1. INTRODUCTION

Today, electronics are widely used in home appliances such as the motor speed regulation of a washing machine, the control of a vacuum cleaner, the light dimming of a lamp and the heating in a coffee vendor machine etc. This provision increases rapidly because appliances require enhanced features, easy to build and modify as electronics-based solutions become cheaper and more sophisticated.

A home appliance control system (HACS) is a system is used to provide the control of remotely operated home appliances. This project is designed to control the home application such as lights, mixer and grinder etc using the InfraRed TV remote which is efficient and low cost.

Nowadays Infra-Red (IR) is widely used in communication and control circuits. Infrared light is an electromagnetic radiation with a wavelength of 0.74 micrometers, and extending conventionally to 300 micrometers. IR is longer than that of visible light, when its measured from the nominal edge of visible red light. These radiations are invisible to the human eye, but can only be felt by our skin temperature sensors.

2. OBJECTIVE

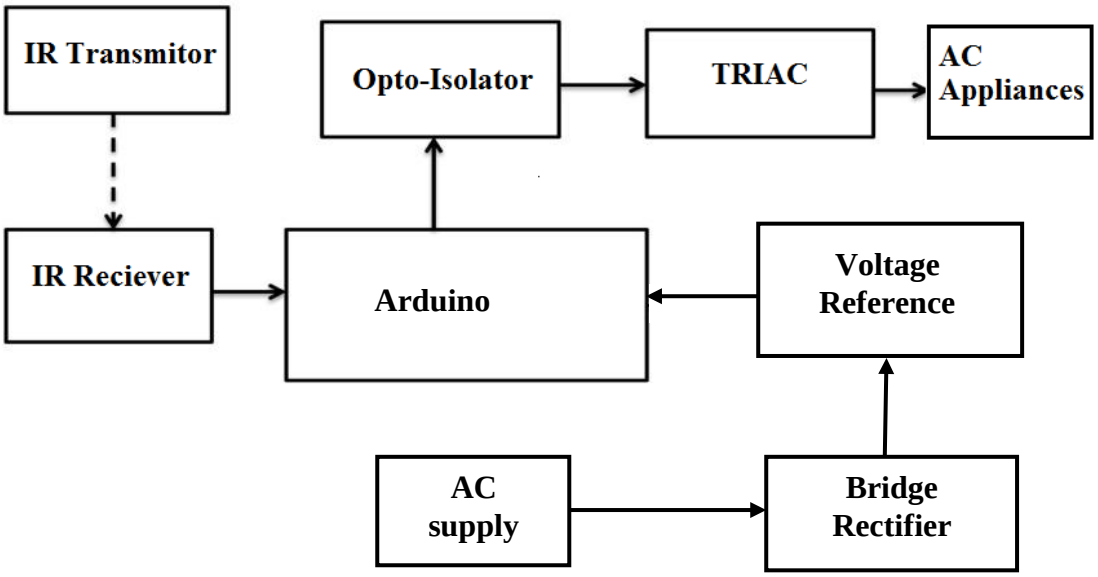
Objective of the project is to build a system for controlling intensity or the speed of the electrical AC appliances such as electrical lamps and the fans. A step ahead in that the controlling of the speed or intensity without actually reaching to the pot or the regulator, the project dose this using an Infrared wave i.e. by simply using a TV or MP3 IR remote.

The project is useful for every person who wants to change the speed of the fan and the intensity of light but don’t want to wake up he an do it by using the remote of tv. The system is very useful in the hospital where the intensity of lights is usually having to be dim. The patients can do this by using remote without any actual movement.

The project also useful for the saving of the electricity. As the world’s demand for the electricity is increased the consumption of the electricity is increased for that we should have to use the min. electricity as much as possible. This project help to reduce the electricity consumption. When we don’t want to be turn on any appliances, we can switch it off by the remote.

3. SYSTEM DEVELOPMENT

BLOCK SCHEMATIC:



Block and Component Description:

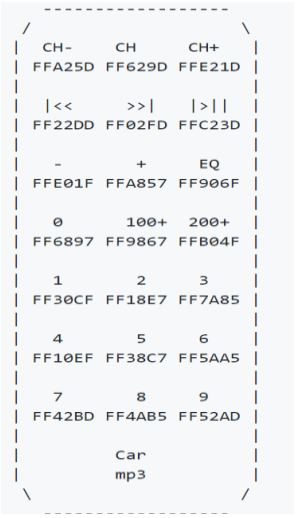
1 AC supply

- It is a 230V AC supply
- Having frequency of 50 Hz.

2 Bridge Rectifiers DB107

- It is uses 1N4007 diode bridge DB107
- it converts AC into pulsating DC
- It also provides isolation.

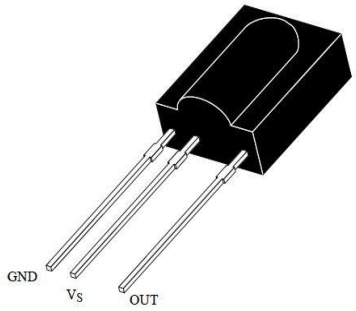
3 IR Transmitter



- Remote control distance: more than 8 meters
- Launch tube infrared wavelength: 940Nm
- Frequency: 38K, Using PWM waves.
- Power supply: CR2025/160mAH
- Button: free height is less than 3mm, the force 200-350g, the life of more than 200,000

4 IR Receivers TSOP1738

- The **sensor** has the ability to read the output signals from home remotes.
- This sensor can pick up any IR signals process them and provide the output.
- Photo detector and preamplifier in one package
- It gets the I/P from IR transmitter.
- It has TTL and CMOS compatibility.
- It's Output active low.
- It can operate Low power.
- High immunity against ambient light
- Continuous data transmission possible.

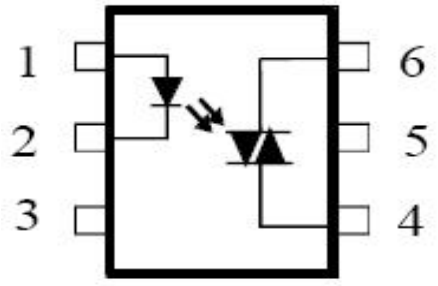


6 Arduino UNO (Atmega 328)

- Arduino UNO board uses 16MHz crystal oscillator.
- Atmega328 has 28 pins in total.
- It is used to decode the pulses from IR receiver.
- It decodes the pulses with the help of program stored in memory
- It will calculate the firing angle for TRIAC
- It will generate the control signal. That will be given to the Opto isolator

7 Opto Isolator MOC3021

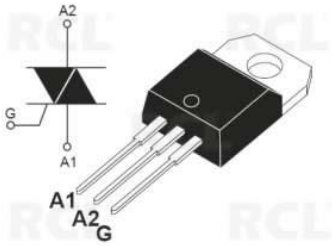
- Opto-couplers are made up of a LED and a light sensitive device, all wrapped up in one package
- No electrical connection between the two devices



- The light sensitive device may be a photodiode, phototransistor, or more esoteric devices such as thyristors, triacs etc
- It receives the signal from Arduino and give it to gate of TRIAC.

8 TRIAC BT136

- TRIAC is a switching device of Power Electronics works on AC signal having three terminals MT1, MT2, GATE
- The output of OPTO ISOLATOR is accepted by TRIAC that triggers the gate of TRIAC and the AC appliances are driven.



- Sensitive gate

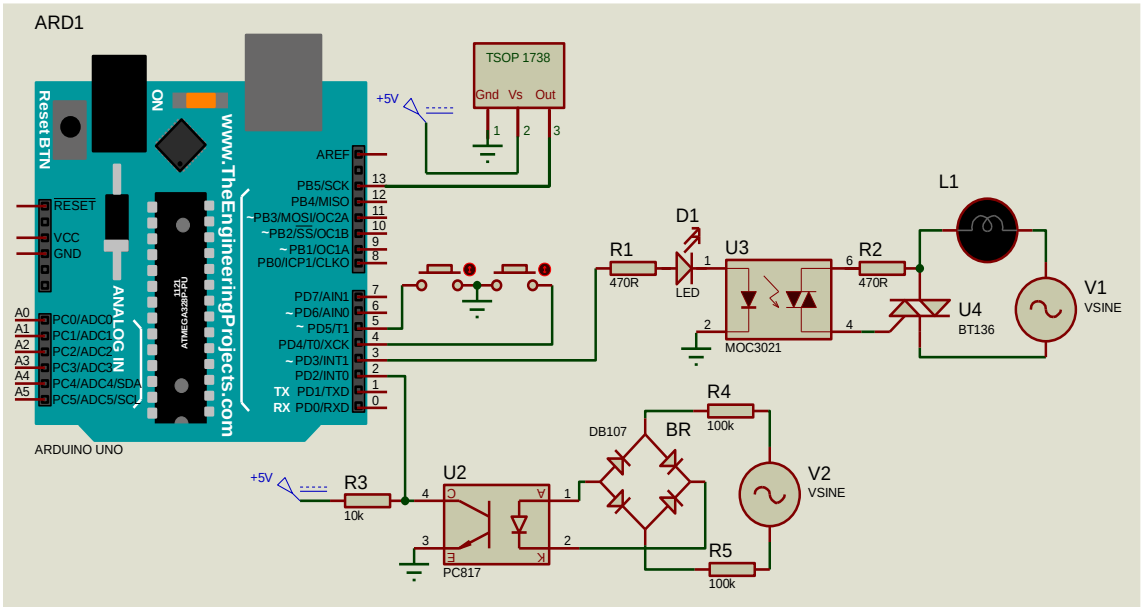
9 Loads:

We can use load as a lamp or an induction motor but as a simplicity we are using lamp as a load.

The intensity of lamp or the speed of motor is controlled by controlling the firing of TRIAC.

When the Firing angle increases intensity of lamp or the speed of induction motor decreases or vice –versa.

CIRCUIT DIAGRAM:



WORKING:

The LED in the standard remote control is an infrared transmitter, which have the range of approximately 8 meters it sends an Infrared wave which couldn't see by the human eyes. TV remote that follows RC5 Protocol is used here. The LED light used to carry the commands from the user to the appliance is the near-infrared range wavelength of approximately 980 nanometers. IR transmitter usually sends the signals in the form of (Pulse Width Modulation) PWM having carrier frequency of the 38KHz. The transmitter has the using hexadecimal value for each button on it and when any button is pressed it sends this value to the receiver. If the button is pressed the transmitter sends the 13 bits signal having one parity bit, 7 command bit and 5 address bits.

The transmitted code is received by the IR receiver (TSOP1738) which have the photodetector in it. It receives the signal and demodulates it and recover the code. The receiver passes the code to the Arduino at pin 13, which decodes the code and checks the conditions given in the program and carries out the command. After decoding the commands, the Arduino generates a signal with appropriate parameters and sends it to the opto isolator which is connected to pin 3.

Signal from the Arduino is thus received by opto isolator connected to the anti-parallel of the thyristor (TRIAC). According the signals send by the Arduino the opto isolators generates the gate triggering pulse and send it to gate of the TRIAC (BT136) and the triac starts conducting by the firing angle which is varied. Which results in the variation of the voltage and power to the load.

In this system the light intensity or the speed of fan is varied in the 10 steps. Starting from 0^{th} step to 9^{th} step. At the 0^{th} step the intensity is high i.e. the lamp is ON normally as the steps starts increasing the intensity starts decreasing step by step and at the time of the 9^{th} step the intensity will be zero i.e. lamp gets off.

The two push buttons also has been used for the manual intensity control whenever there are absence of remote one can reach to the push buttons and can increase or decrease light intensity or speed.

Current flows in the reverse direction the same thing repeats. Thus, the lamp glows in both the cycles in controlled manner depending upon the triggering pulses at the Opto Isolator. If this is given to a motor instead of lamp the power is controlled resulting in speed control.

PROGRAMMING:

```
#include "IRremote.h"
//-----(Declare Constants) -----
int receiver = 13;
//-----(Declare objects) -----
 IRrecv irrecv(receiver);                    // create instance of 'irrecv'
decode_results results;                  // create instance of 'decode_results'
//-----(Declare Variables) -----


#include <TimerOne.h>

 volatile int i=0;                          // Variable to use as a counter
 volatile boolean zero_cross=0;          // Boolean to store a "switch" to tell
                                                    us if we have crossed zero
 int AC_pin = 3;                             // Output to Opto Triac
 int buton1 = 4;                             // first button at pin 4
 int buton2 = 5;                            // second button at pin 5
 int dim2 = 0;                                  // led control
 int dim = 128;                  // Dimming level (0-128)  0 = on, 128 = 0ff
 int pas = 10;                                  // step for count;

 int freqStep = 75;                  // This is the delay-per-brightness step
                                                    in microseconds.
 char incomingByte;                  // incoming data from serial PIN
```

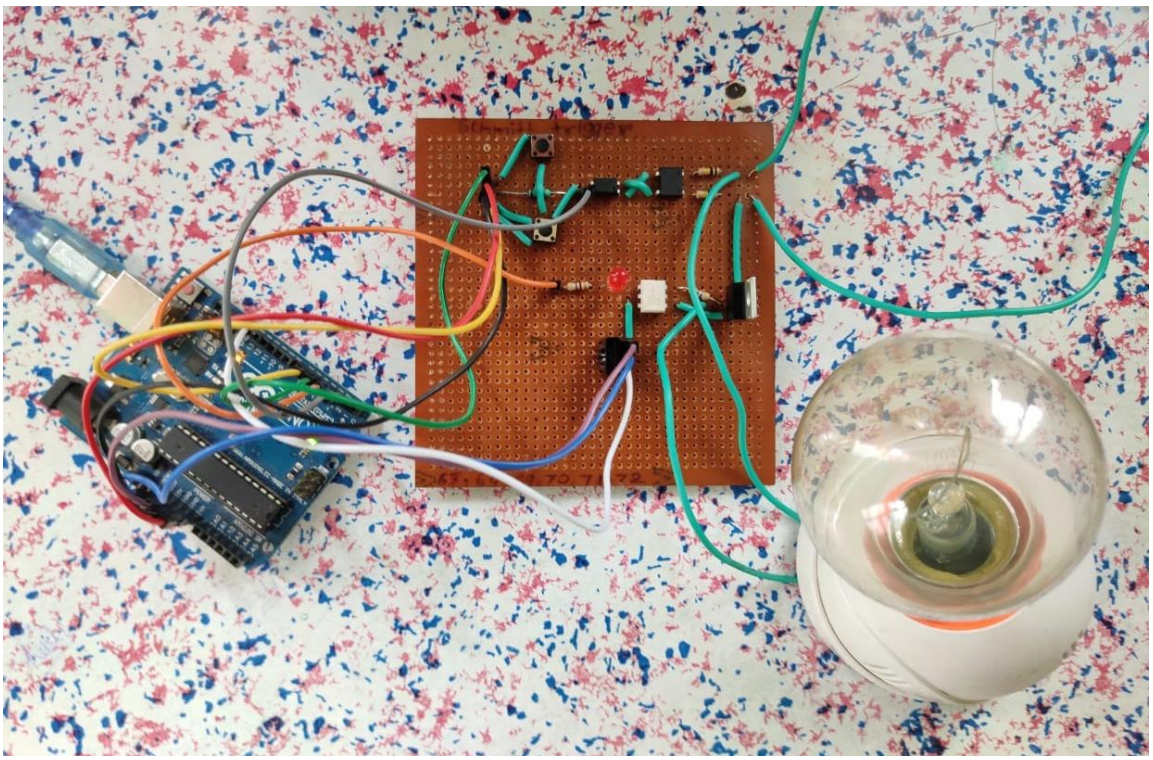
```
void setup() {  // Begin setup
  Serial.begin(9600);                                    // initialization
  irrecv.enableIRIn();                  // Start the IR receiver (classic remote)
  pinMode(buton1, INPUT);                              // set buton1 pin as input
  pinMode(buton2, INPUT);                              // set buton1 pin as input
  pinMode(AC_pin, OUTPUT);                    // Set the Triac pin as output
attachInterrupt(0, zero_cross_detect, RISING);          // Attach an Interupt to
                                    Pin 2 (interupt 0) for Zero Cross Detection
 Timer1.initialize(freqStep);                  // Initialize TimerOne library for
                                                                the freq we need
  Timer1.attachInterrupt(dim_check, freqStep);
  // Use the TimerOne Library to attach an interrupt
}

void zero_cross_detect() {
   zero_cross = true;                // set the boolean to true to tell our dimming
                                              function that a zero cross has occured
  i=0;
  digitalWrite(AC_pin, LOW);
}

// Turn on the TRIAC at the appropriate time
void dim_check() {
  if(zero_cross == true) {
    if(i>=dim) {
      digitalWrite(AC_pin, HIGH);                              // turn on light
       i=0;                                                 // reset time step counter
      zero_cross=false;                                   // reset zero cross detection
    }
    else {
      i++;  // increment time step counter
    }
  }
}

//-----( Declare User-written Functions )-----
void translateIR()                    // takes action based on IR code received

{
  switch(results.value)
  {
case 16625743:
    dim=128;
    break;

case 16580863:
```

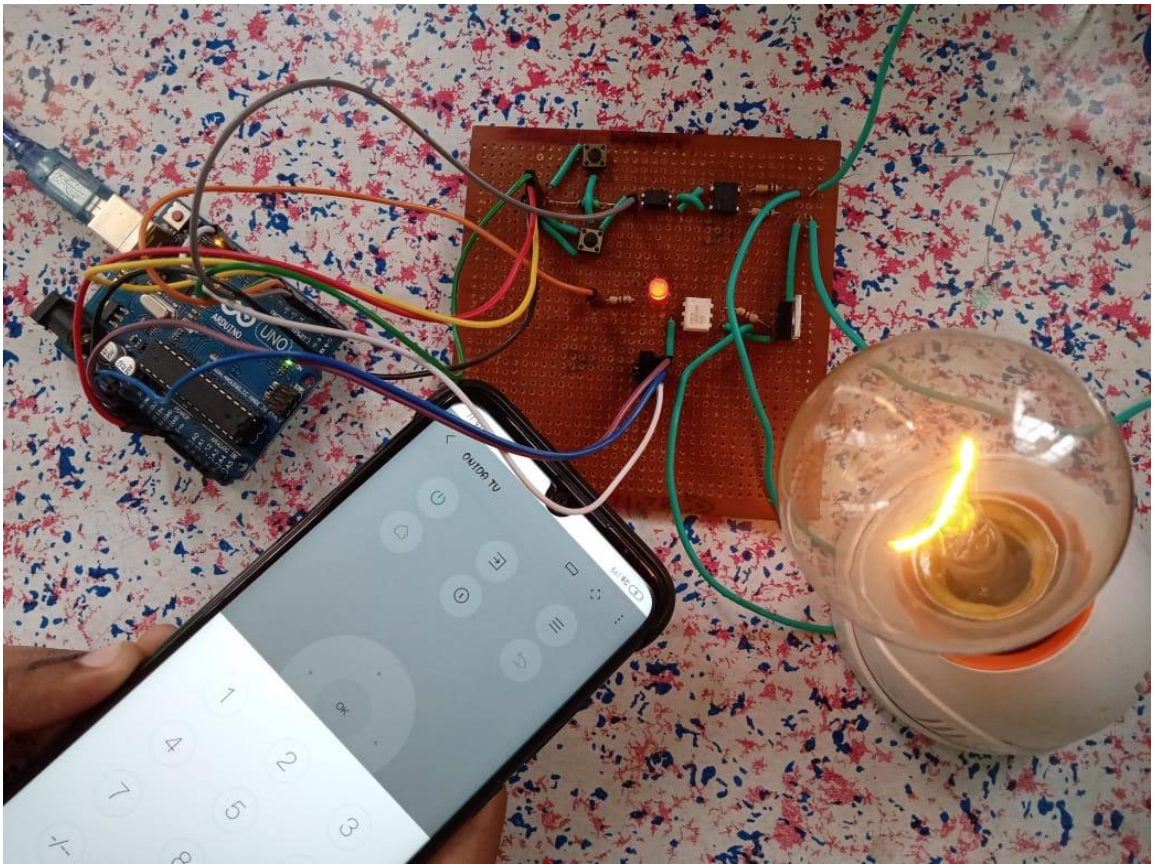
```
    dim=120;
    break;

case 16613503:
    dim=105;
    break;

case 16597183:
    dim=90;
    break;

case 16589023:
    dim=75;
    break;

case 16621663:
    dim=60;
    break;

case 16605343:
    dim=45;
    break;

case 16584943:
    dim=30;
    break;

case 16617583:
    dim=15;
    break;

case 16601263:
    dim=00;
    break;

  case 16591063:
    {
    if (dim<127)
   {
    dim = dim + pas;
    if (dim>127)
    {
     dim=128;
    }
    }
    }
```

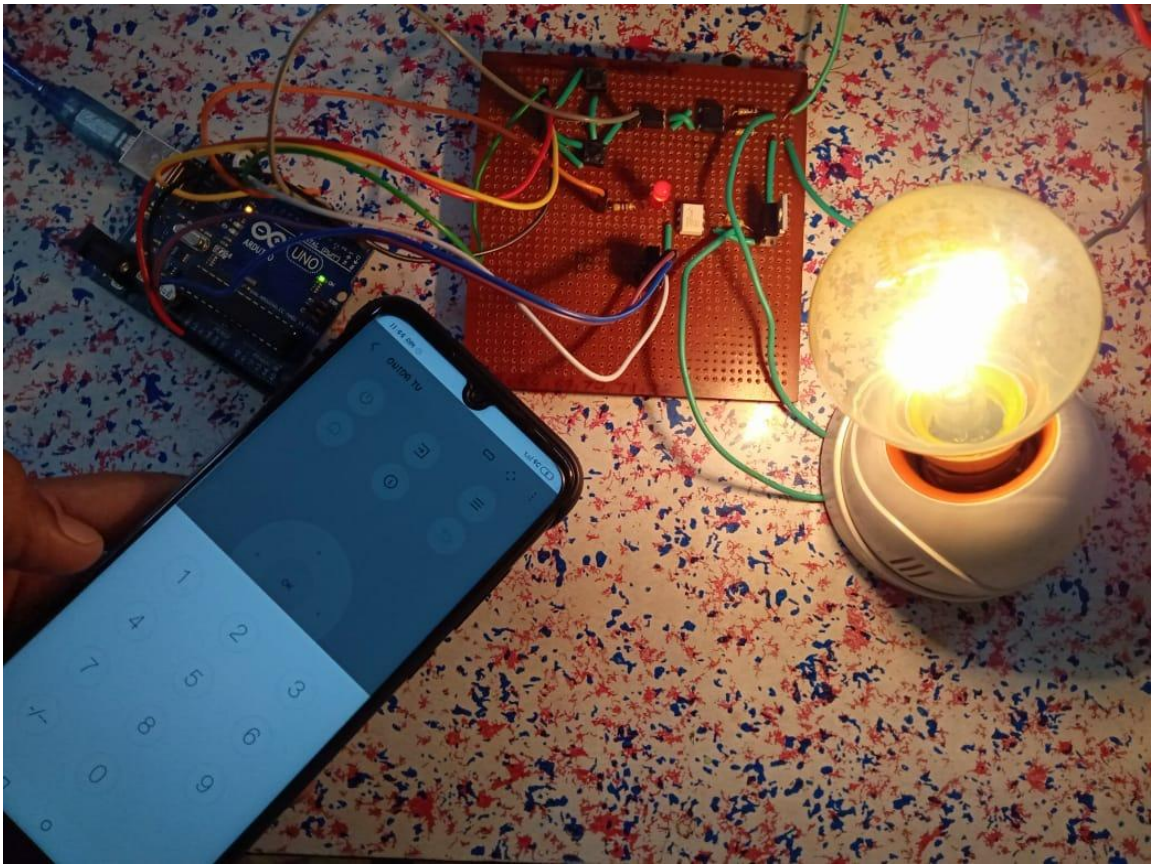
```
   break;

  case 16586983:
    {
      {
  if (dim>5)
  {
     dim = dim - pas;
  if (dim<0)
    {
      dim=0;  // in vechiul sketch era 1
    }
   }
   }
   }
    break;

    default:
    Serial.println(results.value);
  }

}


void loop() {
  digitalWrite(buton1, HIGH);
  digitalWrite(buton2, HIGH);


 if (digitalRead(buton1) == LOW)
   {
  if (dim<127)
  {
    dim = dim + pas;
    if (dim>127)
    {
      dim=128; // in vechiul sketch era 127
    }
  }
   }
  if (digitalRead(buton2) == LOW)
   {
  if (dim>5)
  {
     dim = dim - pas;
  if (dim<0)
```

```
    {
      dim=0;  // in vechiul sketch era 1
    }
   }
   }
    while (digitalRead(buton1) == LOW) {  }
     delay(10);                                          // waiting little bit…
    while (digitalRead(buton2) == LOW) {  }
     delay(10);                                          // waiting little bit...

// remote
 if (irrecv.decode(&results))                  // have we received an IR signal?
  {
    translateIR();
    irrecv.resume();                                  // receive the next value
  }

 delay (100);
}
```

4. PICTURE GALLERY







5. ADVANTAGES

1. Safety
2. Convenience
3. Saves Time
4. Save Money

6. DISADVANTAGES

1. Low range only 8 meters.
2. The remote must be in line with the IR sensor.

7. CONCLUSION

Home automation system using IR application has been tested and successfully implemented. This system is highly reliable and efficient for the aged person and paralyzed person on the wheel chair who cannot reach the switch for the switching of on /off and controlling the device and are dependent on other this system has a wide scope development and modification.

Intensity of a bulb and speed of the fan is controlled in 8 different levels including ON and OFF using a TV Remote. The level at which different loads are operating is displayed on a LCD.