Microcontroller Controlled Car

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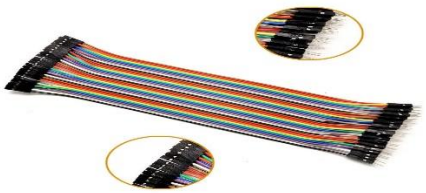
ECET 365

Intro: The purpose of this project is to modify a remote control car to drive and move around by itself. It will have the ability to drive forward and backwards, modify the speed, avoid collisions, detect darkness and detect rise in temperature. We will use the Tiva C microcontroller as the main control for the car and have programs run through that to circuits on a breadboard to activate when needed.

Project Components:

Tiva C tm4c123

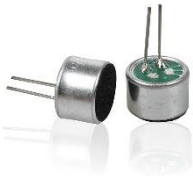
Distance Measure Detector Transducer Sensor



Jumper Cable Wires

5V Relay Module

Photocell



Microphone

Battery Clip

9v Battery

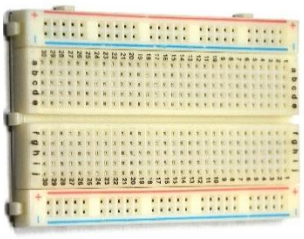
Buzzer

5v DC Motor

Transistors

5v Voltage Regulator

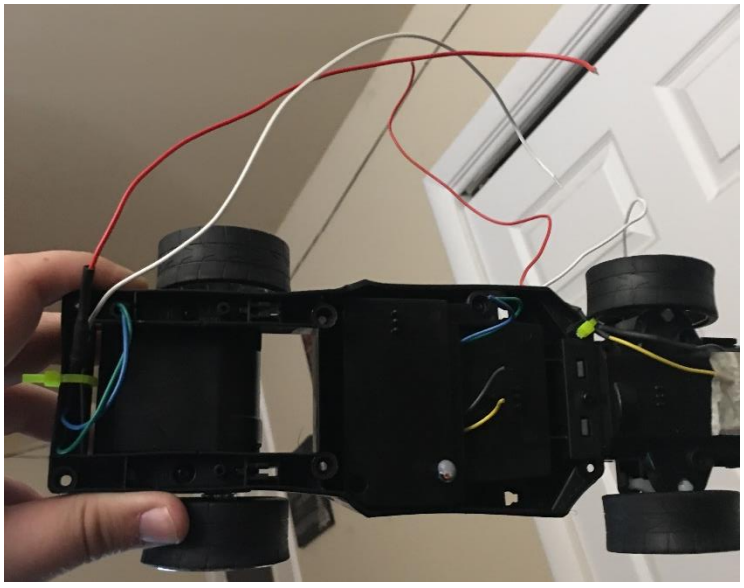
RC Car

Breadboard 

Project 1: Dismantle the RC Car:

Before:

After:



The RC car was stripped of the plastic body and then the wires that went from the power source to the front and rear motors were cut and replaced with red (positive) and white (negative) wires to start the rebuilding process.

Project 2: Forward-Backward Motor Control

Code:

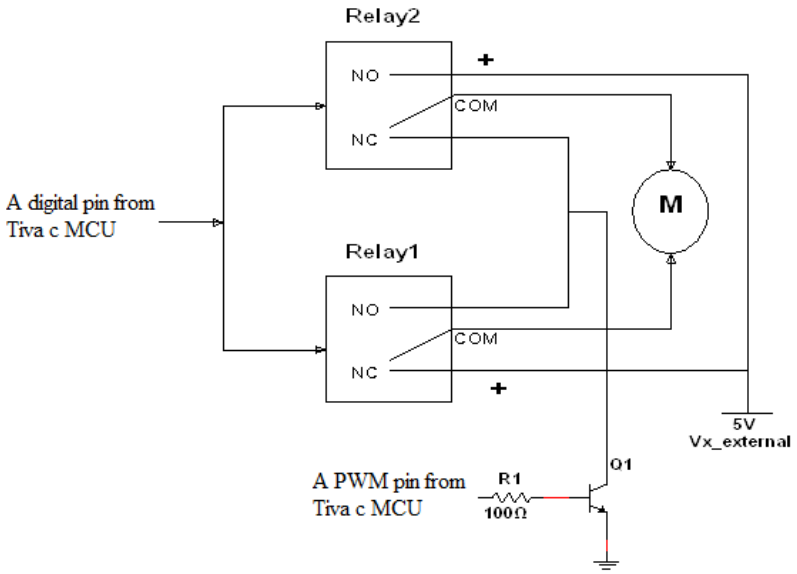
Forward-Backward:

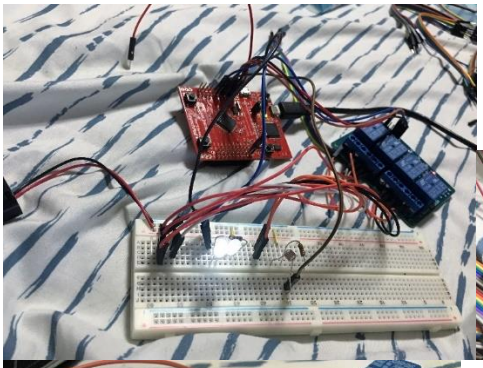
```
void setup() {
   pinMode(2, OUTPUT);
   digitalWrite(2, LOW);
}

void loop() {
  digitalWrite(2, LOW);
  delay(2000);
  digitalWrite(2, HIGH);
  delay(2000);
}
```

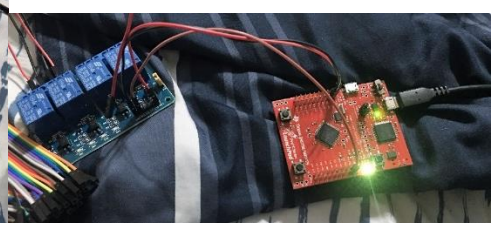
Speed Control:

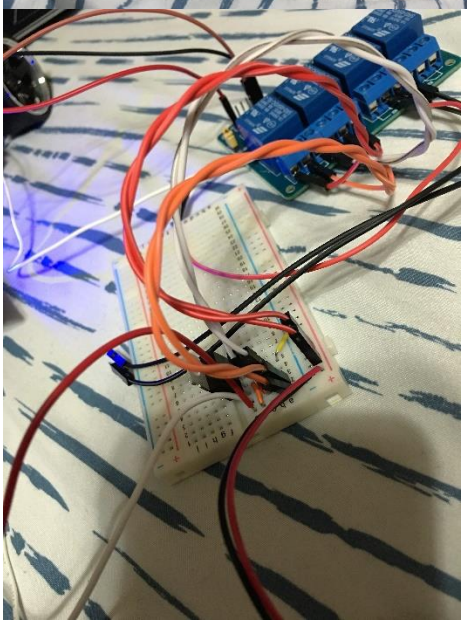
```
const int backled = 3;
const int speedcontrol = 5;

void setup() {

Serial.begin(9600);
pinMode(2, OUTPUT);
pinMode(speedcontrol, OUTPUT);
pinMode(backled, OUTPUT);
}

void loop() {

  delay(100);
  digitalWrite(2, LOW);
  analogWrite(speedcontrol, 135);
  delay(4000);

  digitalWrite(2, HIGH);
  analogWrite(backled, HIGH);
  delay(2500);
  digitalWrite(backled, LOW);
```

Diagram:


Relay2
NO
COM
NC
+
A digital pin from
Tiva c MCU
M
Relay1
NO
COM
NC
+
5V
Vx_external
Q1
A PWM pin from
Tiva c MCU
R1
100Ω





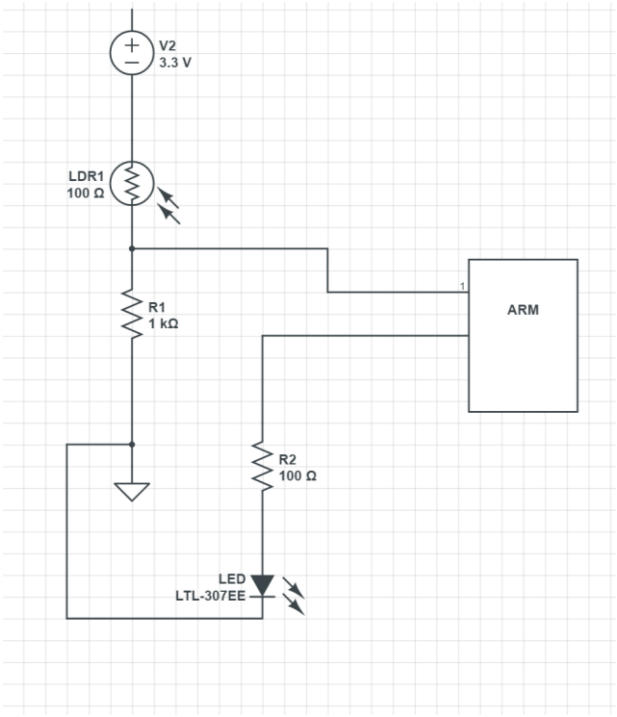


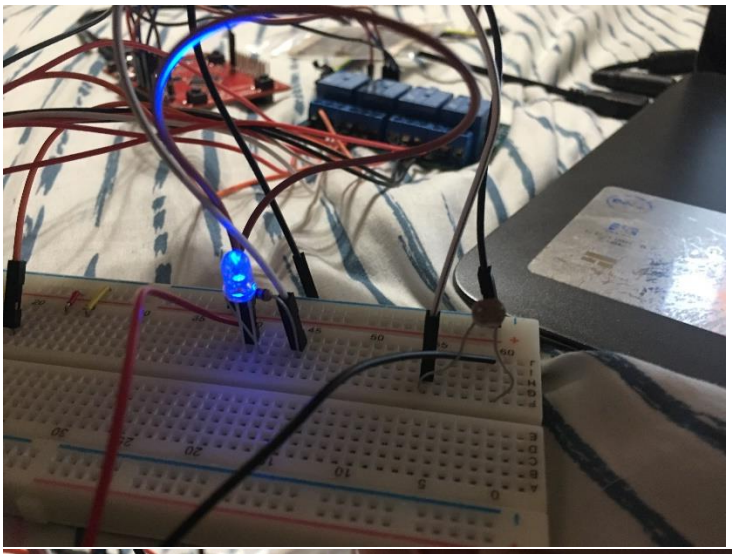
Project 3: Light Detection

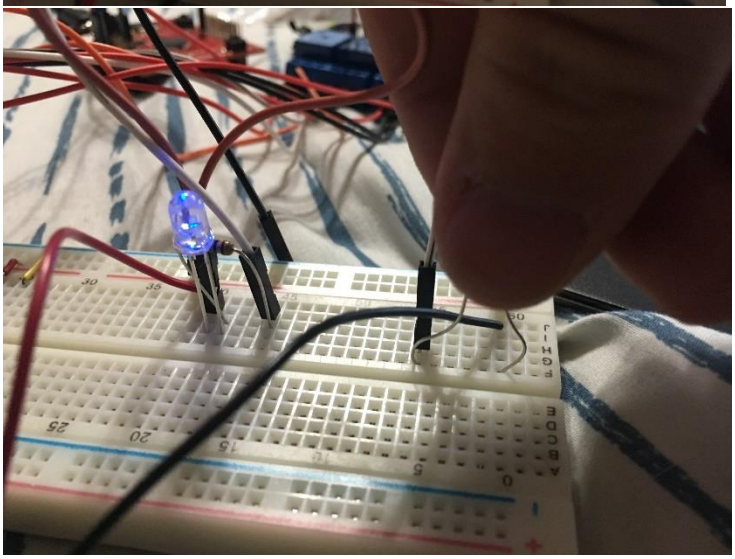
Code:

```
const int photocell = A7; //a0-a11, analog to digital
const int light = 4; //digital pin

void setup() {
  pinMode(4, OUTPUT);
}

void loop() {
  int value = analogRead(photocell);
  Serial.println("value = ");
  Serial.println(value);
  delay(300);

  if(value > 2000) //enter number given for value
  digitalWrite(light, HIGH);
  else
  digitalWrite(light, LOW)
  }
```

Diagram:





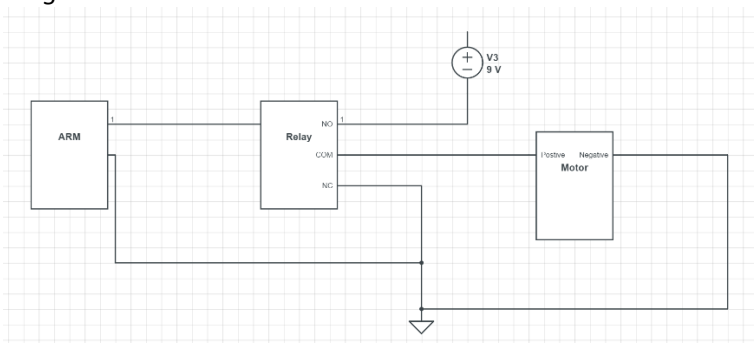


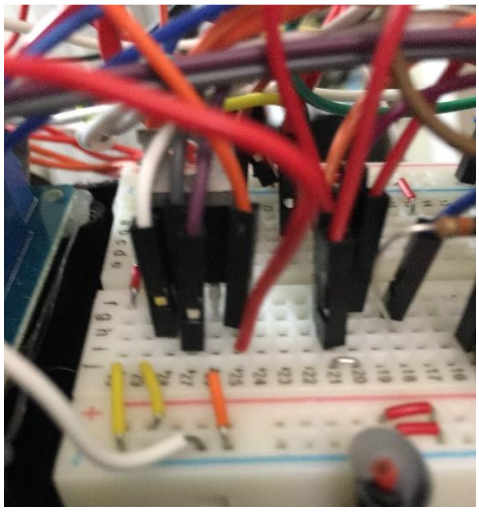
Project 3: Right Left Motor Control

Code:

```
const int rl = 28;

void setup()
{
  pinMode(rl, OUTPUT);
  digitalWrite(rl, HIGH);
}

void loop() {
   {
  digitalWrite(rl, LOW);
  delay(300);
  digitalWrite(rl, HIGH);
  delay(300);
}
}
```

Diagram:



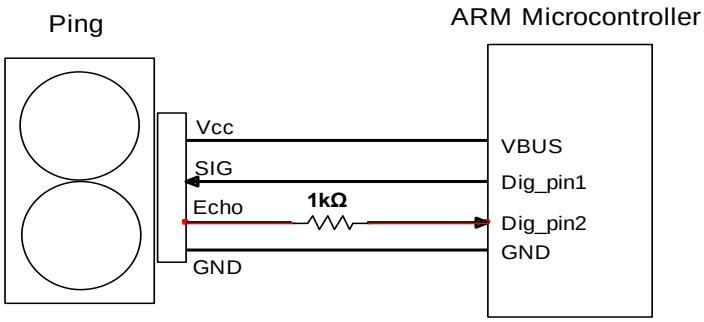


Project 4: Distance Detection

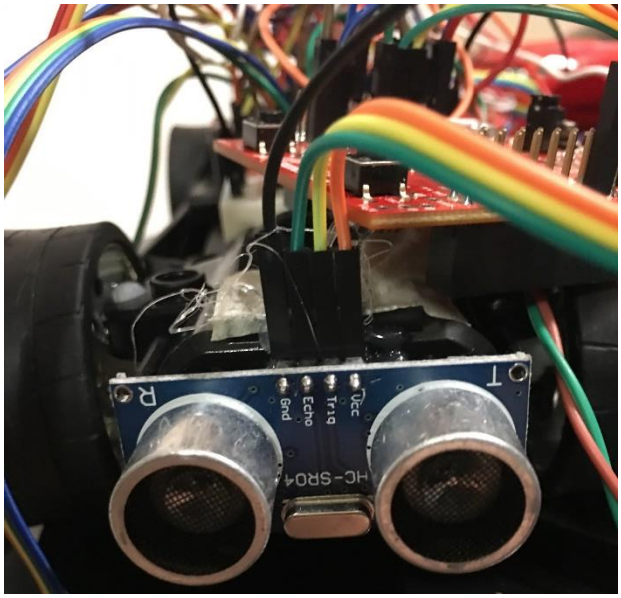
Code:

```
const int pingPin = 23;  //PD1
const int pingPini = 24;  //PD0

void setup() {
  Serial.begin(9600);
   pinMode(pingPin, OUTPUT);
    pinMode(pingPini, INPUT);
}

void loop()
{
 long duration, inches, cm;

  digitalWrite(pingPin, LOW);
  delayMicroseconds(2);
  digitalWrite(pingPin, HIGH);
  delayMicroseconds(5);
  digitalWrite(pingPin, LOW);

  duration = pulseIn(pingPini, HIGH);

  inches = microsecondsToInches(duration);
  cm = microsecondsToCentimeters(duration);

  Serial.print(inches);
  Serial.print("in, ");
  Serial.print(cm);
  Serial.print("cm");
  Serial.println();

  delay(100);
}
long microsecondsToInches(long microseconds)
{
  return microseconds / 74 / 2;
}
long microsecondsToCentimeters(long microseconds)
{
  return microseconds / 29 / 2;
}
```

Diagram:



Dig_pin1 and Dig_pin2 can be any digital pins

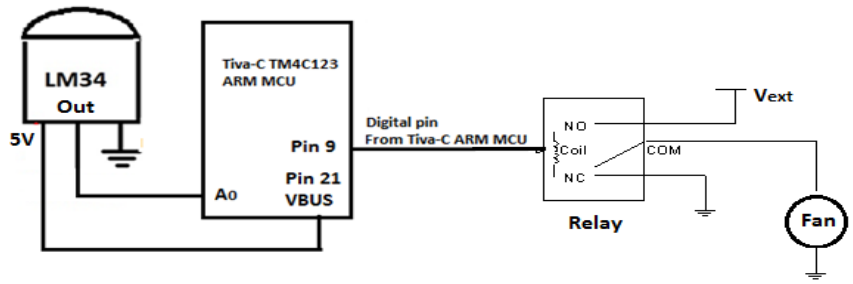


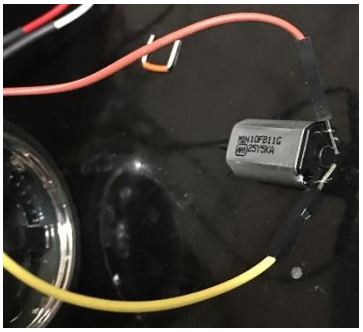
Project 5: Temperature Sensor

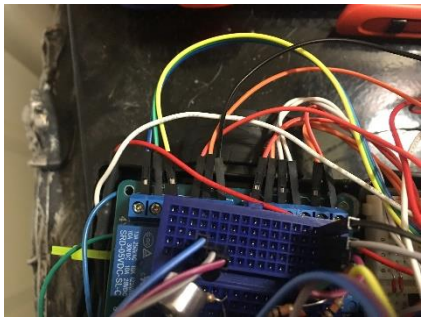
Code:

```
int outputpin= A2;
const int fan = 7;

void setup()
{
Serial.begin(9600);
pinMode(fan,OUTPUT); //Use pin#9 to turn ON/OFF the fan
digitalWrite(fan, HIGH); // Disable Relay switch at the start (Relay is Active LOW)
}

void loop()  {
int rawvoltage= analogRead(outputpin);
float millivolts= (rawvoltage/4096.0) * 3300; // for 3.3V Microcontroller
float fahrenheit= millivolts/10;
Serial.print(fahrenheit);
Serial.print(" degrees Fahrenheit, ");
Serial.println();

if(fahrenheit > 80.00)
{
  digitalWrite(fan, HIGH);
}
else
digitalWrite(fan, LOW);
}
```

Diagram:





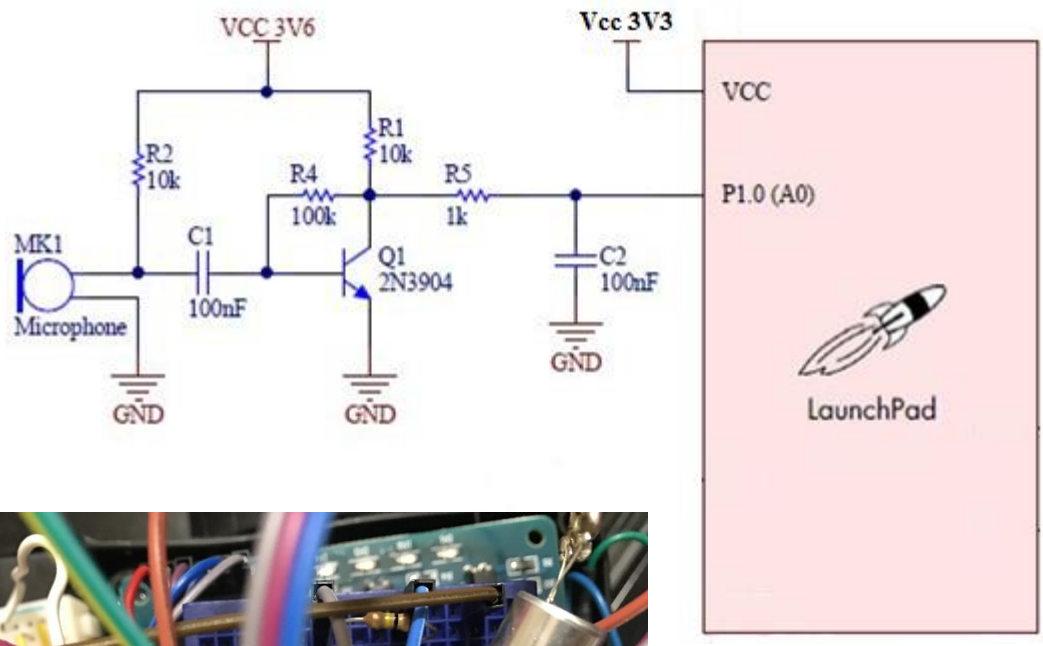


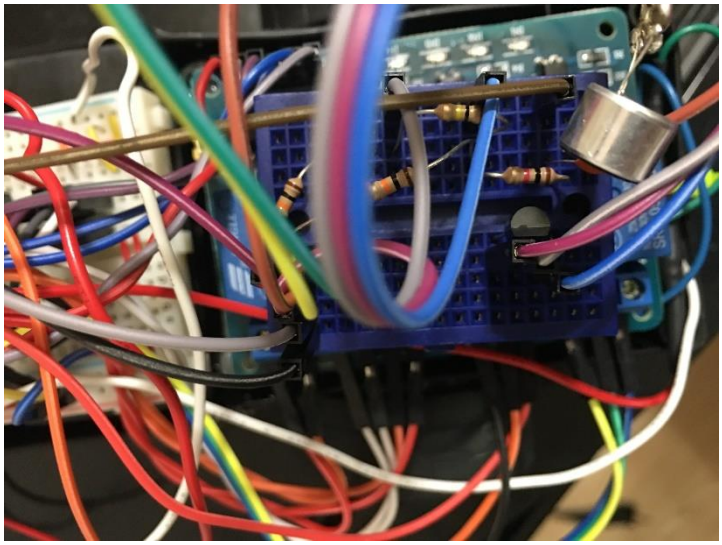
Project 6: Sound Activation

Code:

```
void setup()
{
Serial.begin(9600);
}

void loop()
{
  int sensorValue = analogRead(A1);
  Serial.println(sensorValue); //  // print out the value you read:

  if (sensorValue > 750)
  Serial.println("active");
}
```

Diagram:





Final Product:

Code:

```
const int pingPin = 23;
const int pingPini = 24;
const int backled = 3;
const int speedcontrol = 25;
const int drive = 2;
const int photocell = A3;
const int light = 4;
const int outputpin = A2;
const int fan = 7;
const int rl = 28;
const int sensorValue(A1);

void setup() {
   Serial.begin(9600);
   pinMode(pingPin, OUTPUT);
   pinMode(pingPini, INPUT);
   pinMode(drive, OUTPUT);
   pinMode(speedcontrol, OUTPUT);
   pinMode(backled, OUTPUT);
   pinMode(light, OUTPUT);
   pinMode(photocell, INPUT);
   pinMode(fan,OUTPUT);
   pinMode(rl, OUTPUT);
   pinMode(sensorValue, INPUT);
   digitalWrite(rl, HIGH);
   digitalWrite(fan, HIGH);
}

void loop()
{
//=========Activation====================================================
analogRead(sensorValue);
if(sensorValue > 1000)
{

//========Lights=========================================================
  int value = analogRead(photocell);
  Serial.println("value = ");
  Serial.print(value);
  Serial.println();
  delay(50);

  if(value > 1000) //enter number given for value
  digitalWrite(light, HIGH);
```

```
  else
  digitalWrite(light, LOW);

//==========Fan============================================================

  int rawvoltage= analogRead(outputpin);
  float millivolts= (rawvoltage/4096.0) * 3300; // for 3.3V Microcontroller
  float fahrenheit= millivolts/10;
  Serial.print(fahrenheit);
  Serial.print("F, ");
  Serial.println();

  if(fahrenheit > 80.00)
  {
    digitalWrite(fan, HIGH);
  }
  else
    digitalWrite(fan, LOW);

//=================Distance=================================================

  long duration, inches, cm;

  digitalWrite(pingPin, LOW);
  delayMicroseconds(2);
  digitalWrite(pingPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(pingPin, LOW);

  duration = pulseIn(pingPini, HIGH);


  inches = microsecondsToInches(duration);

  Serial.print(inches);
  Serial.print("in");
  Serial.println();

//==============Drive=======================================================
  if(inches > 20)
  {
  digitalWrite(drive, HIGH);
  analogWrite(speedcontrol, 80);
  digitalWrite(backled, LOW);
  }
else
{
  digitalWrite(drive, LOW);
```

```
  digitalWrite(rl, LOW);
  analogWrite(speedcontrol, 60);
  analogWrite(backled, HIGH);
  delay(700);
  digitalWrite(rl, HIGH);
}
}
else
analogRead(sensorValue);
}

long microsecondsToInches(long microseconds)
{
   return microseconds / 74 / 2;
}
```

Pictures: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MUSTANG GT