Security System using Smart Card Technology

**A Project Report Submitted to the
Department of Electrical and Electronics Engineering
in partial Fulfillment of the Requirement for the Degree of
Bachelor of Science in
Electrical and Electronics Engineering**

**By
Md Humayun Kabir**
ID: 101-33-131
Md Asraful Alam
ID:101-33-132

Supervised by
Md. Dara Abdus Satter
Assistant Professor
Department of Electrical and Electronics Engineering

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
DAFFODIL INTERNATIONAL UNIVERSITY**

April 2014

DEDICATED

TO

OUR BELOVED PARENTS

&

HONOURABLE

ASST. PROF. MD. DARA ABDUS SATTER

Declaration

This is to certify that the work present in this thesis the outcome of the investigation performed by us under the supervision of **Md. Dara Abdus Satter**, Assistant Professor, Department of EEE, DIU. No part if this work has been submitted elsewhere partially or fully for the award of any other degree or Msc. Any material reproduced in this project has been acknowledged.

Submitted by :

………………….
Md Humayun Kabir
ID:101-33-131
(Candidate)

…………………
Md Asraful Alam
ID:101-33-132
(Candidate)

Countersigned

…………………
Md. Dara Abdus Satter
(Supervisor)
Assistant Professor
Department of Electrical and Electronics Engineering
Daffodil International University

Acknowledgement

Firstly we give thanks to almighty Allah from the bottom of our hearts.

We would like to express our sincere gratitude to our honorable supervisor, Assistant Professor Md. Dara Abdus Satter, Department of Electrical and Electronic Engineering, DIU who inspired us in every moment. We are thankful to him for his continuous encouragement, kind co-operation, and scholastic guidance all along the project work. He has always been extremely generous with his time, knowledge and ideas and allowed us great freedom in this research.

We would like to express our deep and sincere gratitude to Prof. Dr. Md Fayzur Rahman, Head, Department of Electrical and Electronic Engineering. We also would like to express our gratefulness to Prof. Dr. M. Shamsul Alam Dean Faculty of Engineering, DIU for his help and guidance throughout our project work.

We express our humble gratitude to all teachers of Department of Electrical and Electronic Engineering for their support in numerous ways throughout this project work. We are also grateful to the authors whose valuable research papers and books we have considered as reference in this project paper.

Finally we would like to thank our parents who have given us tremendous inspirations and supports. Without their mental and financial supports, we would not able to complete our project.

Authors

Abstract

Newly, smart card technology are bring used in a number of around the world, on the other hand security has become significant in information technology. But there are few sectors in our country where security system has been adopted. Security system is more acceptable to the technologically unskilled people. Security system is the main concern of this project. The purpose of this project is to become familiar with the implementation of developing a security system. We used smart card with LDR using optoelectronic for security purpose and the alert will be displayed by LED and buzzer alarm. The objective of this project is to design a simple, easy to electronic circuit. It communicates with the LDR in real-time in order to control the light and buzzer alarm according to the necessary condition.

Contents

List of Figures

List of Table

List of abbreviation

LED   Light emitting Diode

LDR   Light Dependent Resistor

HCl   Hydrochloric Acid

(FeCl)2   Iron(ll) chloride

PCB   Printed Circuit Board

Chapter 1

Introduction

1.1 Background

A smart card is a card which used in the security purpose. The structure of a smart card is very simple. Smart cards are made of plastic, generally polyvinyl chloride, but sometimes polyethylene terephthlate based polyesters, acrylonitrile butadiene styrene or polycarbonate. Smart cards can provide identification, authentication, data storage and application processing. Smart cards may provide strong security authentication for single sign-on (SSO) within large organizations. But we used smart card in this project made by ourselves. When we pushed on valid card in the machine we got a green signal. When we pushed on invalid card in the machine then we got a red signal and buzzer alarm.

1.2 History of Smart card

In 1968 and 1969 German electrical engineers Helmut Gröttrup and Jürgen Dethloff jointly filed patents for the automated chip card. French inventor Roland Moreno patented the memory card concept in 1974. An important patent for smart cards with a microprocessor and memory as used today was filed by Jürgen Dethloff in 1976 and granted as USP 4105156 in 1978. In 1977, Michel Ugon from Honeywell Bull invented the first microprocessor smart card. In 1978, Bull patented the SPOM (self-programmable one-chip microcomputer) that defines the necessary architecture to program the chip. Three years later, Motorola used this patent in its "CP8". At that time, Bull had 1,200 patents related to smart cards. In 2001, Bull sold its CP8 division together with its patents to Schlumberger, who subsequently combined its own internal smart card department and CP8 to create Ax alto. In 2006, Axalto and Gemplus, at the time the world stop two smart card manufacturers, merged and became Gemalto. In 2008 Dexa Systems spun off from Schlumberger and acquired Enterprise Security Services business, which included the smart card solutions division responsible for deploying the first large scale public key infrastructure (PKI) based smart card management systems. The first mass use of the cards was as a telephone card for payment in French pay phones, starting in 1983.[1]

1.3 Objective of the work

➢ Design a proper circuit diagram.

➢ Implement the design

➢ Design & cost analysis

1.4 Methodology

➢ Study about optoelectronic.

➢ Study about the theory of electronic components.

➢ Design a smart card and implement circuit in the PCB.

➢ Construction and design analysis in this project.

1.5 Organization of the report

This project report has six chapters in total. The first chapter describes an idea about smart card, history of smart card, objective of the work and methodology. The second chapter about block diagram, block diagram explanation, circuit diagram, list of components. The chapter third about components description. Chapter fourth explains design analysis. The five chapter describes cost analysis. Finally, chapter six gives the concluding remarks, advantage, limitation, suggestion for the future works and discussion.

Chapter 2

Block Diagram & Circuit Diagram

2.1 Block Diagram

| Power supply | → | LDR | → | Amplifier | → | Switch | → | Door control |

Fig 2.1 Block diagram

2.2 Individual Block Diagram Explanation

Power supply: AC power supply is stepped down, rectified and filtered to get almost ripple-free DC output for the operation of the circuit.

| 220vAC 50Hz |

↓

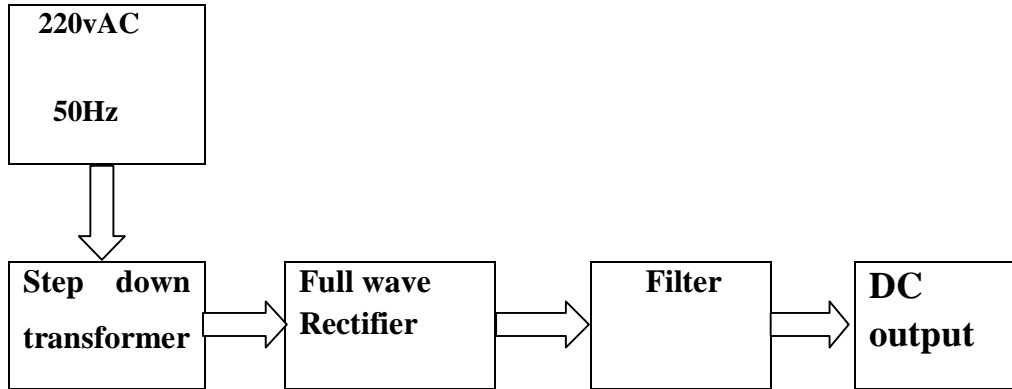| Step down transformer | → | Full wave Rectifier | → | Filter | → | DC output |

Fig 2.2 Power supply block diagram

Light dependent resistor: LDR senses the illumination level and gives the input signal as voltage drop.

Amplifier: Darlington circuit amplifies the input current to get maximum current gain.

13

Switch: Relay switch closes or opens electrically and automatically, which is energized or de energized by the Darlington pair.

Door control: Door control is the output of the circuit. Door control and LED both are output in this project.

2.3 Darlington pair

In the Darlington configuration, the emitter current of one transistor becomes the base current of the second, so that the amplified current from the first is amplified further by the second transistor. This gives the Darlington pair a very high current gain such as 10000, since the Darlington configuration acts like one transistor with a beta which is the product of the betas of the two transistors. Darlington configuration can be used where high output currents are needed. The Darlington configuration has quite high input impedance. A Darlington pair can be sensitive enough to respond to the current passed by skin contact even at safe voltages. Thus it can form the input stage of a touch-sensitive switch.
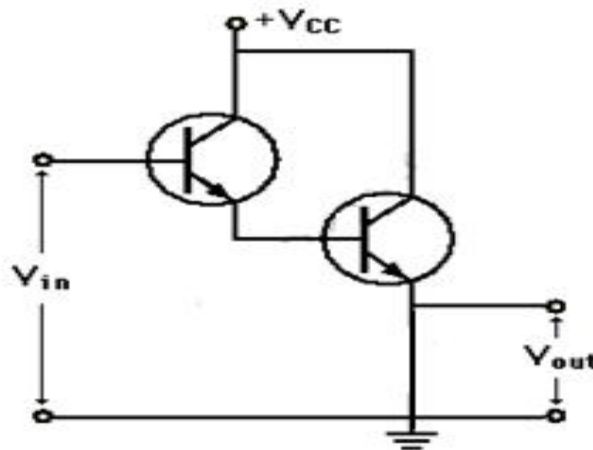
DC Current gain $h_{FE} = h_{FE1} \times h_{FE2}$

Fig 2.2.1 Darlington pair configuration

2.4 Circuit Diagram

Circuit diagram of security system is given below
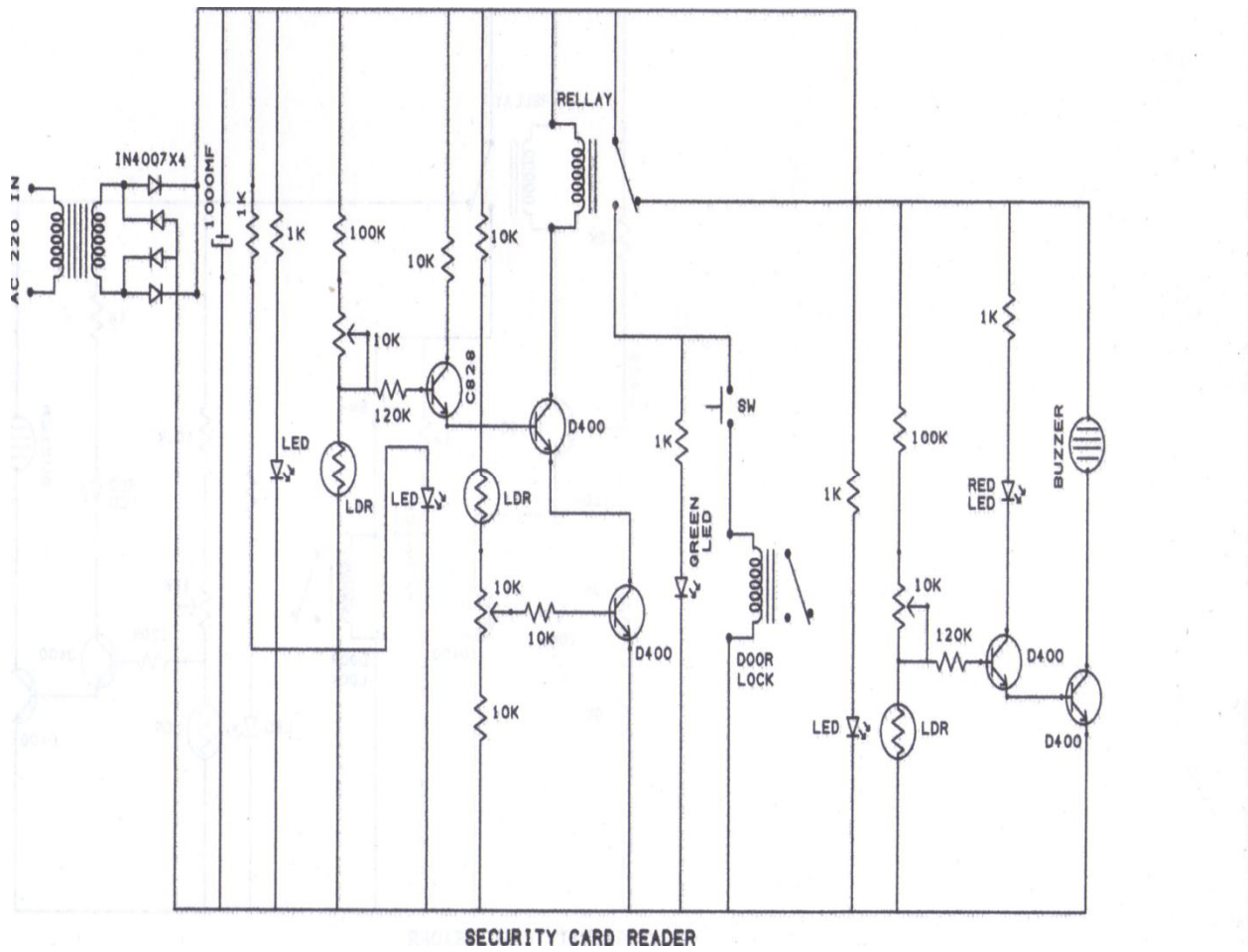
Fig 2.4 Circuit diagram of security system

2.5 List of Components used in Circuit

No	Component	Quantity	Used
1	Resistor 1k	5	To offer resistance
2	Resistor 10k	4	To offer resistance
3	Resistor 100k	3	To offer resistance
4	Resistor 120k	2	To offer resistance
5	Variable Resistor 10k	3	Switch ON point tuning
6	LDR	3	Photoconductor
7	Capacitor 1000 µF 25V	1	To store charge
8	Transistor D400	4	Amplifier and switch
9	Transistor C828	1	Amplifier and switch
10	White LED	3	Indicator
11	Red & Green LED	2	Indicator
12	Relay	2	Switch
13	SPST ON/OFF Switch	1	Switch
14	Buzzer	1	Alarm
15	Diode IN4007	4	Rectifier
16	Transformer XFR12VAC	1	Power Transfer
17	Smart card	2	Input
18	PCB	1	Circuit Board

Chapter 3
Component Description

3.1 Transformer

Usually, DC voltages are required to operate various electronic equipment and these voltages are 5V, 9V or 12V. But these voltages cannot be obtained directly. 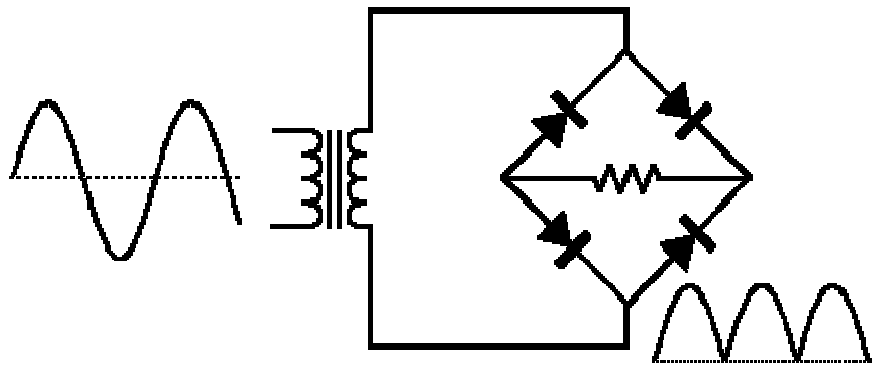Thus the ac input available at the mains supply i.e., 220V is to be brought down to the required voltage level. This is done by a transformer. Thus, a step down transformer is employed to decrease the voltage to a required level. In our project we used XFR12VAC model transformer.

3.2 Full-wave Rectifier

Fig 3.1 Full wave bridge rectifier [2]

A diode bridge is an arrangement of four diodes in a bridge circuit configuration that provides the same polarity of output for either polarity of input. When used in its most common application, for conversion of an alternating current (AC) input into a direct current (DC) output, it is known as a bridge rectifier. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to a rectifier with a 3-wire input from a transformer with a center-tapped secondary winding.
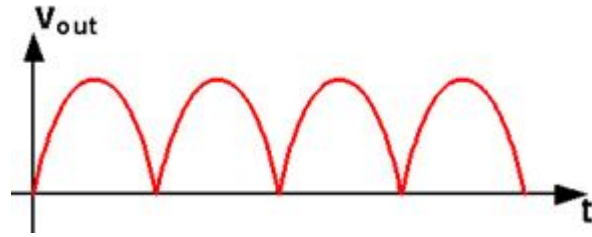
Fig (a) Full-wave rectifier output

3.3 Capacitor Filter
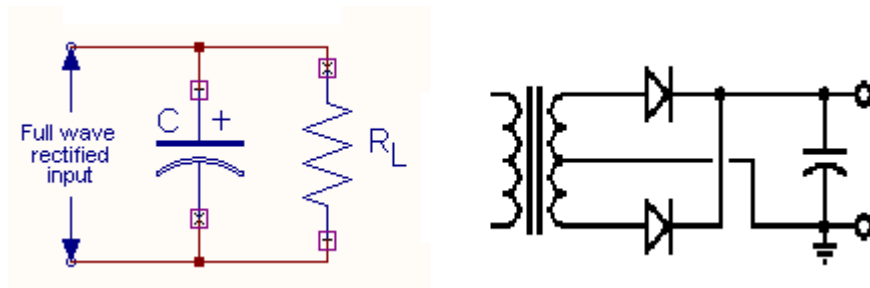
Fig 3.2 Capacitor Filter

The output of the full-wave rectifier will be a rippled DC voltage. In order to obtain a constant DC output voltage, a capacitor is connected across the output of the full-wave rectifier. We have employed an Aluminum Electrolytic type capacitor (1000 μF) for our purpose. The property of a capacitor is that it allows ac component and blocks dc component. The capacitor will get charged to the peak voltage during each half-cycle and then will get discharged exponentially through the load while the rectified voltage drops back to zero. Thus, the capacitor helps to fill in the gaps between the peaks. As a result, the actual voltage output from this combination never drops to zero, but rather takes the shape as shown in the figure given below.
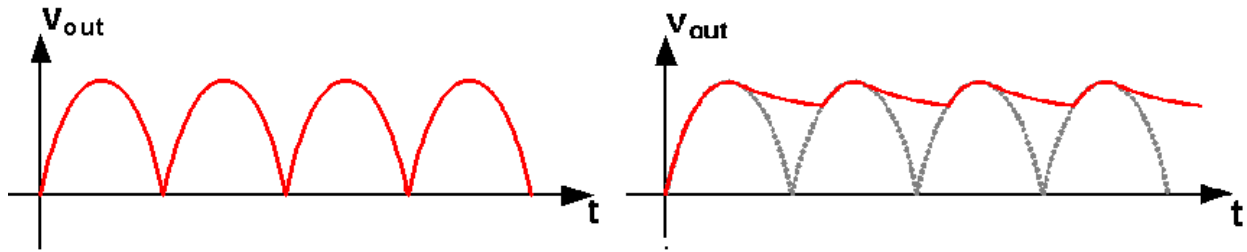
Fig (a) Full-wave rectifier output before passing through filter

Fig (b) Full-wave rectifier output after passing through filter

Even though the output voltage is a not pure dc, but has much less variation in voltage than the unfiltered output of the full-wave rectifier. The extent to which the capacitor voltage drops depends on the capacitance of the capacitor and the amount of current drawn by the load (RC time constant).

The two important parameters to consider when choosing a suitable smoothing capacitor are its Working Voltage, which must be higher than the load output value of the rectifier and it's Capacitance Value, which determines the amount of ripple that will appear superimposed on top of the DC voltage. Moreover, the extent of smoothing is limited by the frequency of the AC voltage and the load current.[3]

3.4 Light Emitting Diode

Light-emitting diodes are elements for light signalization in electronics. The basic principle behind the working of LED is electroluminescence. The Light emitting diode should be forward biased to get the light. In Light emitting diodes, electrons are injected from low work function cathode to the conduction band of the n-type semiconducting material and holes are injected from high work function anode to the valence band of the p-type semiconducting material. When the electron in the conduction band combines with the hole in the valence band, energy is released. In case of indirect band gap semicondutors, phonon will be released to conserve of both energy and momentum. But in case of direct band gap semiconductor, light will be emitted whose wavelength depends on the band gap of the semiconductor.
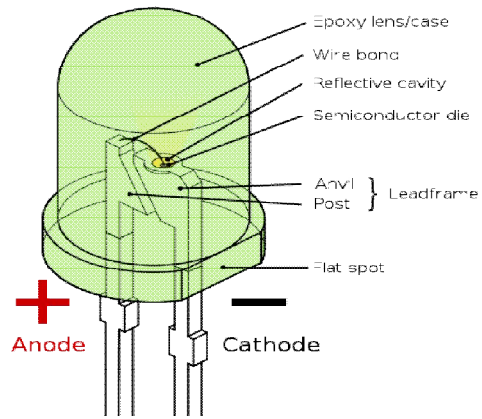
Fig 3.3 Different parts of a Light emitting diode
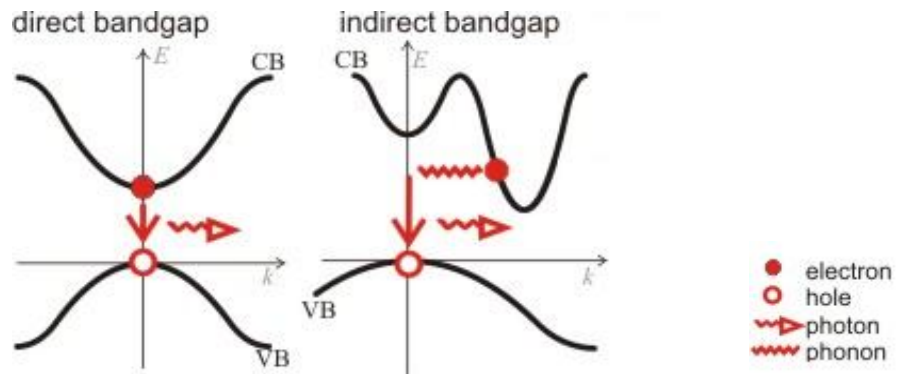
Fig 3.4 Radiative recombination in direct and indirect band gap semiconductor
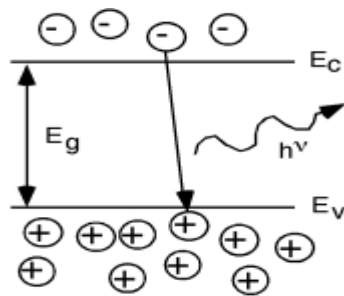
Fig 3.5 Cartoon showing radiative recombination in a direct band-gap semiconductor
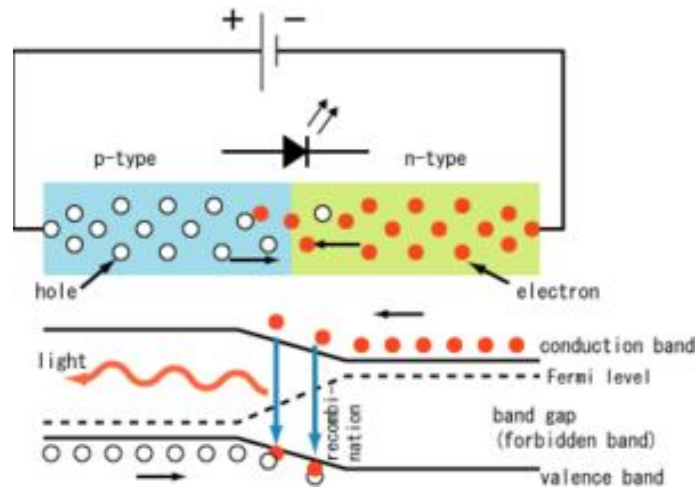
Fig 3.6 Schematic diagram of working of an LED

Fig 3.7 Light emitting Diode and its circuit symbol

The main advantage of Light emitting diode over other light sources is its increased efficiency. LEDs are available in red, orange, amber, yellow, green, Blue and white. Blue and white LEDs are much more expensive than the other colors. We have employed low cost White, green Red LED in our electronic circuit.[3]

3.5 Light Dependent Resistor

A light dependent resistor is a resistor whose resistance changes with the intensity of incident light. The working principle of light dependent resistor is photoelectric effect. A light dependent resisitor is made of a high resistance semiconductor. If the energy of the incident light is greater than the band gap of the semiconductor, electron -hole pairs are generated. The photo generated electron-hole pair transits the device giving rise to photoconductivity. The essential elements of a

photoconductive cell are the ceramic substrate, a layer of photoconductive material, metallic electrodes to connect the device into a circuit and a moisture resistant enclosure. Light sensitive material is arranged in the form of a long strip, zigzagged across a disc shaped base with protective sides. For additional protection, a glass or plastic cover may be included. The two ends of the strip are brought out to connecting pins below the base as shown below.
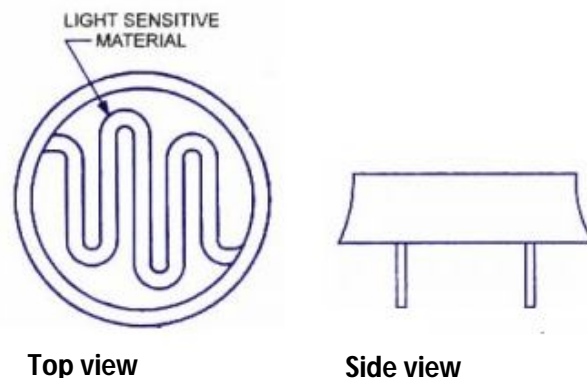
Fig 3.8 Top view and side view of Light Dependent Resisitor

The commercial photoconductive materials include cadmium sulphide (CdS), cadmium selenide (CdSe), Lead sulfide (PbS) and Indium antimonide (InSb) etc., There is large change in the resistance of a cadmium selenide cell with changes in ambient temperature, but the resistance of cadmium sulphide remains relatively stable. Moreover, the spectral response of a cadmium sulphide cell closely matches to that of a human eye. Hence, LDR is used in applications where human vision is a factor such as street light control or automatic iris control for cameras. The above mentioned features drive us to opt for CdS based LDR in our electronic circuit for security system light controller.[3]
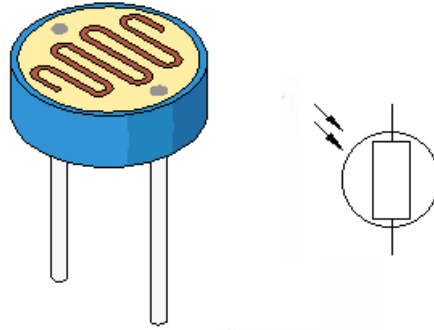
Fig 3.9 Light Dependent Resistor and its circuit symbol

3.6 Resistance

The electrical resistance of an electrical conductor is the opposition to the passage of an electric current through that conductor; the inverse quantity is electrical conductance, the ease at which an electric current passes. Electrical resistance shares some conceptual parallels with the mechanical notion of friction The SI unit of electrical resistance is the ohm (Ω), while electrical conductance is measured in Siemens (S) We used 1k, 10k, 100k, 120k, resistance in our circuit.[4]

Fig 3.10 Resistance

The standard resistor color code table [5]

The standard resistor color code table:

Color	Digit 1	Digit 2	Digit 3*	Multiplier	Tolerance	Temp. Coef.	Fail Rate
Black	0	0	0	$\times 10^0$			
Brown	1	1	1	$\times 10^1$	±1% (F)	100 ppm/K	1%
Red	2	2	2	$\times 10^2$	±2% (G)	50 ppm/K	0.1%
Orange	3	3	3	$\times 10^3$		15 ppm/K	0.01%
Yellow	4	4	4	$\times 10^4$		25 ppm/K	0.001%
Green	5	5	5	$\times 10^5$	±0.5% (D)		
Blue	6	6	6	$\times 10^6$	±0.25% (C)		
Violet	7	7	7	$\times 10^7$	±0.1% (B)		
Gray	8	8	8	$\times 10^8$	±0.05% (A)		
White	9	9	9	$\times 10^9$			
Gold				$\times 0.1$	±5% (J)		
Silver				$\times 0.01$	±10% (K)		
None					±20% (M)		

* 3rd digit – only for 5-band resistors

Table 3.1

3.7 Variable Resistors

Resistors are of the most common electronic components. A resistor is a device, that limit or resists currents. The current limiting ability or resistance is measured in ohms, represented by the Greek symbol Omega. Variable resistors (also called potentiometers or just "pots") are resistors that have a variable resistance. We adjusted the resistance by turning a shaft. This shaft moves a wiper across the actual resistor element. By changing the amounts of resistor between the wiper connection and the connection (S) to the resistor element, we can change the resistance. We will often see the resistance of resistors written with k(kilohms) after the number value. This means that there are that many thousands of ohms. For example, 1k is 1000 ohm,2k is 1000 ohms,3.3k is 3300 ohm, etc. We may also see the suffix M(mega ohms).this simply means millon. Resistors are also rated by their power handling capability. This is the amount of heat the resistor can take before it is destroyed. The power capability is measured in W(watts).Common wattages for variable resistors are 1/8W, 1/4W, 1/2W.Anything of a higher wattages is referred to as a rheostat.10k variable resistance used this project.

3.7.1 Construction of variable Resistors

Variable resistors consist of a resistance track with connections at both ends and a wiper which moves along moves along the track as we turn the spindle. The track may be made form carbon, cermet(ceramic and mixture) or a coil of wire(for low resistances).The track is usually rotary but straight track versions, usually called sliders, are also available.[7]

Fig 3.11 Internal and external construction of variable resistors [7]

3.8 Relays

A relay is an electrically operated switch. Most of the relays use an electromagnet to operate a switching mechanism mechanically. Relays are used where it is necessary to control a circuit by a low-power signal with complete electrical isolation between control and controlled circuits or where several circuits must be controlled by one signal.

The first relays were used in long distance telegraph circuits, repeating the signal coming in from one circuit and re-transmitting it to another. Relays were used extensively in telephone exchanges and early computers to perform logical operations. Relays can also be used to protect electrical circuits from overload. In modern electric power systems these functions are performed by digital instruments still called protective relay, which designed to calculate operating conditions on an electrical circuit and trip circuit breakers when a fault is detected.

When an electric current is passed through the coil it generates a magnetic field that attracts the armature and the consequent movement of the movable contact either makes or breaks a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage or current application it reduces arcing.

3.8.1 Five pin single pole double throw Relay

In Single Pole Single Throw relay, current will only flow through the contacts when the relay coil is energized.
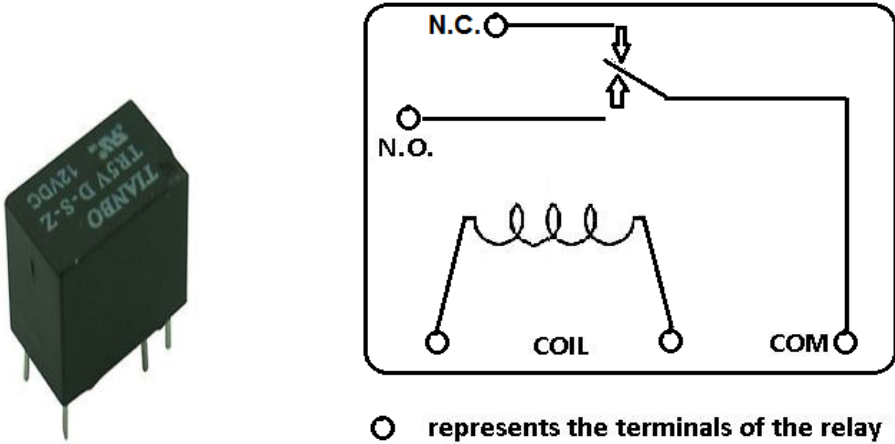
**Fig 3.12** Single pole double throw Relay and its circuit symbol [6]

3.9 Transistors

Transistors are three terminal active devices made from different semiconductor materials that can act as either an insulator or a conductor by the application of a small signal voltage. The transistor's ability to change between these two states enables it to have two basic functions: switching or amplification. Then bipolar transistors have the ability to operate within three different regions:

- ➢ Active Region - the transistor operates as an amplifier and $I_C = \beta\, I_B$
- ➢ Saturation - the transistor is fully-ON operating as a switch and $I_C = I_{saturation}$
- ➢ Cut-off - the transistor is "fully-OFF" operating as a switch and $I_C = 0$

The word Transistor is an acronym, and is a combination of the words Transfer resistor used to describe their mode of operation way back in their early days of development. There are two basic types of bipolar transistor construction, NPN and PNP, which basically describes the physical arrangement of the P-type and N-type semiconductor materials from which they are made.

A transistor is made of a solid piece of semiconductor material, with at least three terminals for connection to an external circuit. The Bipolar Junction Transistor basic construction consists of two PN-junctions producing three connecting terminals with each terminal being given a name to identify it from the other two. These three terminals are known and labeled as the Emitter (E), the Base (B) and the Collector (C) respectively.

Bipolar Transistors are current regulating devices that control the amount of current flowing through them in proportion to the amount of biasing voltage applied to their base terminal acting like a current-controlled switch. The principle of operation of the two transistors type NPN and PNP, is exactly the same the only difference being in their biasing and the polarity of the power supply for each type.
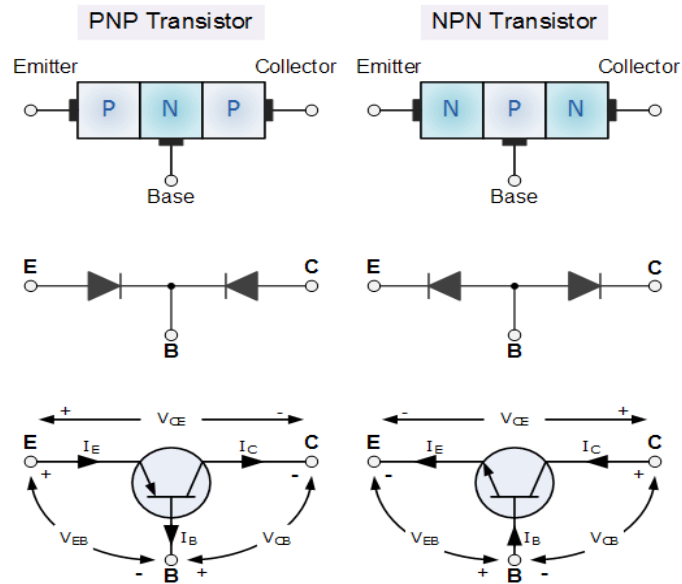
Fig 3.13 Bipolar Junction Transistor Configurations

Since Bipolar Junction Transistor is a three terminal device, there are basically three possible ways to connect it within an electronic circuit with one terminal being common to both the input and output. Each method of connection responding differently to its input signal within a circuit as the static characteristics of the transistor varies with each circuit arrangement.[3]

➢ Common Base Configuration   -   has Voltage Gain but no Current Gain
➢ Common Emitter Configuration   -   has both Current and Voltage Gain.
➢ Common Collector Configuration -   has Current Gain but no Voltage Gain.

3.9.1 NPN transistor configuration
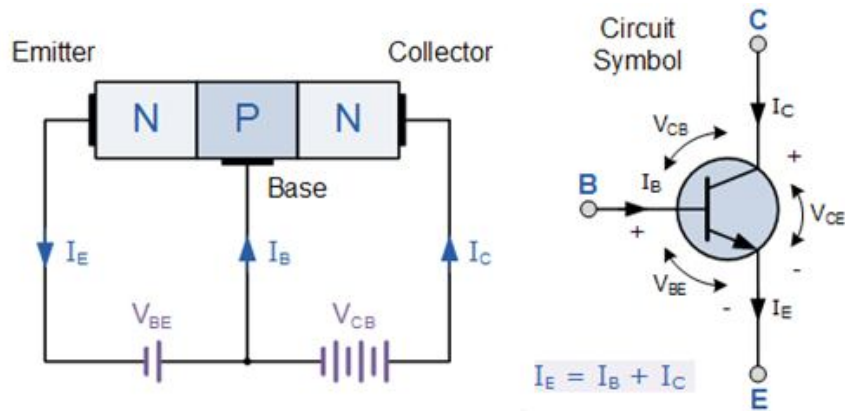
Fig 3.14 NPN transistor configuration [8]

The construction and terminal voltages for an NPN transistor are shown above. The voltage between the Base and Emitter (V_{BE}) is positive at the Base and negative at the Emitter because for an NPN transistor, the Base terminal is always positive with respect to the Emitter. Also the Collector supply voltage is positive with respect to the Emitter (V_{CE}). For an NPN transistor to conduct, the Collector is always more positive with respect to both the Base and the Emitter.
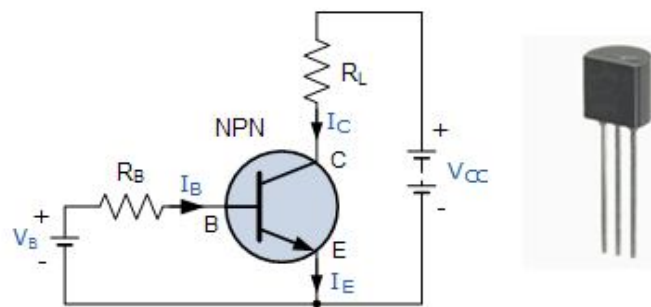

Fig 3. 15 NPN transistor configuration with voltage source

The voltage sources will be connected to an NPN transistor as shown above. The Collector is connected to the supply voltage V_{CC} via the load resistor, R_L which also acts to limit the

maximum current flowing through the device. The Base supply voltage V_B is connected to the Base resistor R_B, which again is used to limit the maximum Base current.

It is well known that the transistor is a current controlled device since the base current controls the collector current. The transistor current in an NPN transistor is the ratio of these two currents (I_C/I_B), called the DC Current Gain of the device and is given the symbol β of **h_{FE}**. The value of β or **h_{FE}** can be large up to 200 for standard transistors and this large ratio between I_C and I_B that makes the NPN transistor a useful amplifying device when used in its active region. Also, the current gain of the transistor from the collector terminal to the emitter terminal, I_C/I_E, is called Alpha (α), and is a function of the transistor. As the emitter current I_E is the product of a very small base current plus a very large collector current, the value of alpha α, is very close to unity, and for a typical low-power signal transistor this value ranges from about 0.950 to 0.999.
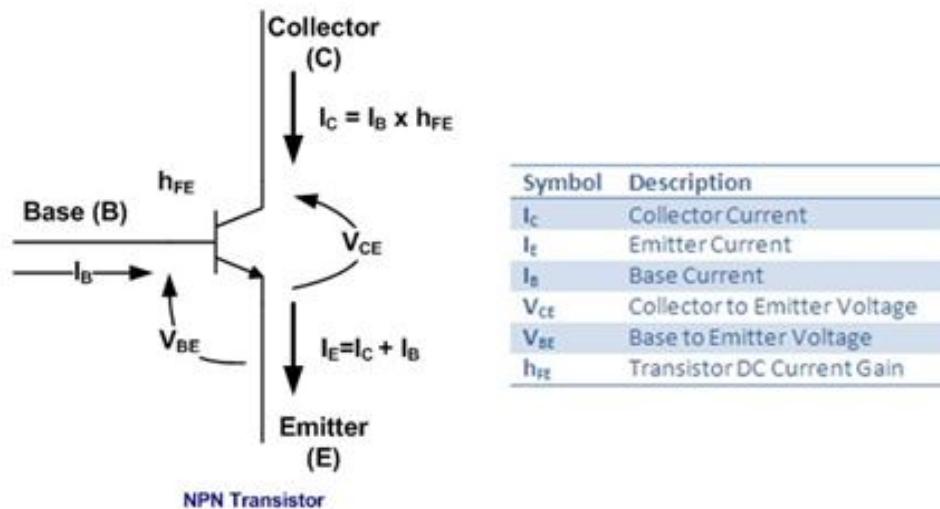
**Fig 3.16** NPN Bipolar Junction transistor

All the transistors have three state of operation:

OFF state: in this state there is no base current applied or $I_B = 0$.

ON ACTIVE state: In this state any changes in I_B will cause changes in I_C since $I_C = I_B \times h_{FE}$. This type of state is suitable when we use transistor as a signal amplifier because transistor is said is in the linear state.

ON SATURATION state: In this state any changes in I_B will not cause changes in I_C anymore (not linear) and I_C will be nearly constant. This state cannot be used to run the transistor as a signal amplifier since the output signal will be clamped when the transistor becomes saturate.
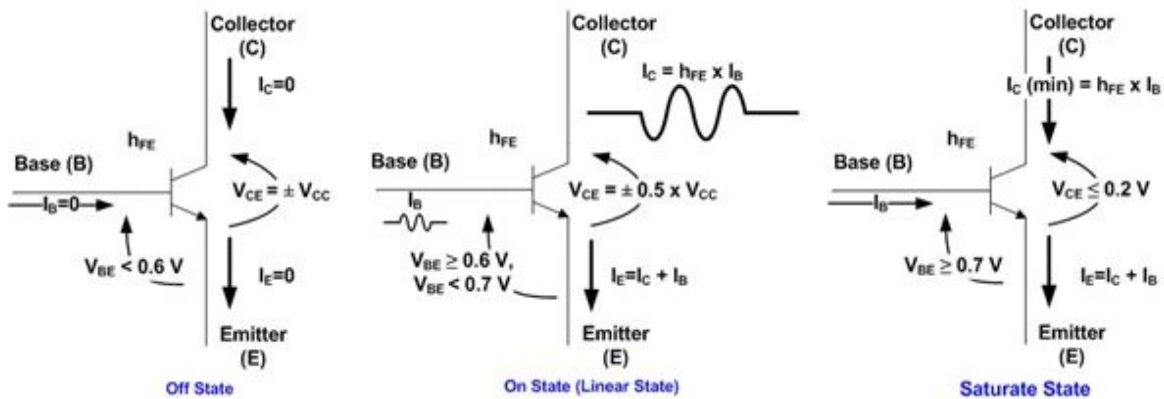

Fig 3.17 Transistor in operating state

When transistor is in **OFF** state, the voltage across collector and emitter terminal is equal to the supplied voltage, which is equivalent to the open circuit. When transistor is in the **SATURATION** state, the collector to emitter voltage is equal or less than 0.2 V, which is equivalent to the closed circuit. Here, the **OFF** state is equivalent to the logical "**0**" and the **SATURATION state** is equivalent to the logical "**1**"[3]

3.9.2 Transistor as an Amplifier

A voltage or current applied to one pair of the transistor's terminals changes the current flowing through another pair of terminals. To be more specific, the current applied to the base terminal will be multiplied by the current gain factor of the transistor which known as h_{FE}. Therefore transistor can be used as amplifier. Any small signal applied to the base terminal will be amplified by the factor of h_{FE} and reflected as a collector current on the collector terminal side.

When we operate transistor as an amplifier, we choose the bias voltage V_{BE} and V_{CE} in such a way that the output I_C and V_{CE} will swing to maximum value (saturation region) or minimum value (cut-off region) without any distortion when the input I_B swing to its maximum or minimum value.[3]
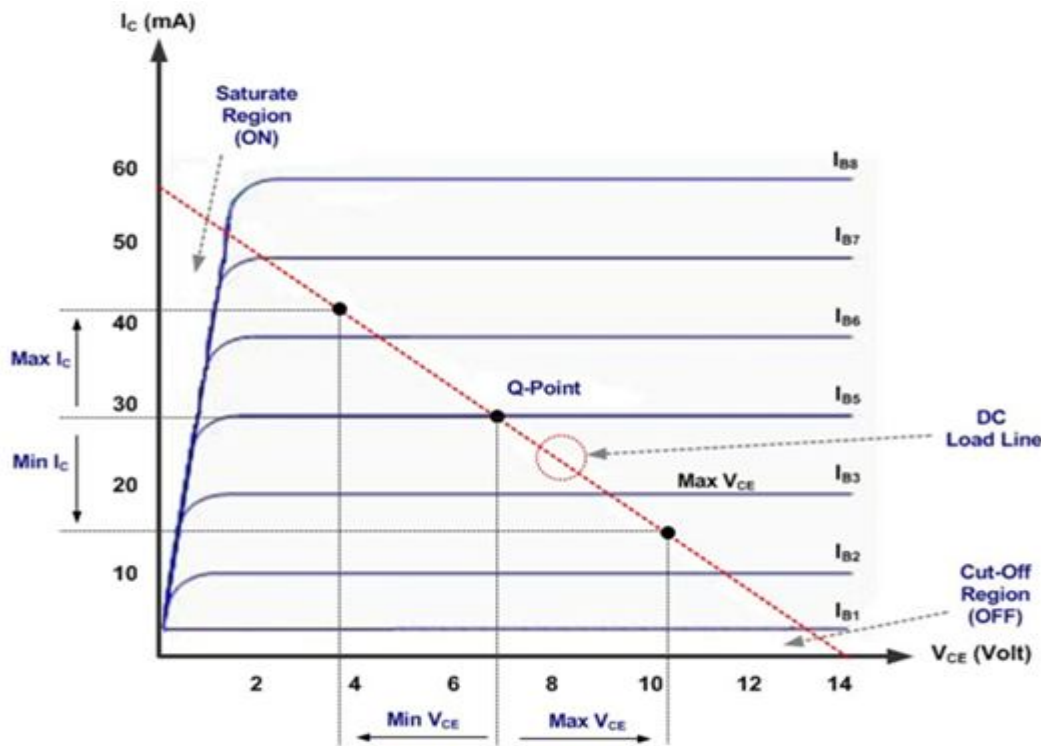

Fig 3.18 Typical NPN transistor characteristic curves for CE Amplifier

3.9.3 Transistor as a Switch

Currents or voltages need to be controlled, Darlington configuration can be used. Transistor As mentioned above, bipolar transistor has three regions of operation: the cut-off region, the linear or active region, and the saturation region. When using the bipolar transistor as a switch they must be either fully-OFF or fully-ON. When used as a switch, the bipolar transistor is operated in the cut-off region, the region where in the transistor is not conducting which makes the circuit open so that the applied voltage will be same as the output to make the transistor OFF and saturation region, the region where in the transistor is in full conducting, thereby closing the circuit so as to get the lowest possible V_{CE} (nearly 0.2 volt) to make the transistor ON. Transistors that are fully ON are said to be in their Saturation region and transistors that are fully

32

OFF are said to be in their Cut-off region. When using the transistor as a switch, a small base current controls a much larger collector load current. When using transistors to switch inductive loads such as relays and solenoids, a Flywheel Diode is used. When large switches can be used to switch and control lamps, relays or even motors.
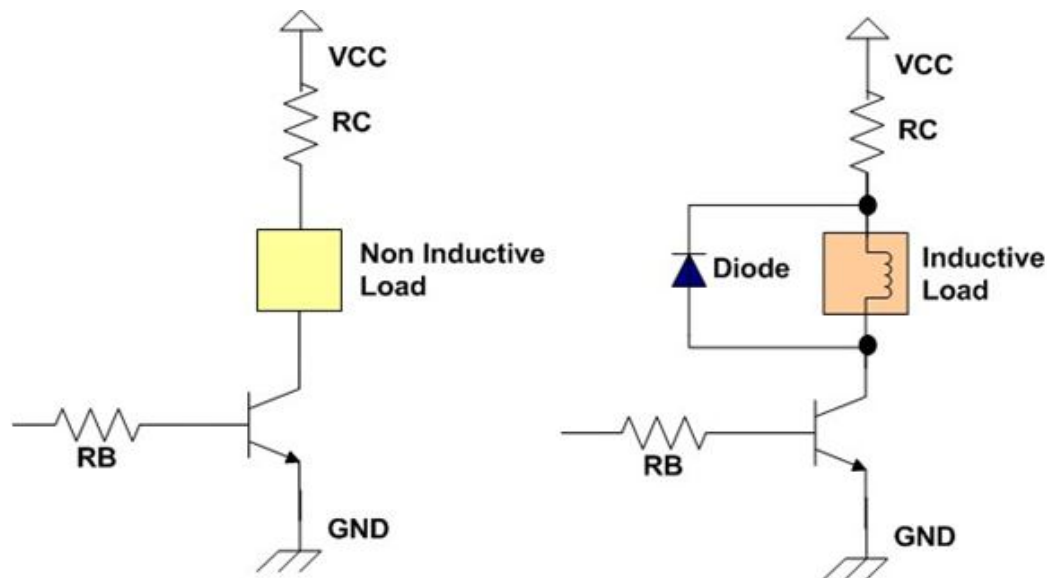
Fig 3.19 NPN transistor as a switch

Here, **RB** resistor is used to control the current on base terminal that make transistor **OFF** and **ON** (saturate) and **RC** resistor is the current limiter for the load. if the load operate with the same voltage as the supplied power (V_{cc}), the resistor RC can be omitted. In the inductive load circuit, a diode (clamp diode) is connected across the inductive load to protect the transistor again the EMF voltage generated by the inductor component when the transistor is switched on and off rapidly, which is an opposing voltage to the source voltage. Here, the diode will act as a short circuit to the high voltage generated by the inductor component. Any diode which is capable of handling minimum 1 A of current can be used. Here we used NPN D400, C828 model transistor in our project.[3]

3.10 Operating Principle

The alternating current voltage (220 V) is stepped down to (12 V) using a suitable step down transformer. The stepped down AC voltage is rectified to direct current Voltage using a full wave rectifier. To obtain a constant ripple-free DC voltage, a capacitor filter is used across the circuit.

Fig 2.4 When No 1 LED is light on the other hand the resistance of LDR is darkness then the voltage is flow in the transistor base to another transistor collector they made Darlington pair. When No 2 LED light on the other hand the light of suitable intensity is incident on the LDR. So, the voltage flow across the transistor base, since both transistor to the saturation region, which makes the collector current Ic very high. Finally the high collector current flowing through the relay, then the green LED is light, switch to remain open on and the door is open.

When No 3 LED is light on the other hand the light of suitable intensity is incident on the LDR. So, the voltage flow the transistor base to another transistor collector they made Darlington pair. Here first transistor collector connected with red LED and emitter is connected with another transistor base. This transistor collector connected with buzzer. When all LED is no light in three LDR, the resistance decreases and the voltage drop across the LDR is low. We got the output of the Red LED got signal and buzzer alarm.

Chapter 4
Design Analysis

Introduction

The hardware used are separated into different stages while developing the whole system. Building and testing these sections made the project more manageable and increased efficiency. By testing smaller aspects of the system, instead of the system as a whole, faults could easily be located and rectified. Once any faults were fixed the system as a whole was tested.

4.1 PCB (Printed Circuit Board) Development

After the circuits had been devised and tested on Breadboard, Then we collect PCB board. At first we drawn the circuit in the PCB with permanent marker .Then the PCB board was sunk with HCl acid. After 20 Minute following figures shows the layout of the PCB board.
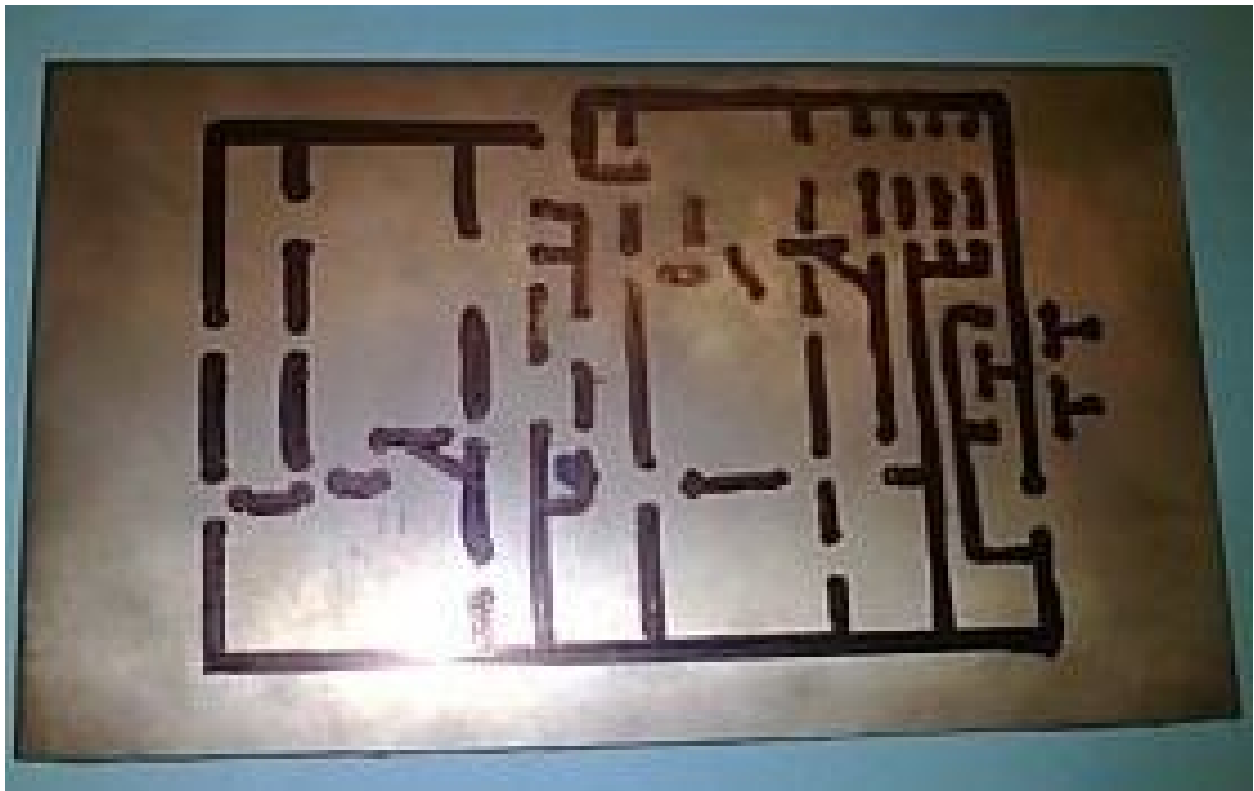
Fig 4.1 Layout the PCB board design

Then we connected the components in the PCB board. Then the component were soldering with lead. The circuit diagram shown in section is implementing on this board. Below is the front view of our system.
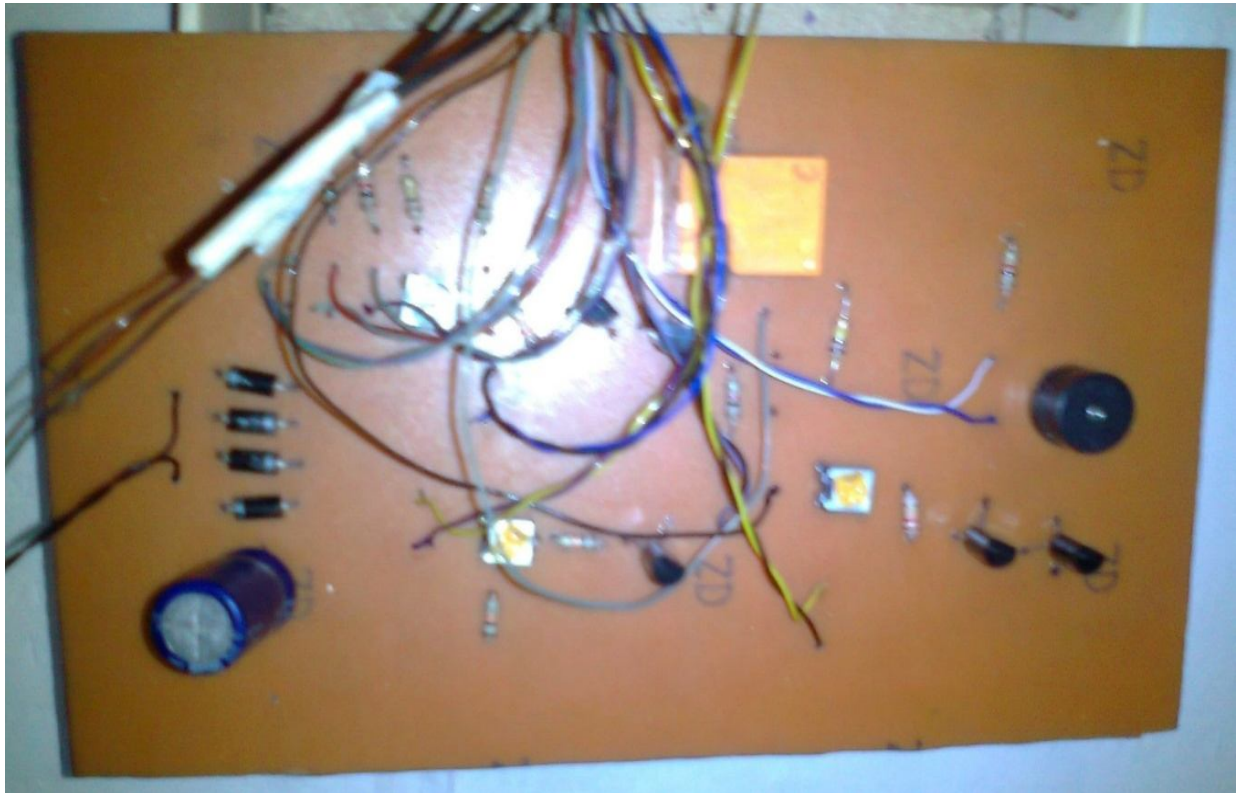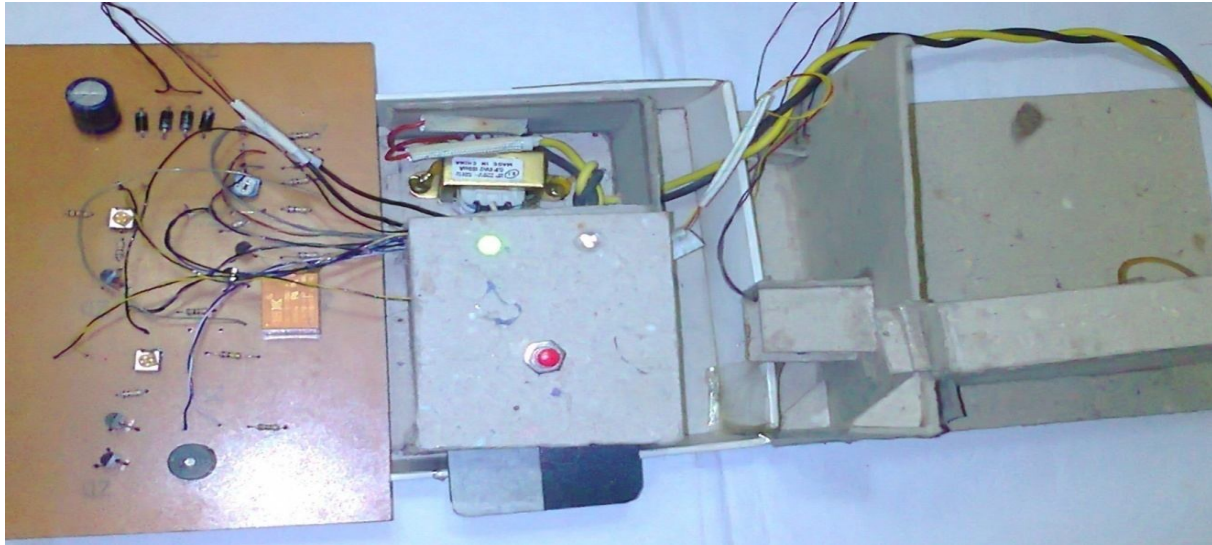

Fig 4.2 project design after connected components

4.2 System Design

After developing the circuit on the PCB, Then complete designing the full system. We can be seen that output.

Fig 4.3 shows clearly the output when valid card pushed on the machine. It can be seen that the green signal.

Fig 4.3 Output when pushed valid card
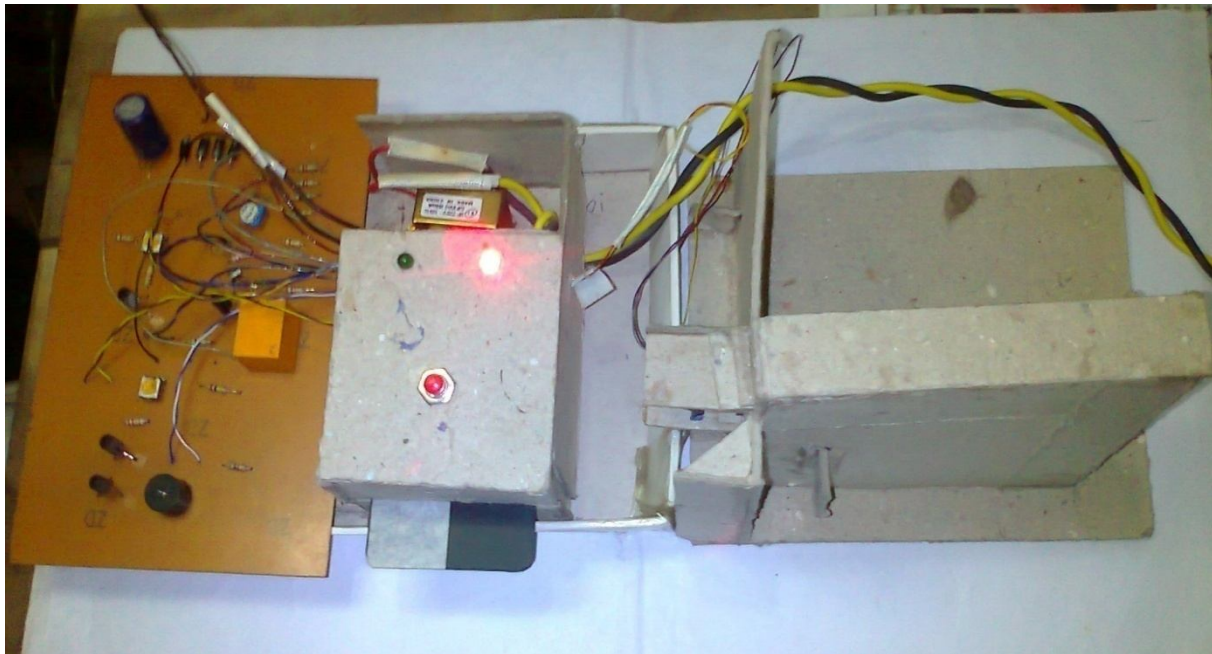
Fig 4.4 Output when pushed invalid card

The above Fig 4.4 shows clearly the output when invalid card push on the machine. It can be seen Red signal and Buzzer alarm.

Chapter 5
Cost Analysis

5.1 Cost Sheet:

No	Component	Quantity	Purchase Price TK
1	Resistor 1k	5	05
2	Resistor 10k	4	04
3	Resistor 100k	3	03
4	Resistor 120k	2	02
5	Variable Resistor 10k	3	15
6	LDR	3	60
7	Capacitor 1000µF 25v	1	25
8	Transistor D400	4	40
9	Transistor C828	1	05
10	White LED	3	10
11	Red & Green LED	2	06
12	Relay	2	50
13	SPST ON/OFF switch	1	20
14	Buzzer	1	25
15	Diode IN4007	4	05
16	Transformer XFR12AC	1	60
17	PCB	1	150
17	Others		400
18	Total		885

Table 5.1

5.2 Cost comparison

The components are available in market are low pricing where as our designed. But smart card cost was very high in our local market. The smart card is at price 1500-2000 Tk.

So we decided that the designed smart card made by ourselves.

Chapter 6
Conclusion

6.1 Conclusion

Finally the project was completed with a successful implementation by us. From the design analysis It can be seen that output clearly. So we said now this device was designed that was cost effective fast response most secure and easy to construct.

6.2 Advantages of the project

Our developed model has been a success providing the required objective as was expected. The following advantages make it an ideal model for research.

- ➢ Cheap in developing. The total costing of the project was nearly around TK.900-1000 including the cost in the fault. Thus making the project more cost efficient.
- ➢ Real time response. When we card pushed on the machine we got signal quickly.
- ➢ Software programming and microcontroller avoided.
- ➢ This types of security system does not break.
- ➢ Ease of construction. After studying about the different devices used and so previous researches in this field, it was enough to complete the circuit diagram.

6.3 Limitation of the project:

We used only 3 LDR in the circuit. When we used 5 or more LDR in the circuit our system is more strong security system.

6.4 Future direction and research:

This project is only home security system. Future working on this project would be not only to home security but also to office or University security. We can use this project in our domestic life.

The most logical next step in research in this area would be modify or increasing the number of LDR and placed Zigzag. Then we get a more secure and strong security system. After this process this type of security system not possible to break.

The working of this device can be used as Textile industries for check cotton put in the cloth. Using our model garments worker find the missing cotton in the cloth.

6.5 Discussion:

To design, Construct and design analysis of the circuit is the basic purpose of our project. Our project work is already completed. The constructed circuit is very nicely working. At first we done a project Automatic street light control, then we used this concept in this project. By studying books, searching internet, discussing our teacher we got full idea about the work.

We were suffered to implement this circuit. At first we fall in a trouble to collect HCl acid. Then we collected (Fecl)2. At last (Fecl)2 and water mixed made HCl acid. We must be sincere to connect the component the PCB, because soldering did not connect with other component.

Finally we overcome this problem and complete our project.

References

[1] http://en.wikipedia.org/wiki/Smart_card100R

[2] http://www.google.com.bd/imgres

[3] http://projectsqa.com/forum_posts.asp

[4] http://en.wikipedia.org/wiki/Electrical_resistance_and_conductance

[5] http:// www.hobby-hour.com/electronics/resistorcalculator.php

[6] http://www.parts-express.com/12-vdc-automotive-5-pin-relay-spd

[7] http://electronicsclub.info/variableresistors.htm

[8] Electronic device and circuit theory by robert L. Boylested louis Nashelsky Ninth edition Page :139