1. Objective and Summary

This is an Automated Hand Model. I was interested about robot since I was young. That’s why I chose this for the project. This can be implemented to handicapped people. This model is so simple, but this can be implemented in many ways. For example, this automated hand mode has 4 buttons that are saved with certain movements. So, handicap people can use this as real hand by wearing this and pressing the buttons. Also, if people try to hold hand with this hand, it can automatically detect the hand, and it will hold their hand after detection.

2. Details

Components used:
- 1 Arduino Uno
- 4 Switch buttons
- 7 Servos
- 1 Wooden hand
- Fishing line
- Black elastic cord
- Hook screws

Description:
- On a back of each finger, there is a black elastic cord which can pull the finger when there is no movement. There are hook screws on finger knuckles, and I connected the servo with each finger with fishing line.

- There are four buttons are on the Arduino. This automated hand waits for the buttons to be pressed. Each button has certain saved movements. By pressing the each button will make the hand fingers to move.

- Before that, there is a light dependence resistor which can detect the light changes. If people put their hand on this model, the resistor will detect that the light is dimmed, and it will perform saved movement which is holding hand by bending fingers.
3. Circuit Diagram

- Light dependence resistor: connected with A0.
- Servos:
  - 1st servo – connected with ~3
  - 2nd servo – connected with ~5
  - 3rd servo – connected with ~6
  - 4th servo – connected with ~9
  - 5th servo – connected with ~10
  - 6th servo – connected with ~11
  - 7th servo – connected with 8
- Buttons:
  - 1st button – connected with 2
  - 2nd button – connected with 7
  - 3rd button – connected with 12
  - 4th button – connected with 13
4. State Diagram

- Initial State: Put 7 servos back to original position, and go to Light Dimmed state.
- Light Dimmed:
  - Yes: Go to Hold Hand state.
  - No: Go to SW1 state.
- SW1:
  - Yes: Go to 1 Finger move state.
  - No: Go to SW2 state.
- SW2:
  - Yes: Go to 1 Finger move2 state.
  - No: Go to SW3 state.
- SW3:
  - Yes: Go to 2 Finger move state.
  - No: Go to SW4 state.
- SW4:
  - Yes: Go to 2 Finger move2 state.
  - No: Go to Initial state.
- Hold hand: Bend fingers just as holding hand, and go back to Initial
- 1 finger move: Each finger bends, and go back to Initial
- 1 finger move2: Each finger bends, and go back to Initial
- 2 finger move: Two finger bends, and go back to Initial
- 2 finger move2: Two finger bends, and go back to Initial
5. Actual Arduino code

```cpp
#include <Servo.h>

Servo servo1;
Servo servo2;
Servo servo3;
Servo servo4;
Servo servo5;
Servo servo6;
Servo servo7;

const int sensorPin = 0;
const int button1pin = 2;
const int button2pin = 7;
const int button3pin = 12;
const int button4pin = 13;
int lightLevel, high = 0, low = 1023;

void setup()
{
    servo1.attach(3); // Assign each servo to output
    servo2.attach(5);
    servo3.attach(6);
    servo4.attach(9);
    servo5.attach(10);
    servo6.attach(11);
    servo7.attach(8);

    pinMode(button1pin, INPUT); // Assign each button to input
    pinMode(button2pin, INPUT);
    pinMode(button3pin, INPUT);
    pinMode(button4pin, INPUT);
}

void loop()
{
    servo1.write(0); // Put servos back to original position
    servo2.write(0);
    servo3.write(0);
    servo4.write(0);
    servo5.write(0);
    servo6.write(0);
    servo7.write(0);
    delay(1000);

    lightLevel = analogRead(sensorPin);
    manualTune();
    int button1State = digitalRead(button1pin); // Gets button state
    int button2State = digitalRead(button2pin);
    int button3State = digitalRead(button3pin);
    int button4State = digitalRead(button4pin);

    if(lightLevel > 150) // When Light is dimmed
    {
        servo5.write(60);
        delay(100);
        servo4.write(60);
        delay(100);
    }
}
```
servo3.write(60);
delay(100);
servo2.write(30);
delay(100);
servo1.write(30);
delay(500);
servo5.write(0);
delay(100);
servo4.write(0);
delay(100);
servo3.write(0);
delay(100);
servo2.write(0);
delay(100);
servo1.write(0);
delay(100);
}

else if(button1State == LOW) {

  // When button 1 pressed
  servo1.write(80);
delay(100);
servo2.write(100);
delay(100);
servo3.write(120);
delay(100);
servo4.write(100);
delay(100);
servo5.write(80);
delay(100);
servo5.write(0);
delay(100);
servo4.write(0);
delay(100);
servo3.write(0);
delay(100);
servo2.write(0);
delay(100);
servo1.write(0);
delay(100);
}

else if(button2State == LOW) {

  // When button 2 pressed
  servo1.write(80);
delay(300);
servo1.write(0);
delay(100);
servo2.write(100);
delay(300);
servo2.write(0);
delay(100);
servo3.write(120);
delay(300);
servo3.write(0);
delay(100);
servo3.write(0);
delay(100);
}
servo4.write(100);
delay(300);
servo4.write(0);
delay(100);
servo5.write(80);
delay(300);
servo5.write(0);
delay(100);

else if(button3State == LOW){  // When button 3 pressed
    servo1.write(80);
servo5.write(80);
delay(300);
servo1.write(0);
servo5.write(0);
delay(100);
servo2.write(100);
servo4.write(100);
delay(300);
servo2.write(0);
servo4.write(0);
delay(100);
servo3.write(120);
delay(300);
servo3.write(0);
delay(100);
}

else if(button4State == LOW){  // When button 4 pressed
    servo6.write(180);
delay(200);
servo7.write(90);
delay(200);
servo2.write(100);
delay(200);
servo1.write(50);
delay(1000);
    servo1.write(0);
delay(200);
servo2.write(0);
delay(200);
servo7.write(0);
delay(200);
servo6.write(0);
delay(200);
}

void manualTune()  // This is for light dependence resistor setting
{
    lightLevel = map(lightLevel, 0, 1023, 0, 255);
    lightLevel = constrain(lightLevel, 0, 255);
}