MPCA PROJECT

Polygraph machine using Arduino

Department: Computer Science

Subject: MPCA

Semester: 4 G

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Problem Statement:

The objective of this project is to design and build a polygraph machine using an Arduino Uno, a breadboard, and various sensors to measure physiological changes in a person's body.

A polygraph machine, also known as a lie detector, is a device that measures and records several physiological responses in a person's body while they are being asked a series of questions. These physiological responses include changes in heart rate, blood pressure, respiration, and skin conductivity, among others.

Specifically, this project aims to use the following sensors to detect changes in humidity, heartbeat, skin resistance, and body temperature:

- DHT11 humidity sensor to measure humidity
- EC0567 heartbeat sensor to measure heart rate
- Two 220 ohm resistor to measure changes in skin resistance
- LM35 temperature sensor to measure body temperature
- Buzzer to signal abnormalities

The main challenge in this project is to integrate all these sensors with the Arduino Uno and develop a software program that can accurately interpret the data and provide a meaningful analysis of the physiological changes in a person's body.

Detailed Project Explanation:

The following is a detailed explanation of the components used in this project and their functions:

- **Arduino Uno:** The Arduino Uno is a microcontroller board based on the ATmega328P. It provides digital and analog input/output pins that can be used to interface with various sensors and devices.
- **Breadboard:** The breadboard is a tool that allows the user to quickly and easily prototype electronic circuits. It is used in this project to connect the sensors to the Arduino Uno.
- **DHT11 humidity sensor:** The DHT11 humidity sensor is used to measure humidity. It is a low-cost digital sensor that can measure

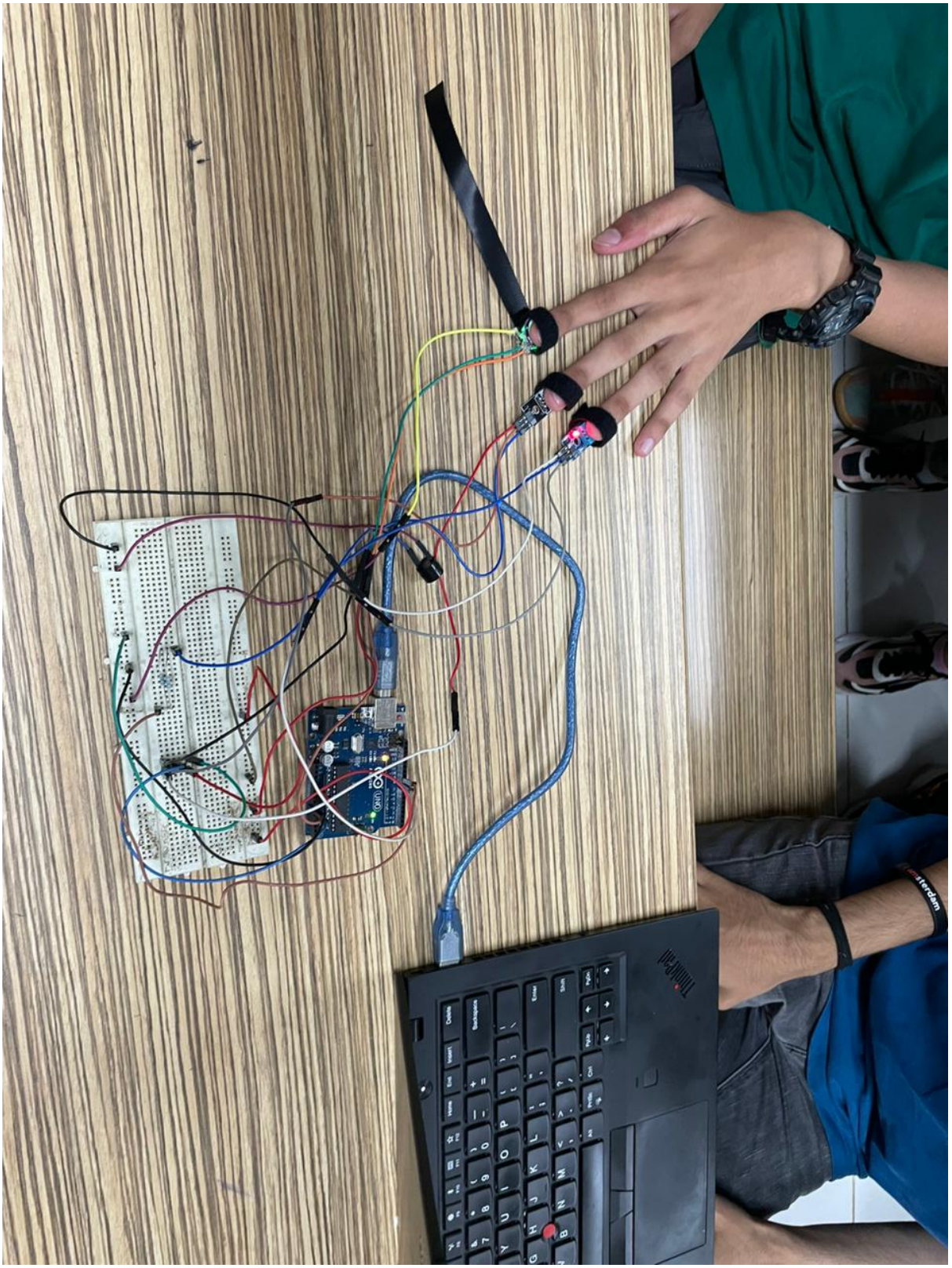
temperature and humidity with reasonable accuracy. It operates using a single-wire digital communication protocol.

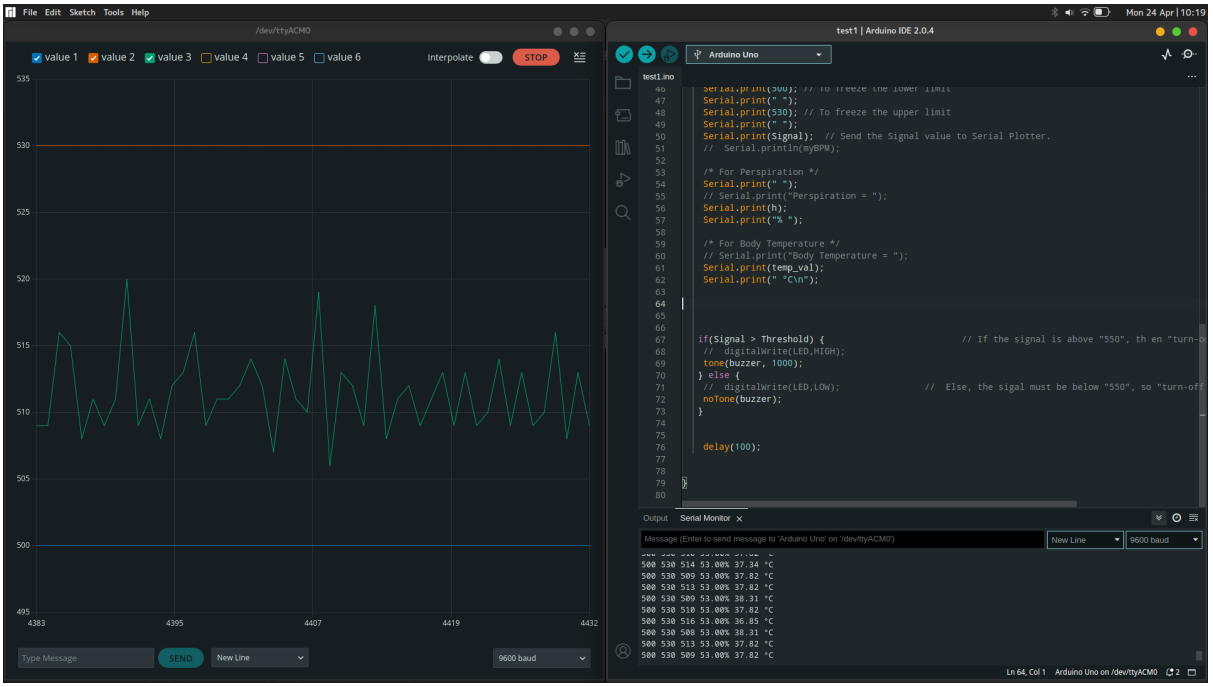
- **EC0567 heartbeat sensor:** The EC0567 heartbeat sensor is used to measure heart rate. It uses a green LED and a photo sensor to detect changes in blood flow through the fingertip. The sensor output is an analog voltage that is proportional to the heart rate.
- **Two 220 ohm resistor in parallel:** Safety precaution for buzzer
- **LM35 temperature sensor:** The LM35 temperature sensor is used to measure body temperature. It is a low-cost analog sensor that can measure temperature with reasonable accuracy. It provides an output voltage that is proportional to the temperature.
- **Buzzer:** The buzzer is connected to detect abnormalities in pulse in case of a supposed lie.

The software program for this project involves interfacing the sensors with the Arduino Uno and processing the data to provide a meaningful analysis of the physiological changes in a person's body. The program will involve setting up the sensors, reading the sensor data, processing the data, and displaying the results.

In summary, the goal of this project is to design and build a polygraph machine using an Arduino Uno and various sensors to measure physiological changes in a person's body. The main challenge is to integrate all these sensors with the Arduino Uno and develop a software program that can accurately interpret the data and provide a meaningful analysis of the physiological changes in a person's body.

Schematic Diagram:





The above image shows the polygraph generated.

Code:

```
#include <PulseSensorPlayground.h>

#include <dht.h>

#define dht11 8

#define pulse_sensor 0

#define buzzer 9







PulseSensorPlayground pulseSensor;

dht DHT;




//  Variables

const int lm35_pin = A1;

int LED = LED_BUILTIN;   //  The on-board Arduion LED




int Signal;                // holds the incoming raw data. Signal value
can range from 0-1024

int Threshold = 560;          // Determine which Signal to "count as a
beat", and which to ingore.




// The SetUp Function:

void setup() {
```

```
  //  pinMode(LED,OUTPUT);              //  pin  that  will  blink  to  your
heartbeat!

  Serial.begin(9600);              //  Set's  up  Serial  Communication  at
certain speed.



}



// The Main Loop Function

void loop() {



   int readData = DHT.read11(dht11);

   Signal = analogRead(pulse_sensor);  // Read the PulseSensor's value.

                                              // Assign this value to
the "Signal" variable.

   // int myBPM = pulseSensor.getBeatsPerMinute();



   float h = DHT.humidity;

   int temp_adc_val;

   float temp_val;

   temp_adc_val = analogRead(lm35_pin);  /* Read Temperature */

    temp_val = (temp_adc_val * 4.88); /* Convert adc value to equivalent
voltage */

   temp_val = (temp_val/10); /* LM35 gives output of 10mv/°C */

   temp_val = (temp_val - 10);



   /* For Heart Beat */

   Serial.print(500); // To freeze the lower limit
```

```
   Serial.print(" ");

   Serial.print(530); // To freeze the upper limit

   Serial.print(" ");

   Serial.print(Signal);  // Send the Signal value to Serial Plotter.

   //  Serial.println(myBPM);



   /* For Perspiration */

   Serial.print(" ");

   // Serial.print("Perspiration = ");

   Serial.print(h);

   Serial.print("% ");



   /* For Body Temperature */

   // Serial.print("Body Temperature = ");

   Serial.print(temp_val);

   Serial.print(" °C\n");







  if(Signal > Threshold) {                          // If the signal is
above "550", th en "turn-on" Arduino's on-Board LED.

   //  digitalWrite(LED,HIGH);

   tone(buzzer, 1000);

  } else {

    //  digitalWrite(LED,LOW);                  //  Else, the sigal must
be below "550", so "turn-off" this LED.
```

```
    noTone(buzzer);

  }




   delay(100);

}
```

Result:

The three sensors namely humidity sensor, temperature sensor and pulse sensor are attached to the test subject's hand via a velcro strap.
At first, 3 baseline questions are asked in order to set a valid baseline of readings of temperature, perspiration and pulse. Following these questions, the subject may be questioned in any manner provided the questions follow the standard template of "yes or no" questions (if non-yes-or-no questions were asked, half-truths may be present which brings ambiguity into the test). When the pulse readings stabilise, the evaluator notes the baseline. In theory, any lie is indicated by a consequent increase in humidity, body temperature, and the frequency of peaks i.e. pulse rises. It is important to note that polygraph machines are not 100% accurate and results should be interpreted appropriately.