved good performance compared with other well-known existing methods.

[3] The Internet of Things (IoT) is increasing in size by having more devices connected to it as they are becoming low-cost to manufacture and easier to connect to the internet. New use cases are being created by the need for it and feasibility to provide it, with low-cost solutions. As a key enabler of the IoT, Long Range Wide Area Network (LoRaWAN) is gaining great attention in research and industry. It provides a desirable solution for applications that require hundreds or thousands of actively connected devices to monitor a process or an environment or to assist in controlling a certain process. Some of these IoT use cases require having the location information of the IoT devices. In some cases, localization can be the intrinsic purpose of deployment. In this regard, the received signal strength indicator (RSSI)-based localization offers a feasible and affordable solution. Since LoRaWAN has only been there for only a few years, research on utilizing LoRaWAN RSSI for localization purposes is in early stages and is scarce. In this paper, we study LoRaWAN RSSI-based localization and evaluate its accuracy, impairments, and prospects. In addition, we employ the use of software-defined radios (SDR) into our work for the purpose of path-loss characterization. The experimental results revealed the fact that a high variance of RSSI due to frequency hopping feature of LoRaWAN could severely impact the localization performance. Potential solutions are developed and presented to reduce this negative impact, hence improve the performance.

[4] In recent years, wireless sensor networks (WSN) have been widely used in many areas due to the rapid development of wireless communication and microelectronics. The positioning of mobile nodes is one of the key applications of WSN. In this paper, we propose a received signal strength indicator (RSSI)-based positioning scheme. We use the Fuzzy C-Means (FCM) algorithm to provide a practical quantized threshold designer for RSSI data, which is used to convert

quantized data based on received signal strength into the distance. Then, we propose a hierarchical voting-based positioning scheme for calculating the position of the mobile node. The proposed algorithm can weaken the influence of non-line of sight (NLOS) error on the positioning result. And the simulation results show that it has better performance than particle swarm optimization (PSO) and quantized distributed gradient target localization using quantized received signal strength (QDG-QRSS) in most cases.

[5] The weighted K-nearest neighbor (WKNN) algorithm is one of the most frequently used algorithms for indoor positioning. However, the traditional WKNN algorithm weights the reference points' coordinates by the inverse of the received signal strength indication (RSSI) difference, which is not accurate enough because of the exponential relationship between RSSI and physical distance. Furthermore, methods based on probabilistic model or data fusion do not consider the uneven spatial resolution of the Wi-Fi RSSI. Therefore, in order to improve the positioning accuracy of traditional location algorithms, this paper proposes a new weighted algorithm based on the physical distance of the RSSI. Experiments were conducted in an office building and the results demonstrate that the proposed method considerably outperforms the KNN, Euclidian-W-KNN, Manhattan-W-KNN, EWKNN, LiFS, and GPR in terms of positioning accuracy, which is defined as the cumulative distribution function of position error

[6] In the proposed system a solution is given to the problem of "Fishermen Tracking their location in the sea". For this the sea area is divided into three zones namely; safe, intermediate and danger. The boat is allowed to roam anywhere within the safety zone. If the boat reaches the intermediate zone, a buzzer alert is given to the fisherman. If the boat reaches the danger zone, an intimation is given to the fisherman where he is supposed to reach the intermediate zone within the specified time. Else the engine gets stopped automatically and the control of the boat goes to the control room. The boat will be released only after inspection by the coast guard or after the emergency help is given. The different Ranges are identified using Received Signal Strength Indicator(RSSI).

[7] This paper presents a global localization system for an indoor autonomous vehicle equipped with odometry sensors and a radio-frequency identification (RFID) reader to interrogate tags located on the ceiling of the environment. The RFID reader can measure the phase of the signals coming from responding tags. This phase has non-univocal dependence on the distance robot tag, but in the considered frequency, it is really sensitive to a change in the position of the robot. For this reason, a multihypothesisKalmanfiltering approach provides a really satisfactory performance even in the case that a very small density of tags is used: In the experimental tests, an average position estimation error of about 4 cm is achieved using only two tags for an area of about 5 m².

[8] In this paper, we present an UHF RFID location tracking system, which is based on measuring the phases of backscattered signals fromRFID tag using multiple spatially distributed antennas at a single carrier frequency. Thewavelength ambiguity of the phase measurements is resolved by using the extended Kalman filter (EKF) and the Rauch-Tung-Striebel (RTS) smoother, where the state includes the position, velocity and the phase offsets of antennas. The performance of the method is experimentally verified at 890 MHz using a commercially available RFID reader.

[9] In this paper a global localization problem of a robot moving in a known environment is considered. The environment is equipped with a relatively sparse set of passive RFID (Radio Frequency IDentification) tags. The robot can detect the presence of the tags when traveling in their proximity and combines this information with the one given by other sensors (e.g. odometry). The RFID measurements are characterized by a highly non Gaussian noise: for this reason in the literature Particle Filter (PF) methods have often been used to fuse these data with the measurements coming from other sensors. In this paper a different approach is pursued, based on the observation that RFID readings can be considered as noisy quantized measurements of the pose of the robot or as noisy dynamic constraints on the pose itself. This allows to exploit the rich literature on Kalman quantized filtering or Kalman constrained estimation, to realize reliable methods with a satisfactory performance which require a computational time significantly lower with respect to the one needed by a PF. Simulative and experimental results will be reported to illustrate the proposed methods.

[10] GPS seems to be the best solution to develop outdoor location systems, but performance of these systems is not good enough to locate entities within indoor environments, mainly if accuracy and precision are required. In this article we propose a tracking indoor system based on passive RFID technology that is able to accurately locate autonomous entities, such as robots, people, etc, within a defined surface. In order to validate the proposal, we compared our system technology performance against other alternatives built on different technologies (Wi-Fi, Bluetooth, IrDA, ultrasound, etc). We also include the system evaluation and final remarks with future improvements.

EXISTING SYSTEM:

In already existed researches and projects there are auto siren systems and face recognition and so on. But these cannot decrease the theft rate and also cannot catch the thief.

DRAWBACKS:

- Thief can easily escape
- There is increase in security but cannot control the theft
- As the security increases the thief can also update with the tricks

PROPOSED SYSTEM:

In this system, RSSI technology used to locate the vehicle within certain distance limit. Here, theft vehicle and theft person are located near around owner.

ADVANTAGES:

- Chances of theft will reduce.
- Theft person will trap inside car.
- Fast response

3.

METHODOLOGY

MODULES:

It has two modules

- Receiver Section
- Transmitter Section

RECEIVER SECTION: CAR

In our system, we have Arduino UNO microcontroller which acts as brain of our system, hence, the entire system program is stored in it. Here, we have two units, vehicle unit has one hidden switch only known by owner, if the switch not turns and person access the vehicle means, once the distance between owner's unit and vehicle exceeds certain limit, then the DC motor will stop to show as vehicle stops. Servo motor will activate the vehicle doors to lock. The GSM will send SMS to police and owner. Vibration sensor is to detect if the theft person breaks the vehicle door.

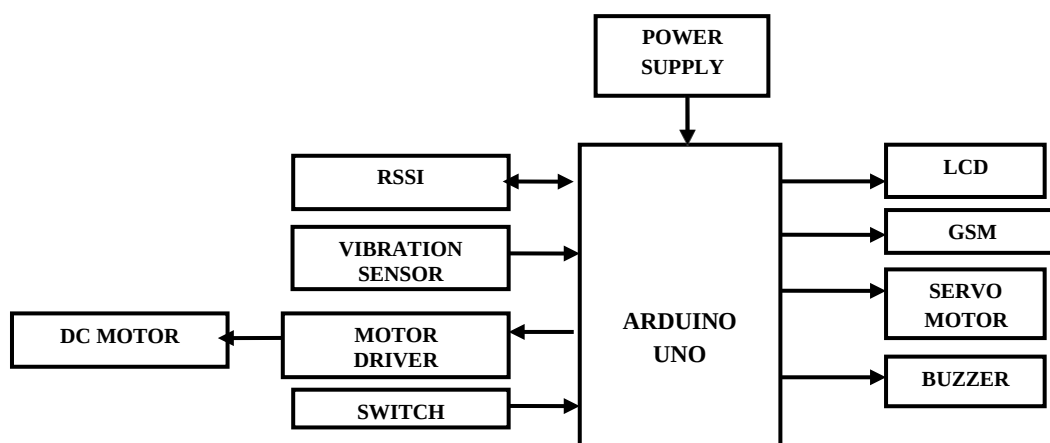


Fig 3.1 Receiver section in the car

TRANSMITTER SECTION: OWNER

In this section the owner connected mobile will be having a range in which if the thief goes beyond certain range then the function will stop working and the car will be locked with all the windows closed with the loud siren.

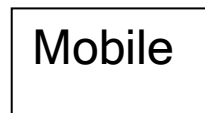


Fig 3.2. Transmitter section

SYSTEM ARCHITECTURE:

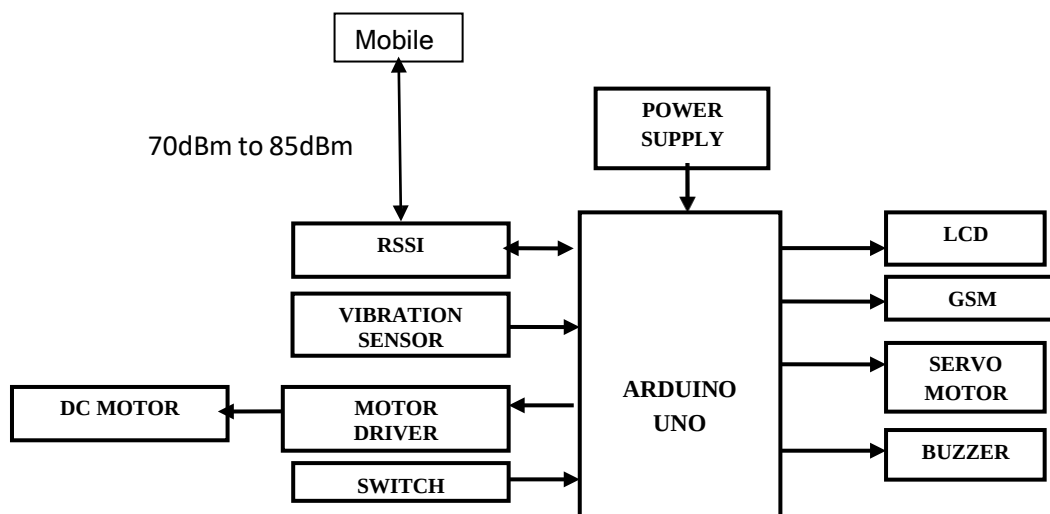


Fig 3.3 Architecture diagram

WORKING:

In our framework, we have Arduino UNO microcontroller which goes about as mind of our framework, consequently, the whole framework program is put away in it. Here, we have two units, vehicle unit has one shrouded switch just known by proprietor, if the switch not turns and individual access the vehicle implies, when the separation between proprietor's unit and vehicle surpasses certain breaking point, at that point the DC engine will stops to appear as vehicle stops. Servo engine will incite vehicle ways to bolt. Vibration sensor is to recognize if the burglary individual breaks the vehicle entryway. All these status are appeared in LCD.

ARDUINO UNO:

The UNO is the best board to for hardware and coding for the beginners. On the off chance that this is your first experience ,, at that point UNO is the most powerful board you can begin playing with. The UNO is the most utilized and leading group of the entire Arduino family. It is anything but difficult to utilize and straightforward



Fig 3.4. ARDUINO UNO

Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics. Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community.

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

- **Inexpensive** - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than \$50.
- **Cross-platform** - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.
- **Simple, clear programming environment** - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take

advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.

- **Open source and extensible software** - The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.
- **Open source and extensible hardware** - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

3.4.1 PROGRAMMING:

The Arduino Uno can be programmed with the (Arduino Software (IDE)). Select "Arduino/Genuino Uno from the Tools > Board menu (according to the microcontroller on your board). For details, see the reference and tutorials. The ATmega328 on the Arduino Uno comes preprogrammed with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header using Arduino ISP or similar; see these instructions for details.

3.1 TECHNICAL SPECIFICATIONS:

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

POWER:

The Arduino Uno board can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and Vin pin headers of the POWER connector.

The board can operate on an external supply from 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

- **Vin.** The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V.** This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7 -12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.

- **3V3.** A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND.** Ground pins.
- **IOREF.** This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

MEMORY:

The ATmega328 has 32 KB (with 0.5 KB occupied by the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

INPUT AND OUTPUT:

See the mapping between Arduino pins and ATmega328P ports. The mapping for the Atmega8, 168, and 328 is identical.

Note that this chart is for the DIP-package chip. The Arduino Mini is based upon a smaller physical IC package that includes two extra ADC pins, which are not available in the DIP-package Arduino implementations.

- **External Interrupts:** 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the **attachInterrupt()** function for details.
- **PWM:** 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the **analogWrite()** function.
- **SPI:** 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- **LED:** 13. There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- **TWI:** A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the **analogReference()** function. There are a couple of other pins on the board:

- **AREF.** Reference voltage for the analog inputs. Used with **analogReference()**.
- **Reset.** Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

RSSI

It means "Received Signal Strength Indicator". It is an estimation of the signal quality between the passageway and the RSSI. It's a worth that is helpful for the great remote association. This worth is utilized to know the separation between the robbery vehicle and the proprietor versatile.



Fig 3.6 RECEIVED SIGNAL STRENGTH INDICATOR

FEATURES

- Supply voltage: 5v DC
- RS232 output
- Output power: up to 4.5dBm-
- Detection range: (10-20) m
- Frequency: 2.4GHz
- Ultra-low power consumption

LIQUID CRYSTAL DISPLAY:

LCD 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. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

Features:

- LCDs are economical
- Easily programmable
- Have no limitation of displaying even custom characters .



Fig 3.7 LIQUID CRYSTAL DISPLAY

PIN DESCRIPTION OF LCD

PIN NO.	FUNCTION	NAME
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V - 5.3V)	VCC
3	Contrast adjustment; the best way is to use a variable resistor such as a potentiometer. The output of the potentiometer is connected to this pin. Rotate the potentiometer knob forward and backwards to adjust the LCD contrast.	Vo / VEE
4	Selects command register when low, and data register when high	RS (Register Select)
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given; Extra voltage push is required to execute the instruction and EN(enable) signal is used for this purpose. Usually, we make it en=0 and when we want to execute the instruction we make it high en=1 for some milliseconds. After this we again make it ground that is, en=0.	Enable
7	8-bit data pins	DB0

IMPORTANT COMMAND CODES FOR LCD:

SR.NO.	HEX CODE	COMMAND TO LCD INSTRUCTION REGISTER
1	01	Clear display screen
2	02	Return home
3	04	Decrement cursor (shift cursor to left)
4	06	Increment cursor (shift cursor to right)
5	05	Shift display right
6	07	Shift display left
7	08	Display off, cursor off
8	0A	Display off, cursor on
9	0C	Display on, cursor off
10	0E	Display on, cursor blinking
11	0F	Display on, cursor blinking
12	10	Shift cursor position to left
13	14	Shift cursor position to right
14	18	Shift the entire display to the left

15	1C	Shift the entire display to the right
16	80	Force cursor to beginning (1st line)
17	C0	Force cursor to beginning (2nd line)
18	38	2 lines and 5×7 matrix

DISPLAYING CUSTOM CHARACTERS ON 16X2 LCD:

Generating custom characters on LCD is not very hard. It requires the knowledge about custom generated random access memory (CG-RAM) of LCD and the LCD chip controller. Most LCDs contain Hitachi HD4478 controller. CG-RAM is the main component in making custom characters. It stores the custom characters once declared in the code. CG-RAM size is 64 byte providing the option of creating eight characters at a time. Each character is eight byte in size.

CG-RAM address starts from 0x40 (Hexadecimal) or 64 in decimal. We can generate custom characters at these addresses. Once we generate our characters at these addresses, now we can print them on the LCD at any time by just sending simple commands to the LCD. Character addresses and printing commands are below.

In the table above you can see starting addresses for each character with their printing commands. The first character is generated at address 0x40 to 0x47 and is printed on LCD by just sending simple command 0 to the LCD.

DISPLAYING CUSTOM CHARACTERS

CG-RAM Characters	CG-RAM Address (Hexadecimal)	Commands to display Generated Characters
1 st Character	0x40	0
2 nd Character	0x48	1
3 rd Character	0x56	2
4 th Character	0x64	3
5 th Character	0x72	4
6 th Character	0x80	5
7 th Character	0x88	6
8 th Character	0x96	7

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DC MOTOR

A DC engine is an electric engine that sudden spikes in demand for direct flow power. In any electric engine, activity is needy upon basic electromagnetism. It is a gadget which changes over electrical vitality to mechanical vitality. It chips away at the way that a current conveying conductor put in an attractive field encounters a power which makes it pivot concerning its unique position.

Almost every mechanical development that we see around us is accomplished by an electric motor. Electric machines are a method of converting energy. Motors take electrical energy and produce mechanical energy. Electric motors are utilized to power hundreds of devices we use in everyday life. Electric motors are broadly classified into two different categories: Direct Current (DC) motor and Alternating Current (AC) motor. In this article we are going to discuss about the DC motor and its working. And also how a gear DC motors works. A DC motor is an electric motor that runs on direct current power. In any electric motor, operation is dependent upon simple electromagnetism. A current carrying conductor generates a magnetic field, when this is then placed in an external magnetic field, it will encounter a force proportional to the current in the conductor and to the strength of the external magnetic field. It is a device which converts

electrical energy to mechanical energy. It works on the fact that a current carrying conductor placed in a magnetic field experiences a force which causes it to rotate with respect to its original position. Practical DC Motor consists of field windings to provide the magnetic flux and armature which acts as the conductor.



Fig 3.8 DC MOTOR

DC MOTOR EQUATIONS:

Magnitude of flux experienced is,

$$F = BIl$$

Where, B- Flux density due to flux produced by field windings

l- Active length of the conductor,

I-Current passing through the conductor.

As the conductor rotates, an EMF is induced which acts in a direction opposite to the supplied voltage. It is given as

$$E_b = \frac{\phi PNZ}{60A}$$

Where, ϕ - Flux due to the field windings,

P- Number of poles,

A-a constant,

N - Speed of the motor,

Z- Number of conductors.

The supply voltage, $V = E_b + I_a R_a$

The torque developed is

$$T_a = \frac{0.159 \Phi I_a P Z}{A}$$

Thus the torque is directly proportional to the armature current.

Also speed varies with armature current, hence indirectly torque and speed of a motor are dependent on each other.

For a DC shunt motor, speed remains almost constant even if torque increases from no load to full load.

For a DC series motor, speed decreases as torque increases from no load to full load.

Thus torque can be controlled by varying the speed. Speed control is achieved either by,

- Changing flux by controlling the current through field winding- Flux Control method. By this method, speed is controlled above its rated speed.
- Armature Voltage Control - Provides speed control below its normal speed.
- Supply Voltage Control - Provides speed control in both directions.

GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

A GSM modem doesn't have a keypad and show to connect with simply like cell phones. It just acknowledges certain orders through a sequential interface and gives affirmation for those. These orders are called as Attention orders. There are a rundown of Attention orders to educate the modem to play out its capacities. Each order begins with "AT". That is the explanation they are called as Attention orders.



Fig 3.9 GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

The switching system (SS) is responsible for performing call processing and subscriber-related functions. The switching system includes the following functional units:

- **home location register (HLR)**—The HLR is a database used for storage and management of subscriptions. The HLR is considered the most important database, as it stores permanent data about subscribers, including a subscriber's service profile, location information, and activity status. When an individual buys a subscription from one of the PCS operators, he or she is registered in the HLR of that operator.
- **mobile services switching center (MSC)**—The MSC performs the telephony switching functions of the system. It controls calls to and from other telephone and data systems. It also performs such functions as toll ticketing, network interfacing, common channel signaling, and others.
- **visitor location register (VLR)**—The VLR is a database that contains temporary information about subscribers that is needed by the MSC in order to service visiting subscribers. The VLR is always integrated with the MSC. When a mobile station roams into a new MSC area, the VLR connected to that MSC will request data about the mobile station from the HLR. Later, if the mobile station makes a call, the VLR will have the information needed for call setup without having to interrogate the HLR.

eachtime.

- **authentication center (AUC)**—A unit called the AUC provides authentication and encryption parameters that verify the user's identity and ensure the confidentiality of each call. The AUC protects network operators from different types of fraud found in today's cellularworld.
- **equipment identity register (EIR)**—The EIR is a database that contains information about the identity of mobile equipment that prevents calls from stolen, unauthorized, or defective mobilestations. The AUC and EIR are implemented as stand-alone nodes or as a combined AUC/EIRnode.

3.5 GSM MILESTONES:

Year	Milestone
1982	GSM formed
1986	field test
1987	TDMA chosen as access method
1988	memorandum of understanding signed
1989	validation of GSM system
1990	preoperation system

1991	commercial system start-up
1992	coverage of larger cities/airports
1993	coverage of main roads
1995	coverage of rural areas

BUZZER:

A ringer or beeper is a sound flagging gadget, which might be mechanical, electromechanical or electric. They are utilized in alert gadgets, clocks, and affirmation of client information, for example, mouse snap or console.



Fig 3.10. BUZZER

SPECIFICATIONS:

Rated Voltage: A magnetic buzzer is driven by 1/2 square waves (V o-p).

Operating Voltage: For normal operating. But it is not guaranteed to make the minimum Sound Pressure Level (SPL) under the rated voltage.

Consumption Current: The current is stably consumed under the regular operation. However, it normally takes three times of current at the moment of starting to work.

Direct Current Resistance: The direct current resistance is measured by ammeter directly.

Sound Output: The sound output is measured by decibel meter. Applying rated voltage and 1/2 square waves, and the distance of 10 cm.

Rated Frequency: A buzzer can make sound on any frequencies, but we suggest that the highest and the most stable SPL comes from the rated frequency.

Operating Temperature. : Keep working well between -30°C and +70°C.

How to choose:

Driving methods: AX series with built drive circuit will be the best choice when we cannot provide frequency signal to a buzzer, it only needs direct current.

Dimension: Dimension affects frequency, small size result in high frequency.

Voltage: Depend on V o-p (1/2 square waves)

Fixed methods: From the highest cost to the lowest- DIP, wires/ connector, SMD.

Soldering methods: AS series is soldered by hand, the frequency is lower because of the holes on the bottom. On the other hand, we suggest AC series for the reflow soldering, the reliability is better.

VIBRATION SENSOR

This sensor produce rationale states relies upon vibration and outside power applied on it. When there is no vibration this module gives rationale LOW yield. At the point when it feels vibration at that point yield of this module goes to rationale HIGH. The working inclination of this circuit is between 3.3V to 5V DC.

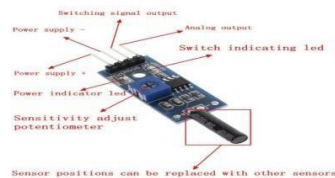


Fig 3.11 VIBRATION SENSOR

Vibration Sensor is a high sensitivity non-directional vibration sensor. When the module is stable, the circuit is turned on and the output is high. When the movement or vibration occurs, the circuit will be briefly disconnected and output low. At the same time, you can also adjust the sensitivity according to your own needs. The vibration switch that opens when vibration is detected and closes when there is no vibration.

Working

This sensor module produce logic states depends on vibration and external force applied on it. When there is no vibration this module gives logic LOW output. When it feels vibration then output of this module goes to logic HIGH. The working bias of this circuit is between 3.3V to 5V DC.

The vibration sensor Comes with breakout board that includes comparator LM 393 and Adjustable on board potentiometer for sensitivity threshold selection, and signal indication LED.

The breakout board contains an LM393 op-amp IC but it is used as a comparator and not an amplifier. Basically, the D0 pin goes high when there is vibration and goes low when there isn't. You can adjust the sensitivity of the sensor by turning the trimmer on the board.

The board comes with two LEDs: one for power indication and one tied directly to D0. When the D0 pin is high, the D0 LED turns off and vice versa. Yeah, it's the opposite of what we would like the LED to do.

My breakout board gives a high pulse every time I give it a shake. I could use the pulse width to indicate that there is vibration going on.

Features

The default state of the switch is close

- Digital output Supply voltage:3.3V-5V
- On-board indicator LED to show the results
- This is Open-Type Vibration sensor Module;
- Fixed bolt hole, convenient installation;
- The comparator output, signal clean, good waveform, driving ability is strong, for more than 15 ma;
- On-board LM393 chip
- SW-420 based sensor, normally closed type vibration sensor
- Dimension of the board: 3.2cm x 1.4cm
- Adopt SW-18010P Vibration sensor.
- Use the LM393 wide voltage comparator;
- Output form: digital switch output (0 and 1);

SERVO MOTOR

A Servo Motor is a little gadget that has a yield shaft. This pole can be situated to explicit rakish situations by imparting the servo a coded sign. For whatever length of time that the coded signal exists on the info line, the servo will keep up the precise situation of the pole. On the off chance that the coded signal changes, the rakish situation of the pole changes. They are likewise utilized in radio-controlled autos, manikins, and obviously, robots.

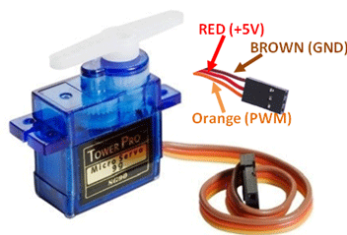


Fig 3.11 SERVO MOTOR

A Servo Motor is a small device that has an output shaft. This shaft can be positioned to specific angular positions by sending the servo a coded signal. As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft. If the coded signal changes, the angular position of the shaft changes. In practice, servos are used in radio-controlled airplanes to position control surfaces like the elevators and rudders. They are also used in radio-controlled cars, puppets, and of course, robots.

servo motors use feedback to determine the position of the shaft, you can control that position very precisely. As a result, servo motors are used to control the position of objects, rotate objects, move legs, arms or hands of robots, move sensors etc. with high precision. Servo motors are small in size, and because they have built-in circuitry to control their movement, they can be connected directly to an Arduino. Tiny and lightweight with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. You can use any servo code, hardware or library to control these servos. Good for beginners who want to make stuff move without building a motor controller with feedback & gear box, especially since it will fit in small places. It comes with a 3 horns (arms) and hardware.

Specifications

- Weight: 9 g
- Dimension: 22.2 x 11.8 x 31 mm approx.
- Stall torque: 1.8 kgf·cm
- Operating speed: 0.1 s/60 degree
- Operating voltage: 4.8 V (~5V)
- Dead band width: 10 µs
- Temperature range: 0 °C - 55 °C

Most servo motors have the following three connections:

- Black/Brown ground wire.
- Red power wire (around 5V).
- Yellow or White PWM wire.

In this experiment, we will connect the power and ground pins directly to the Arduino 5V and GND pins. The PWM input will be connected to one of the Arduino's digital output pins

3.6 WIRE CONFIGURATION

Wire Number	Wire Colour	Description
1	brown	Ground wire connected to the ground of the system
2	Red	Powers the motor typically +5v is used
3	Orange	PWM signal is given in through this wire to drive the motor

SWITCH:

Switch is an electrical part which can represent the deciding moment electrical circuit consequently or physically. Switch is for the most part works with ON (open) and OFF (shut) system. Various circuits hold switches that control how the circuit functions or impel various qualities of the circuit. The characterization of switches relies upon the association they make. Two imperative parts that affirm what sorts of associations a switch makes are post and toss

Switch is an electrical component which can make or break electrical circuit automatically or manually. Switch is mainly works with ON (open) and OFF (closed) mechanism. Numerous circuits hold switches that control how the circuit works or actuate different characteristics of the circuit. The classification of switches depends on the connection they make. Two vital components that confirm what sorts of connections a switch makes are pole and throw.

These are classified on based the connections they make. If you were under the impression that switches simply turn circuits on and off, guess again.

The terms pole and throw are also used to describe switch contact variations. The number of "poles" is the number of separate circuits which are controlled by a switch. The number of "throws" is the number of separate positions that the switch can adopt. A single-throw switch has one pair of contacts that can either be closed or open. A double-throw switch has a contact that can be connected to either of two other contacts; a triple-throw has a contact which can be connected to one of three other contacts, etc.

- **Pole:** The amount of circuits controlled by the switch is indicated by poles. Single pole (SP) switch controls only one electrical circuit. Double pole (DP) switch controls two independent circuits.
- **Throw:** The number of throws indicates how many different output connections every switch pole can connect its input. A single throw (ST) switch is a simple on/off switch. When the switch is ON, the two terminals of switch are connected and current flows between them. When the switch is OFF the terminals are not connected, so current does not flow.

4. RESULTS AND DISCUSSION

DESIGN STEPS REQUIRED FOR THE DEVELOPMENT OF EMBEDDED SYSTEM:

Designing steps required for embedded system are different from the design process of another electronic system.

Let's see a flow chart represent the design steps required in the development of an embedded system:

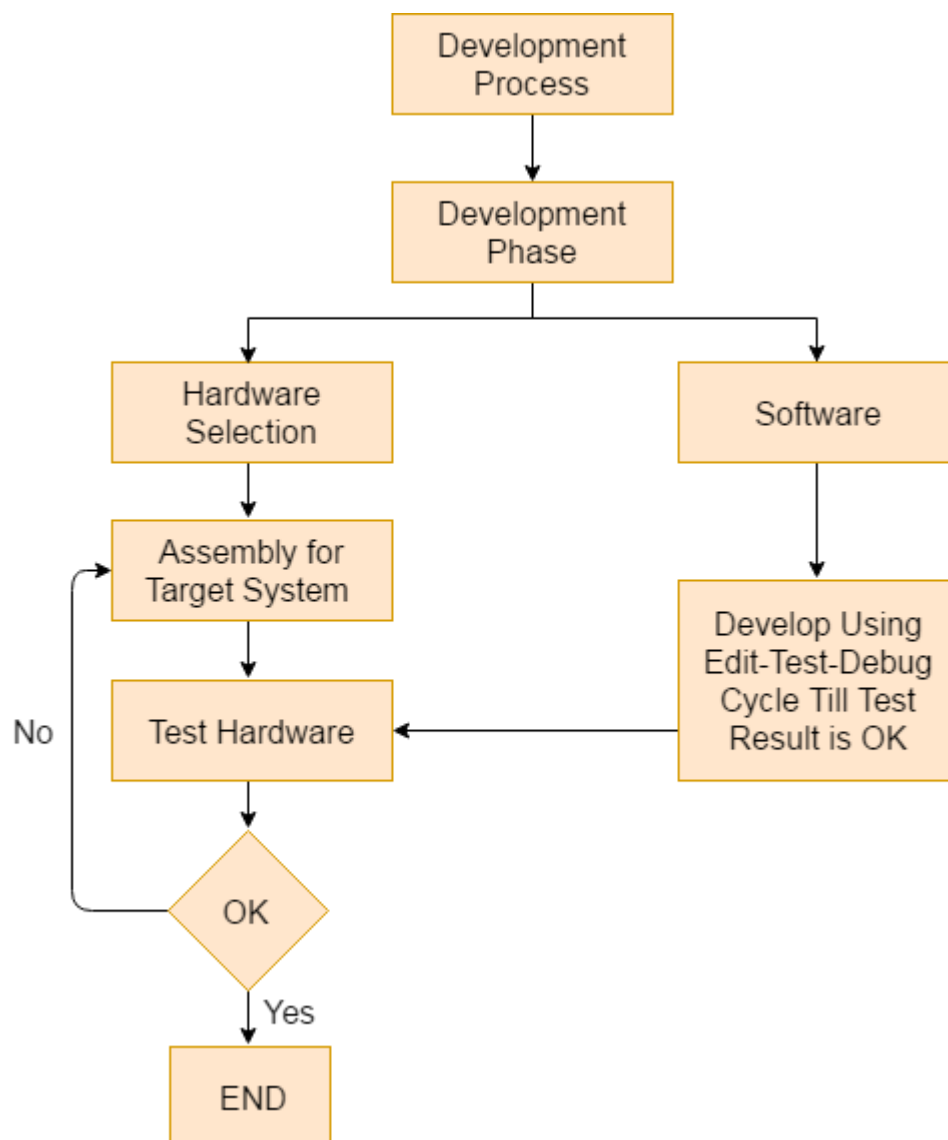


FIG 4.1 STEPS FOR EMBEDDED SYSTEM

Compiler:

Compiler is used for converting the source code from a high-level programming language to a low-level programming language. It converts the code written in high level programming language into assembly or machine code. The main reason for conversion is to develop an executable program.

Let's see the operations performed by compiler are:

- Code generation
- Code optimization
- Parsing
- Syntax direct translation
- Preprocessing

Cross-Compiler:

If a program compiled is run on a computer having different operating system and hardware configuration than the computer system on which a compiler compiled the program, that compiler is known as cross-compiler.

Decompiler:

A tool used for translating a program from a low-level language to high-level language is called a decompiler. It is used for conversion of assembly or machine code to high-level programming language.

Assembler:

Assembler is embedded system tool used for translating a computer instruction written in assembly language into a pattern of bits which is used by the computer processor for performing its basic operations. Assembler creates an object code by translating assembly language instruction into set of mnemonics for representing each low-level machine operation.

SOFTWARE REQUIREMENTS:

- EMBEDDED C
- ARDUINO IDE

4.2.1 ARDUINO SOFTWARE (IDE):

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.



FIG 4.2 ARDUINO WINDOW

CONCLUSION:

Right now primary angle is utilizing of Received Signal Strength Indicator In our framework, we have Arduino UNO microcontroller which goes about as mind of our framework, consequently, the whole framework program is put away in it. Here, we have two units, vehicle unit has one concealed switch just known by proprietor, if the switch not turns and individual access the vehicle implies, when the separation between proprietor's unit and vehicle surpasses certain breaking point, at that point the DC engine will stops to appear as vehicle stops. Servo motor will incite vehicle ways to bolt. The GSM will send SMS to police and proprietor. Vibration sensor is to distinguish if the burglary individual breaks the vehicle entryway. All these status are appeared in LCD. This can be additionally evolved in each vehicle like bike, bus, etc. by utilizing improved sensors and gear since this undertaking is for the most part for the vehicle. This is so on the grounds that the robbery individual can be gotten uniquely in the vehicle yet not on a bicycle so this can likewise be helpful for the bicycle too. And additionally for the transports by utilizing gear which is reasonable for the transports to be made sure about and to diminish the burglary in each and every aspect.

FUTURE ENHANCEMENT:

This can be additionally evolved in each vehicle like bike, bus, etc. by utilizing improved sensors and hardware since this undertaking is basically for the vehicle. This is so in light of the fact that the burglary individual can be gotten uniquely in the vehicle however not on a bicycle so this can likewise be helpful for the bicycle too. And additionally for the transports by utilizing hardware which is appropriate for the transports to be made sure about and to diminish the robbery in each and every aspect.

6. REFERENCES

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7. APPENDICES:

SAMPLE CODE:

```
#include<LiquidCrystal.h>
unsigned int SWITCH=3;
unsigned int VIBRATION=4;
LiquidCrystal lcd(8,9,10,11,12,13);
void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);
  lcd.begin(16,2);
  pinMode(SWITCH,INPUT);
  pinMode(VIBRATION,INPUT);
  attachInterrupt(digitalPinToInterrupt(VIBRATION),VIB, FALLING);
  lcd.setCursor(0,0);
  lcd.print("THEFT DETECTION");
  lcd.setCursor(0,1);
  lcd.print("USING BY RSSI");
}

void loop() {
  // put your main code here, to run repeatedly:

  //////////////////////////////////***SWITCH***////////////////////////////////////
  unsigned int SWITCH_STATE = digitalRead(SWITCH);
  if(SWITCH_STATE == LOW){
    VIB();
  }

}

////////////////////////////////***VIBRATION DETECTED***////////////////////////////////////
void VIB(){
  Serial.print("VEHICLE THEFTED");
  lcd.setCursor(0,0);
  lcd.print("UNKNOWN PERSON");
  lcd.setCursor(5,1);
  lcd.print("ACCESSING");
}
```

SCREEN SHOTS:

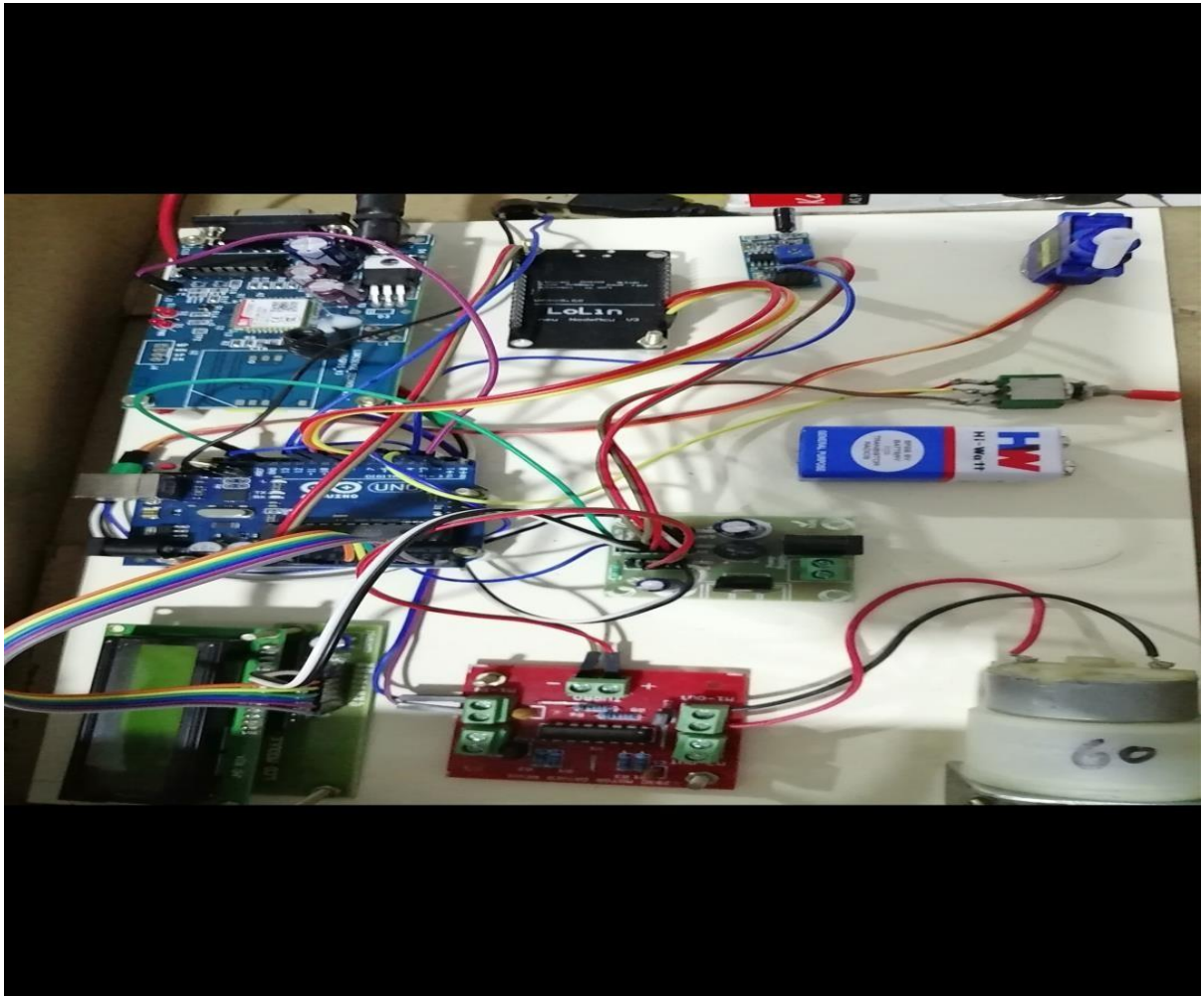


Fig 7.1 complete circuit

