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RF Based Wireless Remote Control for Home Appliances With Microcontroller

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ABSTRACT:

Remote control device is a home device used to control the switch of household appliances from a distance. This system can change the state of electrical appliances either in OFF state or in ON state. Now-a-days we use many electrical devices at homes, industries, offices, institution, that are controlled manually .To reduce man power we need some wireless controlling system. Mostly these wireless controlling systems are based on IR or RF .This project is RF based one. It comprises of arduino based transmitter and receiver section. This controlling system is helpful for elderly persons or physically challenged persons who are able to go to the switch board to control the devices

I. INTRODUCTION

Technology is advancing so household appliances are easier and more comfortable If one can control the devices like fan, T. v, music system ,etc., with the remote from the distant place just by pressing the button, life will became smarter .Using RF controlled switches, houses are gradually shifting from conventional switches to centralized control system. As we press switch from RF transmitter end then immediately data to be transmitting in the air. Data receiving air by the radio frequency module and proceed to electrical appliances circuit . The use of remote to restore order to the household [1].changes life style; brings multi-function and multi-platform lives easy .It is the efficient and low cost system in the modern world .By using arduino nano controller we can make our home secured with safety. Such systems need to operate over a wireless network in certain environments and achieve certain tasks. When we talk about wireless automation, we simply refer to radio frequency or GSM communication over the IOT (internet of platform [2].However, the choice of which communication platform (network based or radio frequency based) to be used is largely dependent on the nature of task to be carried out and what parameters are concerned with the process and particularly the cost effective nature of each platform to be used. Such parameters as mentioned above have very vital effects over the nature of design [3].

II. MATERIALS AND WORKING

Materials:

- RF transmitter module
- RF receiver module
- Arduino Nano
- Resistor
- LED
- Push Button

Working of Materials :

RF transmitter module

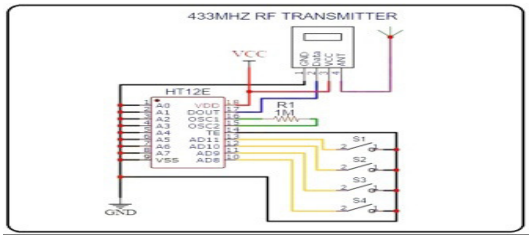

Fig (1) block diagram of RF transmitter

The figure 1 shows the block diagram of RF transmitter with their explanation. The HT12E encoder IC **VSS** pin connected to the power supply ground (-) and the **VDD** Connected to power supply VCC (+). IC A0- A7 pins are connected to ground switch S1 to S4 are respectively connected to AD11,AD10, AD9, AD8. The 1Mega ohm resistor is connected between the pin 15 and 16 which provides the external resistor for the operation of internal oscillator of the HT12E IC. The RF transmitter module ground(-) and the VCC is connected to power supply VCC(+). The data pin is connected to pin 17 of the IC.

RF receiver module;

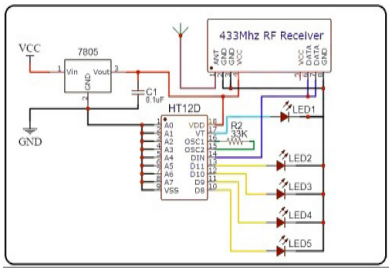

Fig (2) block diagram of RF receiver

The HT12D decoder IC VSS pin is connected to the power supply ground and VDD is connected to the power supply Vout(+) of 7805 5v voltage regulator . IC A0-A7 pins (pin 1-8) are connected to the ground (-). The LED2,LED3 ,LED4 and LED 5 are respectively connected to the D11,D10,D9 and D8. The 33K ohm resistor is connected between pin 15 and 16 which provides external resistance for the operation of the internal oscillator of the HT12D IC. The RF receiver module ground (-) and VCC is connected to the power supply VCC(+).The data pin is connected to the DIN(pin14) of the IC .This are explain in fig (2). Radio frequency (RF) is any of the electromagnetic wave frequencies that lie in the range extending from 3 kHz to 300 GHz, which include those frequencies used for communications or radar signals [4].

Arduino Nano

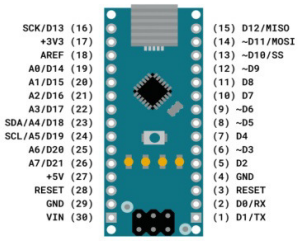

Fig (3)pin diagram of Ardino nano

Arduino is an open-source platform arranged in a simple microcontroller board [5]. The Arduino is designed to be easy to use unit has its programming language called as the Arduinos programming language [6]. The Arduino Nano is one of the most popular Arduino boards .It is based on the AT mega 328 8-bit microcontroller by Atmel. Arduino Nano has a total of 36 pins out of these 8 are analog input pins and 14 digital input/output pins. Nano has 16M HZ SMD crystal resonator, a mini USB –B port, an ICSP header, 3 RESET pins and RESET buttons. All of the digital pins of the Arduino Nano can be used as input or output using the function pin mode, digital read and digital write . They operate at 5Vand each pin can receive or provide a maximum of 40 mA of current. The analog can also be used as digital pins using the aliases A0,A1 etc,. The expectation is the Arduino Nano's A6 and A7 pin which can only be used as analog inputs. The pin specification is given below

Specification

Table(1) specification of arduino nano

Microcontroller:	ATmega328
Operating voltage:	5 V
Input voltage (VIN):	6-20 V
Power consumption:	19 mA
Flash memory:	32 KB (of which 2 KB is taken by bootloader)
SRAM:	2 KB
Clock speed:	16 MHz
EEPROM:	1 KB
Current per I/O pin:	40 mA (20 mA recommended)
PCB size:	18 x 45 mm
Weight:	7 g

Resistor :

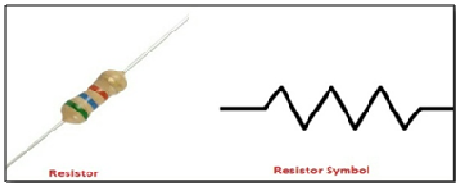

Fig (4) resistor and its symbol

This figure shows the resistor is a passive two-terminal electrical component which is used as a resistance of incoming current [7]. Resistance of any resistor is described in ohms. Ohm is denoted by the greek letter omega . The resistance can be derived from Ohm's law which indicate voltage is directly proportional to the current flowing through the circuit.

$$V = IR$$

The SI unit of electrical resistor is ohm (symbol : **Ω**). An ohm is equivalent to a volt per ampere. The reciprocal of resistance R is called conductance G. The value of resistance is measured by color code as given below table 2 and diagram FIG(5)

Color Name	Value As Figure	As Decimal Multiplier
Black	0	x 1
Brown	1	x 10^1
Red	2	x 10^2
Orange	3	x 10^3
Yellow	4	x 10^4
Green	5	x 10^5
Blue	6	x 10^6
Violet	7	x 10^7
Grey	8	x 10^8
White	9	x 10^9
Golden	-	x 10^{-1}
Silver	-	x 10^{-2}

Table (2) colour code

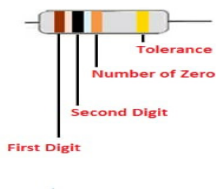

Fig (5) diagram

LED

LED is a acronomy of *Light Emitting Diode*.It is a P-N junction diode which consist of two leads and semiconductor light source .Its diagram and symbol is given below the fig(6)

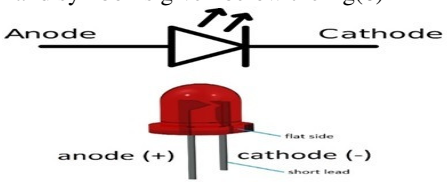

Fig (6) symbol and figure of LED

In PN junction diode the P side contain excess of positive charge i.e., holes while the N side contains excess of negative charge i.e., electrons. When a electron holes within device, releasing the energy in the form of photon. This effect is called electroluminescence effect. The color of light is determined by the energy band gap of the semiconductor. LED lighting equipments are widely used for automobiles [8]

Push Button :

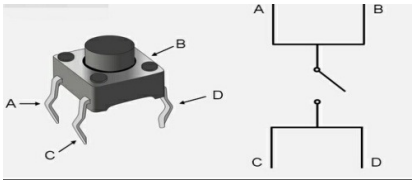

Fig (7) circuit diagram of push button

In this figure (7) shows the circuit diagram and its working. It is a type of switch which complete the circuit as it is pressed. It's very important for triggering inputs .

Battery :

A batter convert chemical energy into electrical energy .usually the chemicals are kept inside the battery. It is used in a circuit to power the other components , here we use 9V battery.

View of RF Transmitter and Receiver

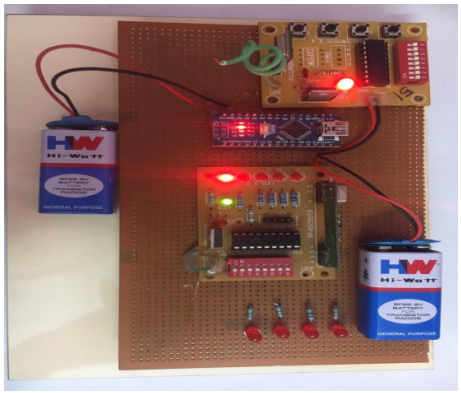

Fig (8) circuit setup

Working:

From the fig(8), we can see that the 9V battery is separately connected to the RF transmitter and RF receiver circuit. By using four push buttons four inputs are given to the transmitter . The RF transmitter can transmit the inputs to the receiver with the help of Arduino Nano controller. The output given by the receiver is indicated by LEDs.

III. RESULT AND DISCUSSION

We did the testing of our components after finalization our design. This testing is helpful for control our circuit.

The effect of the input power to the range of communication was tested here, and the corresponding readings were taken as shown in table 3

Table (3) Input power and output analysis

Input power	**Range/Distance**	**Analysis**
5V	20 meters	Communication established
5V	30 meters	Weak signal is received
7V	30 meters	Communication established
7V	60 meters	Weak signal is received
9V	60-90 meters	Communication is established

From the table 3 remote control system is analyzed. simple analysis gathered by the input power test, it was practically observed that the theoretical range of communication is quite different from the operational range. As the DC transmitter input/supply voltage increases, the operational range also increases. A 5V reference voltage is applied to the system, the communication is established at the distance of 20 meter . Again 5v is applied to the system weak signal is received at the range of 30 meter. Similarly we applied the voltage 7v again the communication is established at the distance 30 meter and the weak signal is received at the range of 60 meter. The 9v voltage is applied to the system the communication is established at the distance of range from 60-90meters.

Software testing

When any key is pressed, data is passed to the arduino nano and then to the RF transmitter from where it is transmitted. The RF receiver receives this data and gives it to the arduino nano. The arduino nano serially converts the serial bit data into four-bit data at a port of microcontroller ATmega328p. The software program is given below

```
int A = 12;
 int B = 11;
int C = 10;
int D = 9;

 int Aout=8;
 int Bout=7;
int Cout=6;
 int Dout=5;
 void setup()
 {
```



```
Serial.begin(9600);
pinMode(A, INPUT);
pinMode(B, INPUT);
pinMode(C, INPUT);
pinMode(D, INPUT);
pinMode(Aout,OUTPUT);
pinMode(Bout,OUTPUT);
pinMode(Cout,OUTPUT);
pinMode(Dout,OUTPUT);
}
void loop()
{
int A stat = digitalRead(A);
int B stat = digitalRead(B);
int C stat = digitalRead(C);
int D stat = digitalRead(D);
if(A stat==0)
{
digitalWrite(Aout,HIGH);
delay(10000);
}
else
{
digitalWrite(Aout,LOW);
}
if(Bstat==0)
{
digitalWrite(Bout,HIGH);
delay(10000);
}
else
{
digitalWrite(Bout,LOW);
}
if(Cstat==0)
{
digitalWrite(Cout,HIGH);
delay(10000);
}
else
{
digitalWrite(Cout,LOW);
}
if(Dstat==0)
{
digitalWrite(Dout,HIGH);
delay(10000);
}
else
{

digitalWrite(Dout,LOW);

}

}
```

IV. CONCLUSION :

The implementation of this project is successfully . This controlling system is built from RF transmitter and RF receiver modulus which are operating at certain frequency along with a encoder and decoder with few passive components . Multiple device can be controlled by using single remote. This controlling system can also be used in

various fields such as garage door, car door controller ,wireless security system, fire alarm etc,. This is system can upgraded by using GSM modem. It is an advanced technology remote control system . In this system the home appliances are controlled by sending SMS through mobile.

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