TINKERING LAB

AUTOMATIC SHIRT FOLDER

PROBLEM STATEMENT

We were assigned a project to develop an Automatic Shirt Folder.

For this we were provided the basic idea behind this project.

DESCRIPTION

The Automatic Shirt Folder project uses an Arduino board to automate shirt folding. Sensors detect the shirt's presence and orientation, while the Arduino controls the folding mechanism to ensure neat folds. This project highlights Arduino's potential in household automation, providing convenience and saving time.

WOODEN ASSEMBLY

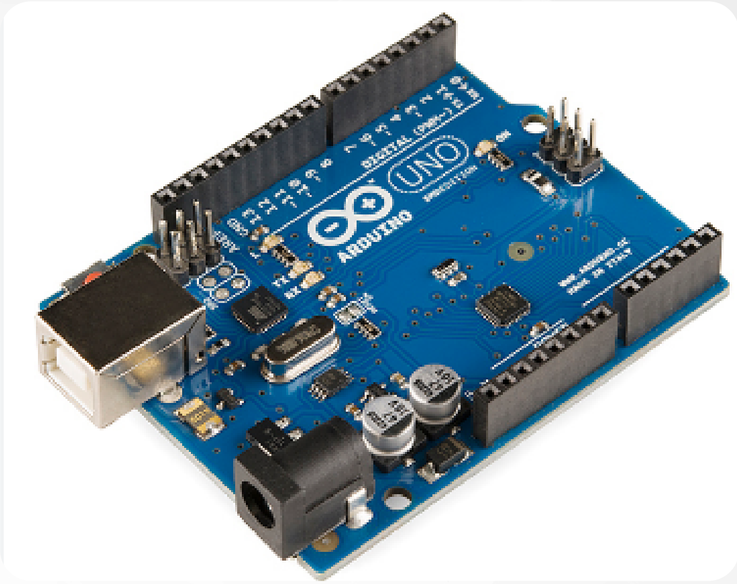
We crafted a wooden assembly in our carpentry workshop. This is a sturdy design to which the flaps were attached, shirt will be placed on the flaps. It provides a stable base to our folder.

ACRYLIC SHEET

Acrylic sheets, of required dimensions, were laser cut. They were used as the flaps. They were attached using hinges and screws, in order to perform the folding action.

ARDUINO UNO BOARD

The Arduino board controls the automatic shirt folder by processing input from ultrasonic sensors to detect the shirt and then guiding servo motors to rotate flaps for folding. This integration ensures precise and efficient shirt folding.



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These were used to detect the presence of shirt. Once the shirt is detected, it signals for the folding operation to be initiated.

SERVO MOTORS

Servo motors in the automatic shirt folder move the folding flaps precisely. For the side flaps, MG996R servo motors are used, providing the strength and precision needed for accurate folding of the shirt's sides.

The bottom flap is operated by a micro servo SG90. Guided by the Arduino board, this motor rotates at specific angles to fold the shirt's bottom part, ensuring each shirt is folded correctly and consistently.

BREADBOARD

All the components were connected using F to F, F to M and M to M jumper wires on breadboard.

ARDUINO IDE

We used the Arduino IDE to code the automatic shirt folder. This code integrates ultrasonic sensors to detect the presence and position of the shirt. Once the shirt is detected, the Arduino board sends commands to the servo motors to fold it. We used MG996R servo motors for the side flaps and a micro servo SG90 for the bottom flap. The Arduino processes sensor data and precisely controls the movements of these servos, ensuring accurate and consistent folding of the shirt.

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Select Board

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```ino
#include <Servo.h>

Servo servo1; // Create servo objects
Servo servo2;
Servo servo3;

int trigPin = 5; // Digital pin connected to ultrasonic sensor trigger
int echoPin = 6; // Digital pin connected to ultrasonic sensor echo
long duration; // variable to store duration of ultrasonic pulse
int distance; // variable to store distance measurement

const int open=0;
const int close=180;

void setup() {
  Serial.begin(9600); // Start serial communication for debugging (optional)
  servo1.attach(9); // Attach servos to pins (adjust based on your connection)
  servo2.attach(10);
  servo3.attach(11);
  pinMode(trigPin, OUTPUT); // Set trigger pin as output
  pinMode(echoPin, INPUT); // Set echo pin as input
  servo1.write(open);
  servo2.write(open);
  servo3.write(open);
}

void foldShirt(){
    Serial.println("Shirt detected!"); // Optional for debugging

    // Grip the shirt with servo1 (adjust movement based on your design)
    servo1.write(close);
    delay(2000);
    servo1.write(open);
    delay(1000);
    servo1.write(close);
    delay(1000);
```

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```ino
    servo2.write(open);
    delay(10);
    servo2.write(240);
    delay(1000);
    servo2.write(open);
    delay(1000);

    servo3.write(open);
    delay(10);
    servo3.write(close);
    delay(1000);
    servo3.write(open);
    delay(6000);
  }

int measureDistance() {
  long duration;

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

  duration = pulseIn(echoPin, HIGH);
  return duration * 0.034 / 2; // Convert duration to cm (adjust formula if needed)
}

void loop() {
  // Check for shirt presence
  distance = measureDistance();

  if(distance<20){
    foldShirt();
  }
}
```

DIFFICULTIES FACED

During the development of the automatic shirt folder, we faced several challenges:

- Turning the flaps at correct angles: Ensuring the servo motors moved the flaps to the precise angles required for proper shirt folding was a significant challenge.
- Code issues: The code did not work correctly at times, requiring debugging and adjustments to ensure reliable operation.
- Wooden assembly: Constructing the wooden assembly accurately was difficult, especially making sure it aligned correctly and functioned smoothly.
- Servo motor slots: Creating precise slots for the servo motors in the wooden assembly was necessary for stable and accurate movements.
- Making connections: Ensuring all electronic connections were correct and secure was essential for the proper functioning of the system.

THANK YOU