HOME AUTOMATION

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Points for discussion

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INTRODUCTION

1. The aim of this project is to demonstrate the implementation of home automation using Arduino Uno, temperature sensor, real time clock and relay module.

2. Home automation refers to the integration of smart devices and systems that manage various aspects of your home, such as lighting, climate control, entertainment systems, and appliances.

3. Home automation enhances convenience, energy efficiency, and security.

4. Most home automation systems revolve around a central hub or gateway. This hub acts as a command post, allowing communication between controllers (computers or mobile devices) and the controlled devices.

5. In this era of rapid urbanization and technological proliferation, the demand for smart solutions to everyday challenges is ever-growing. Recognizing this need, our team embarked on a journey to develop a comprehensive home automation system that would revolutionize the way occupants interact with their living spaces.

FUNCTIONALITY

1. <u>Control Lighting</u>: Users can remotely switch lights on and off using their smartphones or tablets. Additionally, the system can be programmed to implement scheduling or motion detection for automated lighting control, further optimizing energy usage.
2. <u>Regulate Fan</u> : By interfacing with a fan using the relay module, our system allows users to adjust fan speed based on ambient temperature readings. This not only ensures optimal comfort but also minimizes energy consumption by avoiding unnecessary fan usage.
3. <u>Monitor Temperature</u>: The integration of a temperature sensor enables our system to continuously monitor room temperature. Users can view real-time temperature data and configure automated responses, such as activating fans when the temperature exceeds a certain threshold.

WORKING PRINCIPLE

1. <u>Arduino Uno</u>: Serving as the brain of our automation system, Arduino Uno facilitates the integration and control of various peripherals through its GPIO pins.
2. <u>Relay Module</u>: A relay module acts as an interface between Arduino Uno and high-power devices such as lights and fans enabling microcontroller to switch these devices on and off safely.
3. <u>Temperature Sensor</u>: To enhance the functionality of our system, we integrate a temperature sensor. This sensor enables us to monitor ambient temperature and implement automated responses, such as adjusting fan speed based on room temperature.
4. <u>Real Time Clock(RTC)</u>: An RTC, or Real-Time Clock, is a timekeeping device used in electronic systems to maintain accurate time and date information even when the system is powered off or reset.
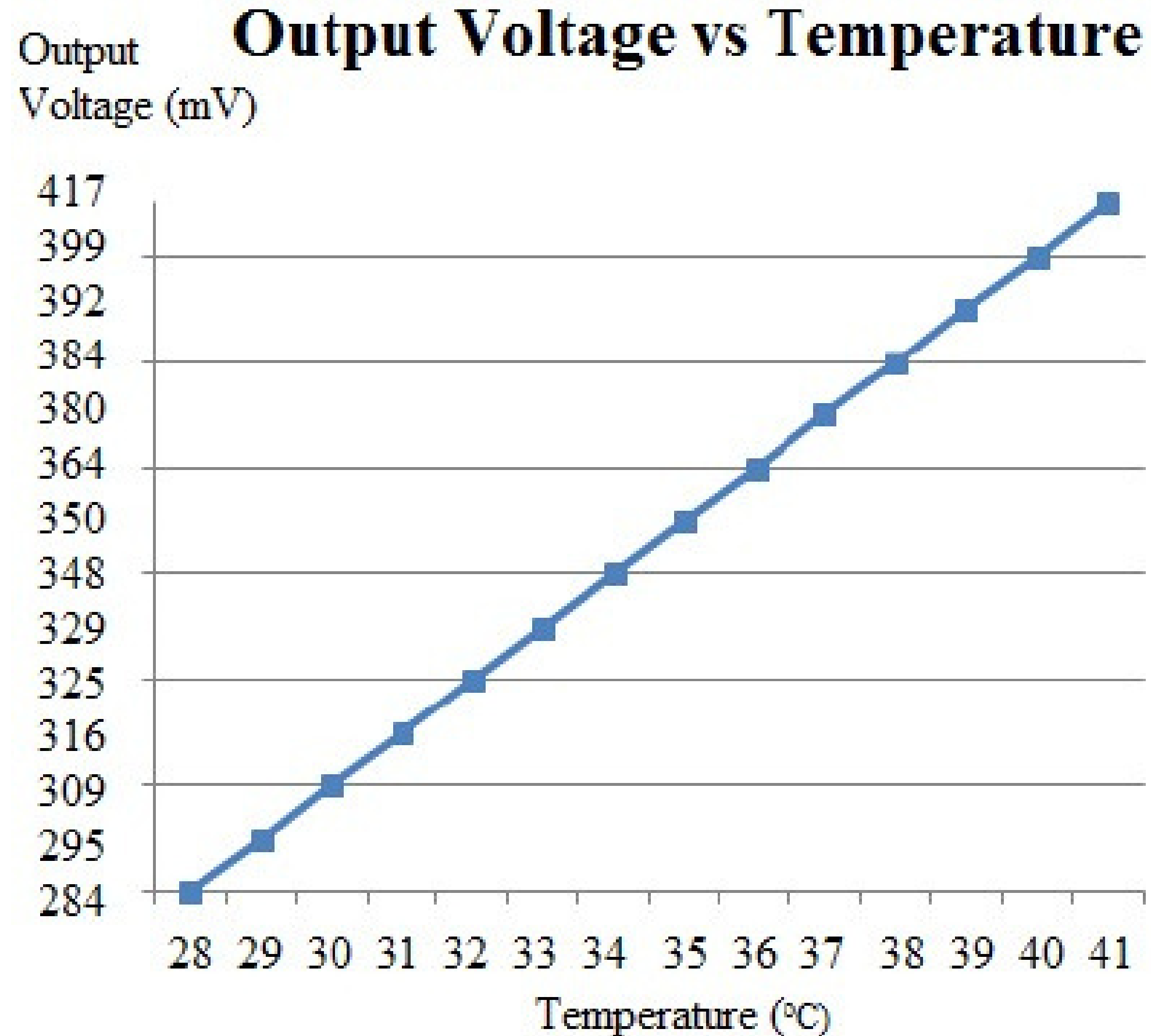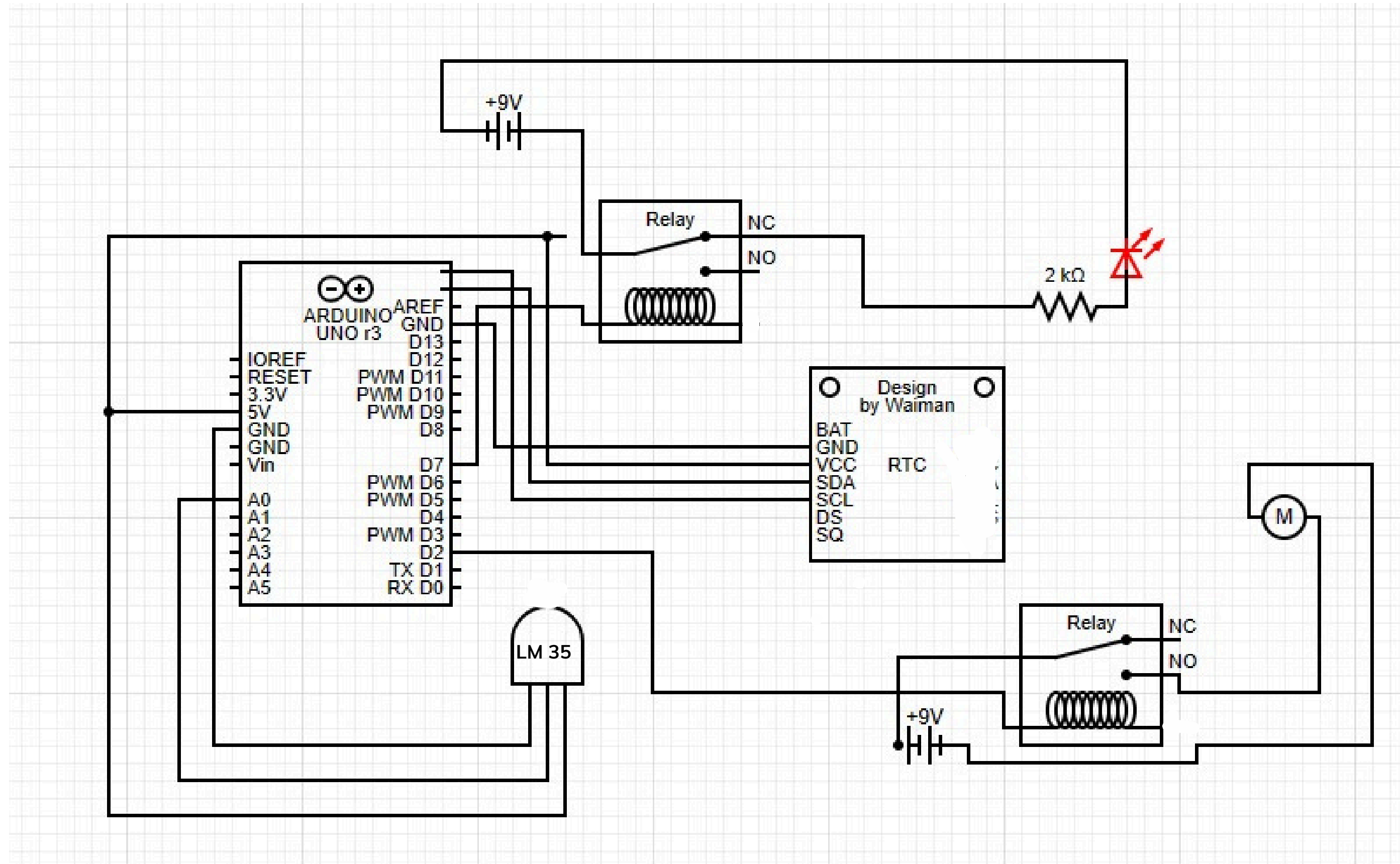
CONNECTION DIAGRAM

9V DC BATTERY

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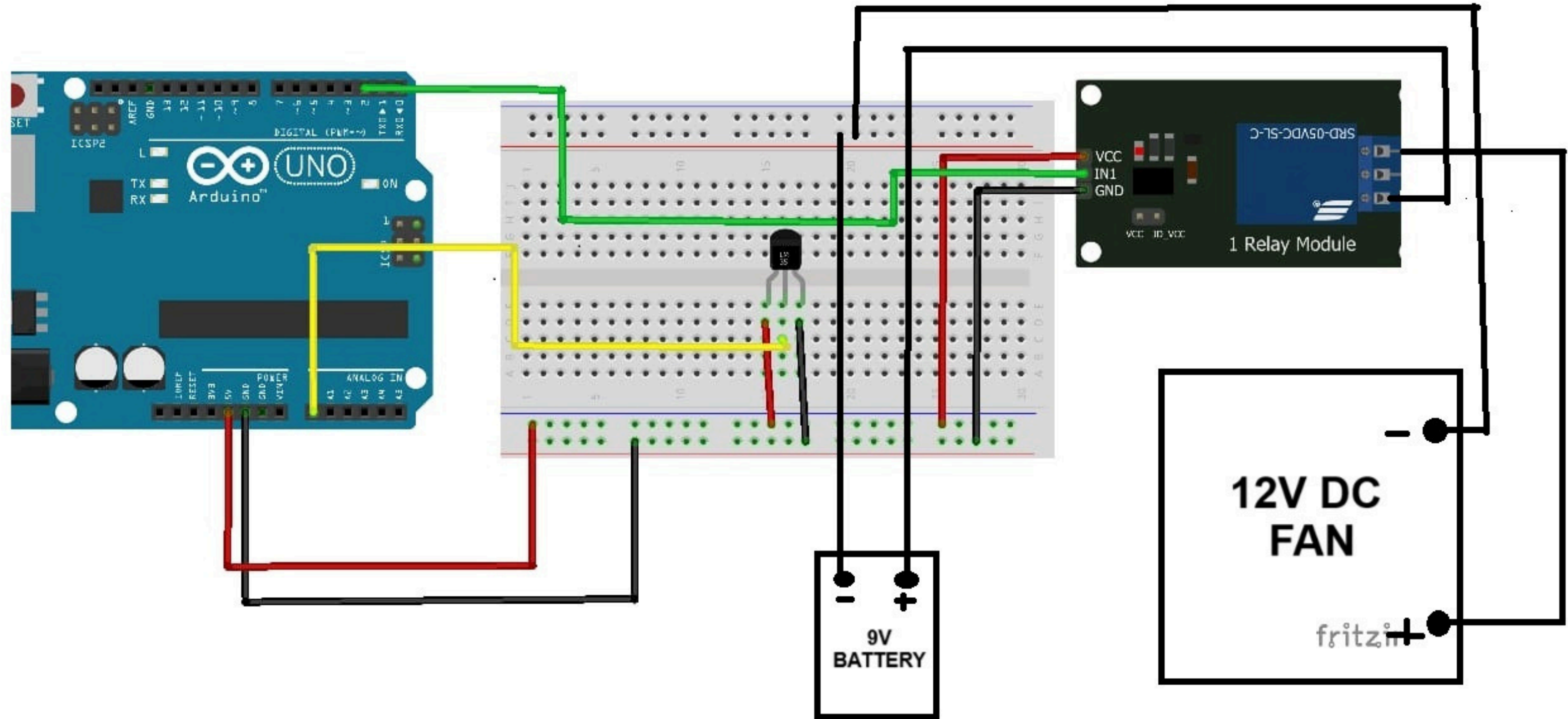
LM35 CIRCUIT DIAGRAM
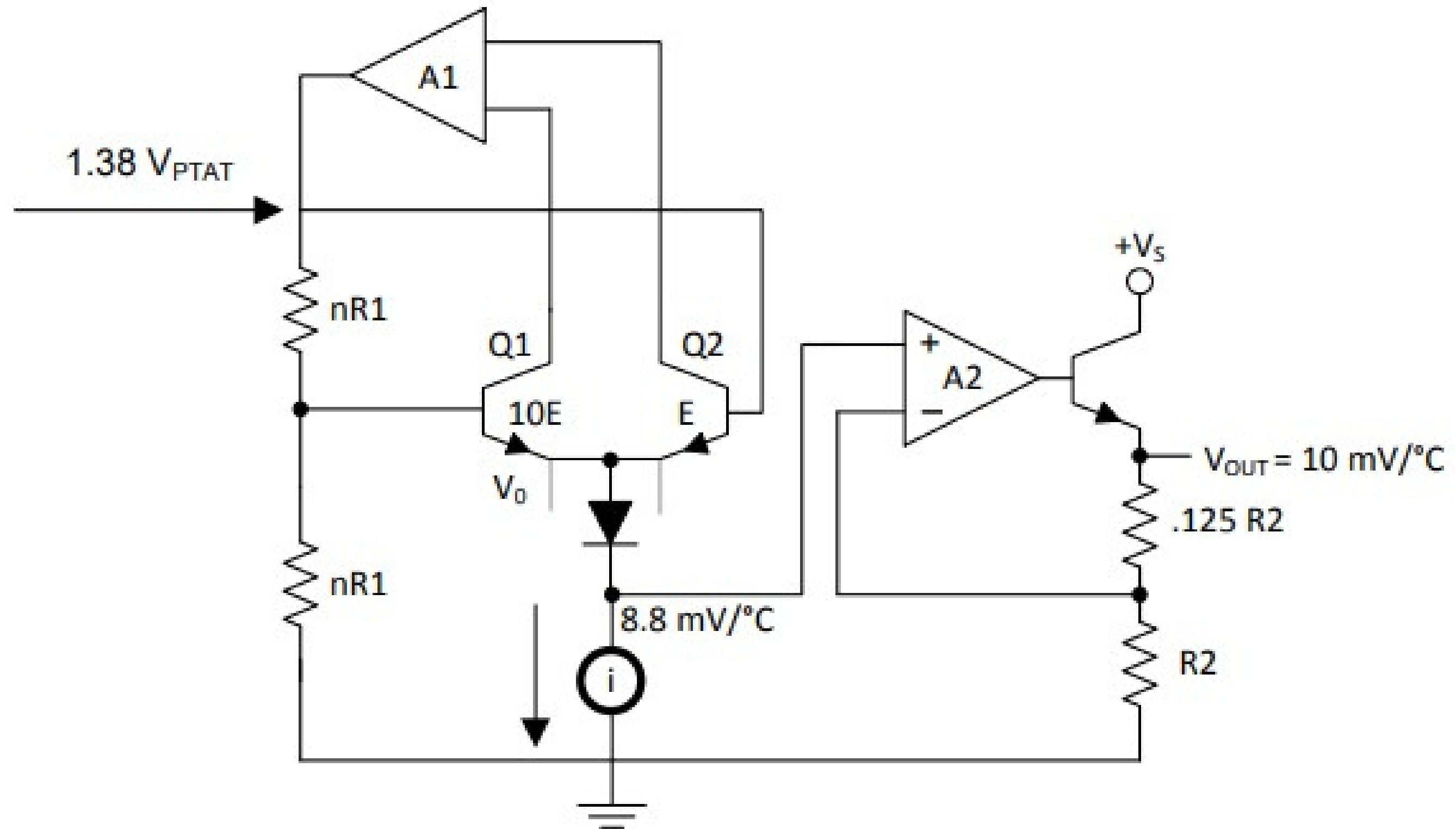
Output Voltage vs Temperature Curve of LM35

Output Voltage vs Temperature

CIRCUIT DIAGRAM OF THE PROJECT

CODE

```arduino
#include <RTClib.h>
//#include<LiquidCrystal_I2C.h>
const int sensor=A0;
float tempc;
float vout;
float dummy;
//LiquidCrystal_I2C lcd(0x27 ,16, 2);
int data;
const int lightPin = 7;
RTC_DS3231 rtc;
void setup() {
pinMode(lightPin, OUTPUT);
rtc.begin();
pinMode(sensor,INPUT);
pinMode(2,OUTPUT);
Serial.begin(9600);
}

void loop() {
 data = Serial.read(); // Reads the data from the serial port
DateTime now = rtc.now();
 Serial.print("Current Time: ");
  // Add leading zero for single-digit hours/minutes
  //Serial.print(now.hour() < 10 ? "0" : "");
  int x = (now.hour());
  int y = (now.minute());
  Serial.print(x);
  Serial.print(":");
  //Serial.print(now.minute() < 10 ? "0" : "");
  Serial.println(y);
  Serial.println(data);
  if(x >= 17 && x <= 22 ){
    digitalWrite(lightPin,HIGH);
  }

else{
 digitalWrite(lightPin,LOW);
 }
vout=analogRead(sensor);
  vout=(vout*500)/1023;
  tempc=vout/3.5
 dummy=23;
  Serial.println(tempc);
 if (tempc>25 )   {
    digitalWrite(2,HIGH);
    Serial.println("on");
    }
  if (tempc<25){
   digitalWrite(2,LOW);
   Serial.println("off");
  }
  delay(1000); //Delay of 1 second for ease of viewing
}
```

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CODE OUTPUT

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KEY COMPONENTS

MICROCONTROLLER
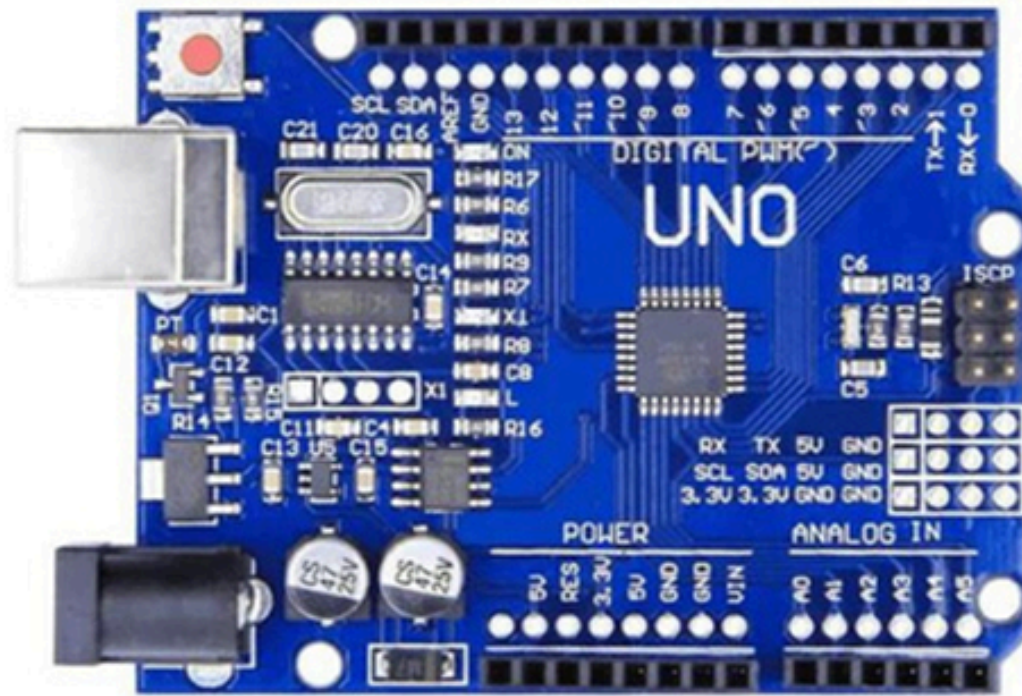
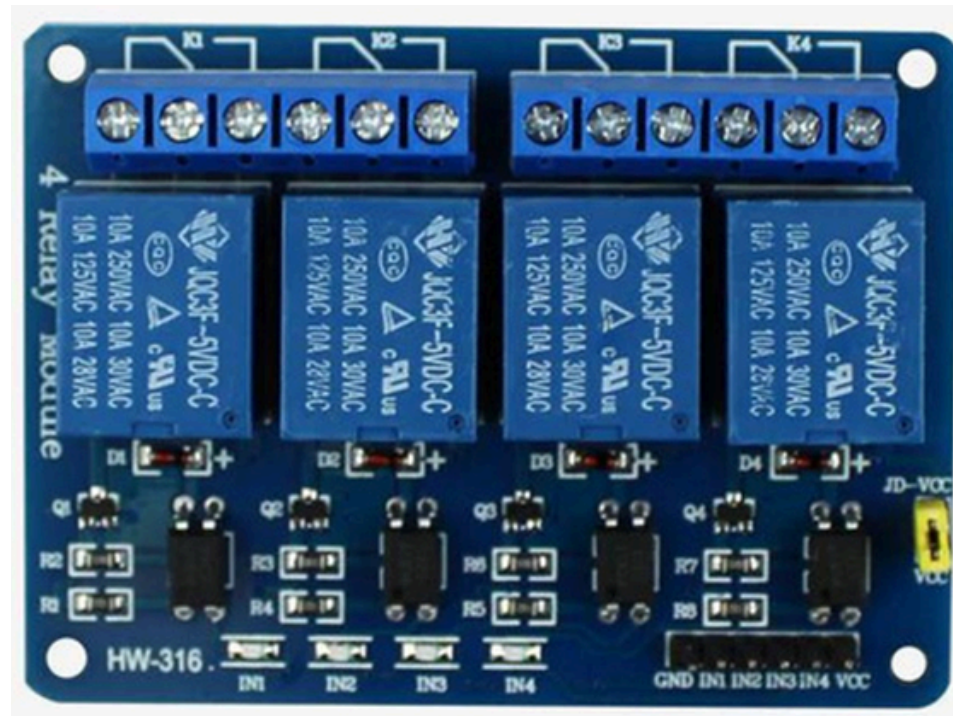The Arduino Uno R3 is a popular microcontroller board,. It has 14 digital and 6 analog I/O pins, USB connectivity, a 16 MHz clock speed. It is widely used for prototyping and DIY electronics projects.

RELAY MODULE

A relay module is an electronic device that acts as a switch, allowing low-voltage microcontrollers like Arduino to control higher-voltage circuits. It can be used for applications such as turning on/off lights, appliances, or other high-power devices in response to digital signals
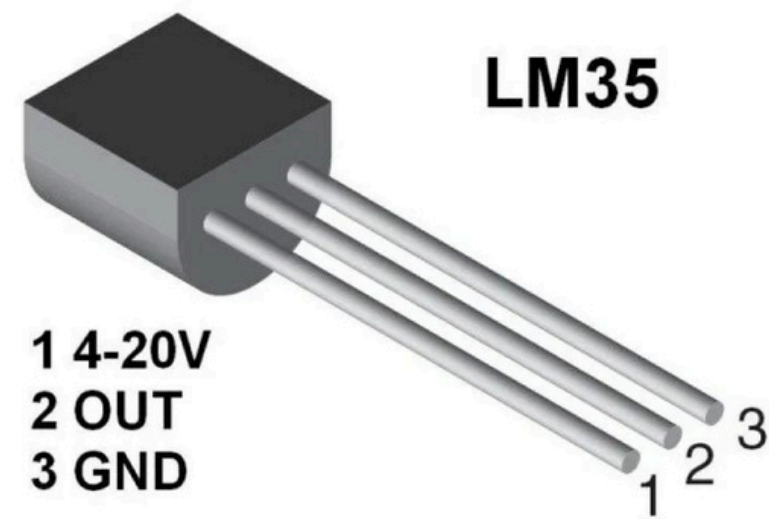
REAL TIME CLOCK
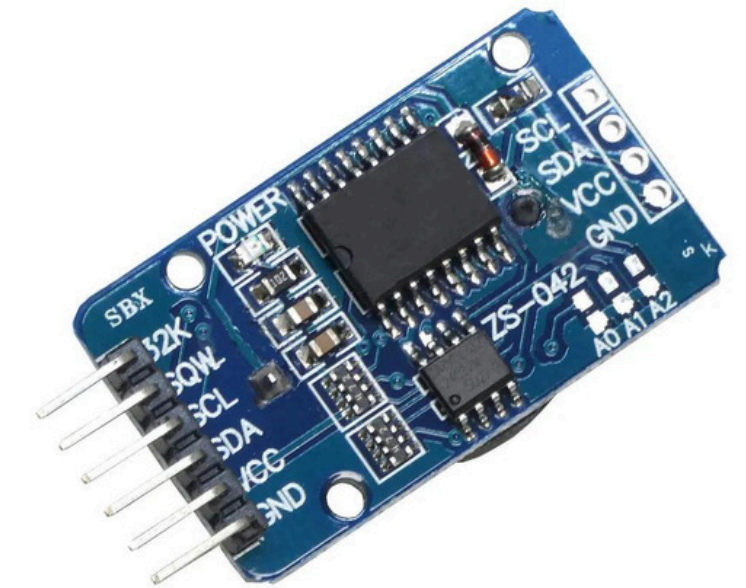
RTC functions by utilizing a quartz crystal oscillator to generate precise clock pulses, which are processed by internal circuitry to keep track of time. A battery backup ensures continuous operation and retention of time and date information, even when the main system power is off.
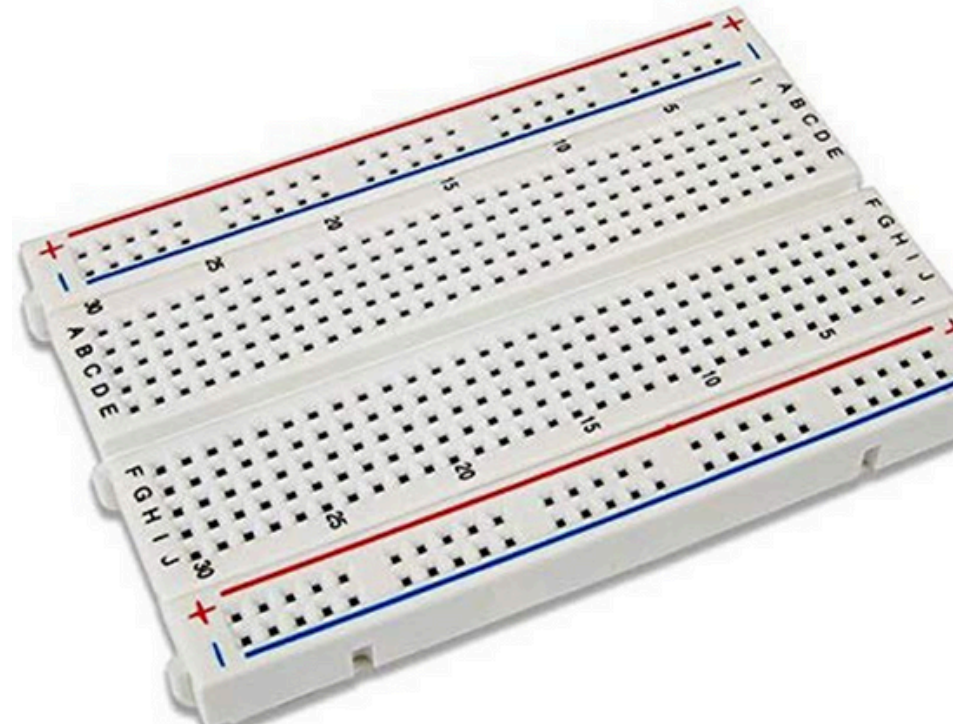
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KEY COMPONENTS

TEMPERATURE SENSOR

A temperature sensor is a device that measures ambient temperature and converts it into an electrical signal. They provide input for systems like climate control, weather stations, and electronic devices to monitor and respond to temperature changes.

BREAD BOARD

A breadboard is a solderless prototyping board used in electronics. It allows for the temporary connection of electronic components and wires, facilitating the creation and testing of circuits without the need for soldering.
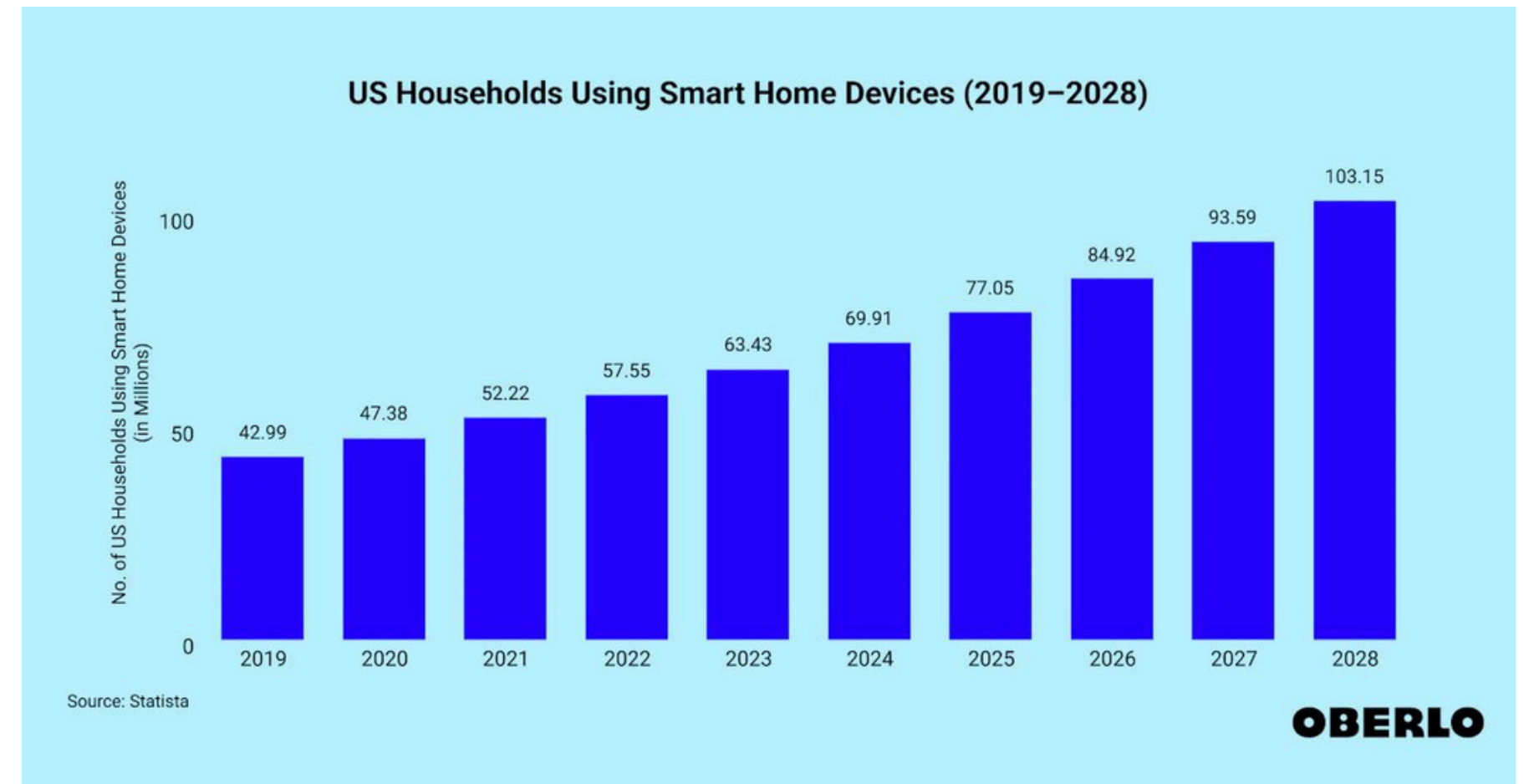
JUMPER WIRES
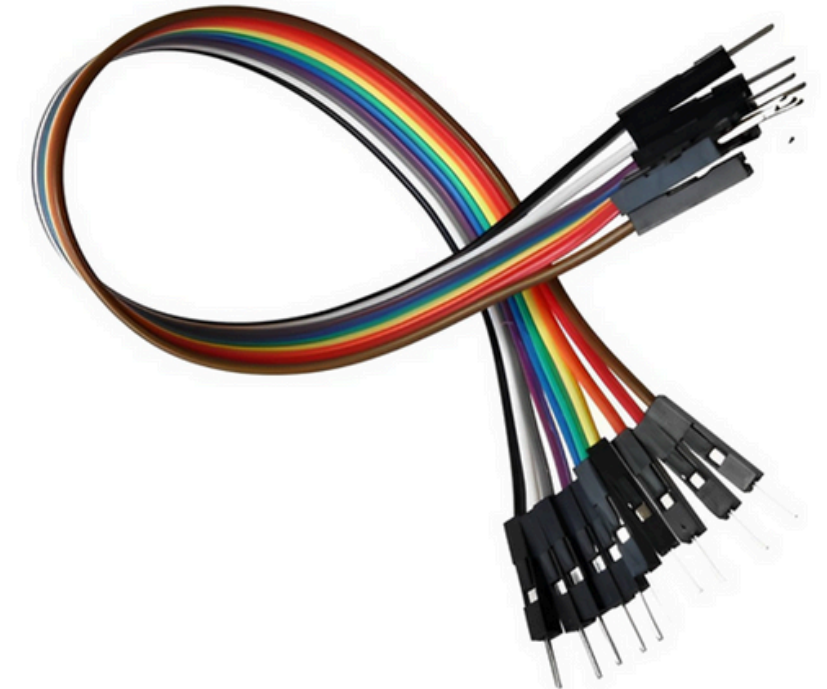
Jumper wires are short, insulated wires with connectors on each end, commonly used to make temporary electrical connections on a breadboard or between components in electronics projects.

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STATISTICS

Number of Household using Smart Home Devices with coming years and it is expected to be 103.2 millions by 2028.

US Households Using Smart Home Devices (2019–2028)

No. of US Households Using Smart Home Devices (in Millions)

| Year	Value
2019	42.99
2020	47.38
2021	52.22
2022	57.55
2023	63.43
2024	69.91
2025	77.05
2026	84.92
2027	93.59
2028	103.15

Source: Statista

OBERLO

<u>BENEFITS</u>

The key benefits of home automation includes:

1. <u>Convenience</u>: Automation allows users to control various aspects of their homes with ease, whether it's adjusting the thermostat, turning off lights

2. <u>Energy Efficiency</u>: Smart home systems can optimize energy consumption by regulating heating, cooling, and lighting based on occupancy and preferences.

3. <u>Customization</u>: Home automation systems are highly customizable, allowing users to tailor their smart homes to meet their specific needs and preferences.

4. <u>Integration and Interoperability</u>: Modern home automation platforms often support integration with a wide range of devices and technologies, fostering interoperability.

Future Possibilities
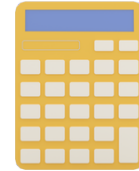
Increased task automation and use of artificial intelligence.

The primary goal of is to enhance convenience, efficiency, security, and energy conservation within a home,

The central hub acting as the brain of the smart home, connecting and communicating with all smart devices.

A better conscious focus on physical health of senior citizens and physically disabled.

We can access it from anywhere in the world.

<u>REFERENCES</u>

1. **https://www.ti.com/lit/ds/symlink/lm35.pdf**
2. **https://www.alldatasheet.com/datasheet-pdf/pdf/112132/DALLAS/DS3231.html**
3. **https://www.circuit-diagram.org/editor/**
4. **https://www.arduino.cc/**
5. **https://en.wikipedia.org/wiki/Relay#:~:text=A%20relay%20is%20an%20electrically,break%20contacts%2C%20or%20combinations%20thereof.**

THANK YOU