

## LAMPIRAN

### Lampiran 1 Program Aktuator Tangan Robotik Untuk Rehabilitasi

/\*

Blink

Turns an LED on for one second, then off for one second, repeatedly.

Most Arduinos have an on-board LED you can control. On the UNO, MEGA and ZERO

it is attached to digital pin 13, on MKR20000 on pin 6. LED\_BUILTIN is set to the correct LED pin independent of which board is used.

If you want to know what pin the on-board LED is connected to on your Arduino model, check the Technical Specs of your board at:

<https://www.arduino.cc/en/Main/Products>

modified 8 May 2014

by Scott Fitzgerald

modified 2 Sep 2016

by Arturo Guadalupi

modified 8 Sep 2016

by Colby Newman

This example code is in the public domain.

<http://www.arduino.cc/en/Tutorial/Blink>

\*/

// the setup function runs once when you press reset or power the board

```
void setup() {  
    // initialize digital pin LED_BUILTIN as an output.  
  
    pinMode(2, OUTPUT);  
    pinMode(3, OUTPUT);  
    pinMode(4, OUTPUT);  
    pinMode(5, OUTPUT);  
    pinMode(6, OUTPUT);  
    pinMode(7, OUTPUT);  
    pinMode(8, OUTPUT);  
    pinMode(9, OUTPUT);  
    pinMode(10, OUTPUT);  
    pinMode(11, OUTPUT);  
    pinMode(12, OUTPUT);  
    pinMode(13, OUTPUT);  
    Serial.begin(9600);    // initialize serial  
  
}  
  
// the loop function runs over and over again forever  
void loop() {  
    mati();  
    tahap1();  
    tahap1();  
    tahap1();  
    tahap1();  
}
```

tahap1());

tahap2A());

tahap2A());

tahap2A());

tahap2A());

tahap2A());

tahap2B());

tahap2B());

tahap2B());

tahap2B());

tahap2B());

tahap3());

tahap3());

tahap3());

tahap3());

tahap3());

tahap4());

tahap4());

tahap4());

tahap4());

tahap4());

tahap5());

```
tahap5();  
tahap5();  
tahap5();  
tahap5();  
off();  
  
}
```

```
void mati(){  
digitalWrite(2, HIGH);  
digitalWrite(3, HIGH);  
digitalWrite(4, HIGH);  
digitalWrite(5, HIGH);  
digitalWrite(6, HIGH);  
digitalWrite(7, HIGH);  
digitalWrite(8, HIGH);  
digitalWrite(9, HIGH);  
digitalWrite(10, HIGH);  
digitalWrite(11, HIGH);  
digitalWrite(12, HIGH);  
digitalWrite(13, HIGH);  
}
```

```
void off(){  
digitalWrite(2, HIGH);  
digitalWrite(3, HIGH);  
digitalWrite(4, HIGH);
```

```

digitalWrite(5, HIGH);
digitalWrite(6, HIGH);
digitalWrite(7, HIGH);
digitalWrite(8, HIGH);
digitalWrite(9, HIGH);
digitalWrite(10, HIGH);
digitalWrite(11, HIGH);
digitalWrite(12, HIGH);
digitalWrite(13, HIGH);
delay(20000);

}

void tahap1(){
Serial.println("Tahap 1 proses ! jari jemari");
digitalWrite(2, LOW); // ajk
delay(2000); // jedah 2 detik
digitalWrite(3, LOW); // ajm
delay(2000);
digitalWrite(4, LOW); // ajtg
delay(2000);
digitalWrite(5, LOW); // ajt
delay(2000);
digitalWrite(6, LOW); // aij
delay(2000);
delay(4000);
digitalWrite(2, HIGH); //

```

```

digitalWrite(3, HIGH); //
digitalWrite(4, HIGH); //
digitalWrite(5, HIGH); //
digitalWrite(6, HIGH); //
delay(5000);

}

void tahap2A(){
Serial.println("Tahap 2a proses ! pergelangan tangan");
delay(5000);
digitalWrite(7, LOW); // APT1
digitalWrite(8, LOW); // APT2
delay(10000);
digitalWrite(7, HIGH); // APT1
digitalWrite(8, HIGH); // APT2
delay(5000);
digitalWrite(9, LOW); // APT3
digitalWrite(10, LOW); // APT4
delay(10000);
digitalWrite(9, HIGH); // APT3
digitalWrite(10, HIGH); // APT4
delay(5000);

}

void tahap2B(){

```

```

Serial.println("Tahap 2b proses ! pergelangan tangan ");
delay(5000);
digitalWrite(8, LOW); // APT2
digitalWrite(9, LOW); // APT3
delay(10000);
digitalWrite(8, HIGH); // APT2
digitalWrite(9, HIGH); // APT3
delay(5000);
digitalWrite(7, LOW); // APT1
digitalWrite(10, LOW); // APT4
delay(10000);
digitalWrite(7, HIGH); // APT1
digitalWrite(10, HIGH); // APT4
delay(5000);

}

void tahap3(){
Serial.println("Tahap 3 proses ! siku siku");
delay(5000);
digitalWrite(11, LOW); // AS ON
delay(5000);
digitalWrite(11, HIGH); // AS OFF
delay(5000);
}

void tahap4(){

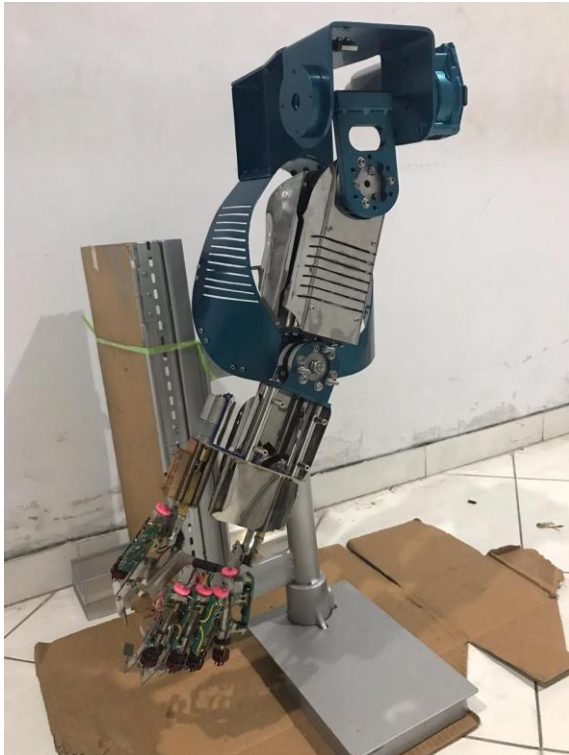
```

```
Serial.println("Tahap 4 proses ! bahu 1 ");
delay(5000);
digitalWrite(12, LOW); // AB1 ON
delay(5000);
digitalWrite(12, HIGH); // AB1 OFF
delay(5000);
}
```

```
void tahap5(){
Serial.println("Tahap 5 proses ! bahu 2");
delay(5000);
digitalWrite(13, LOW); // AB2 ON
delay(5000);
digitalWrite(13, HIGH); // AB2 OFF
delay(5000);
}
```



## Lampiran 2 Foto Foto Aktuator Tangan Robotik



Gambar 5.1 Mekanik Akuator Tangan Robotik



Gambar 5.2 Akuator Tangan Robotik Terintegrasi



Gambar 5.3 Akuator Tangan Robotik tampak samping



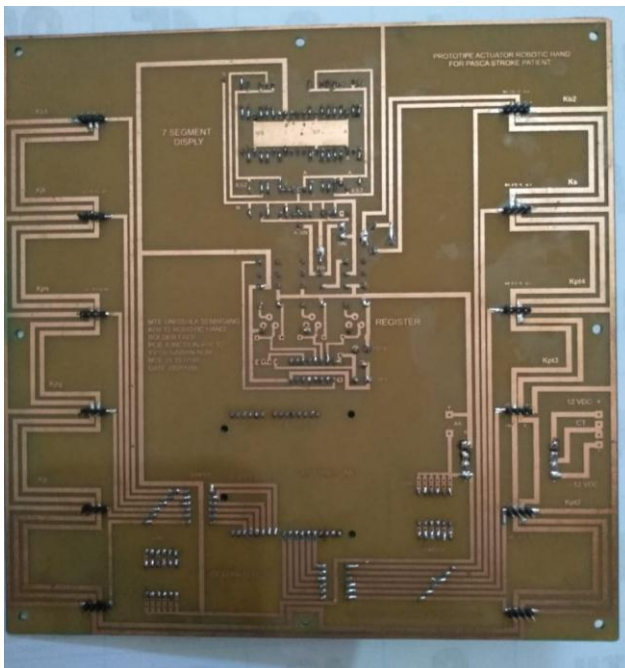
Gambar 5.4 Akuator Tangan Robotik tampak samping



Gambar 5.5 Flex Sensor



Gambar 5.6 Seven Segment



Gambar 5.7 Solder Face PCB Interface

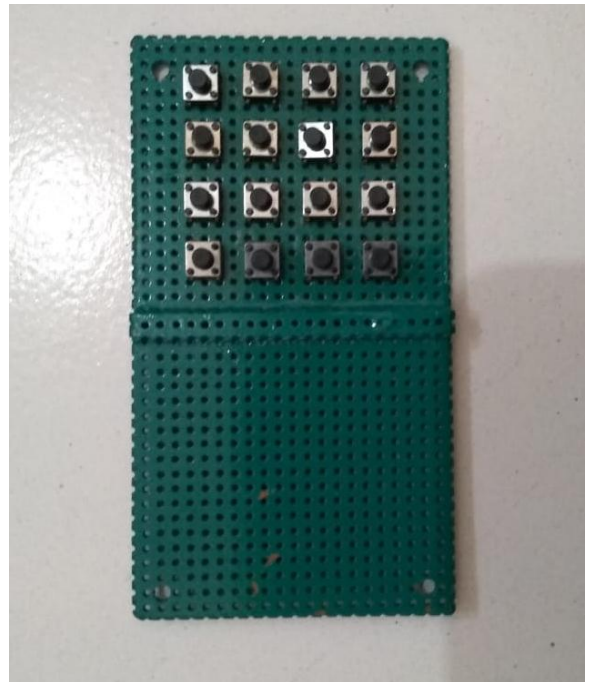
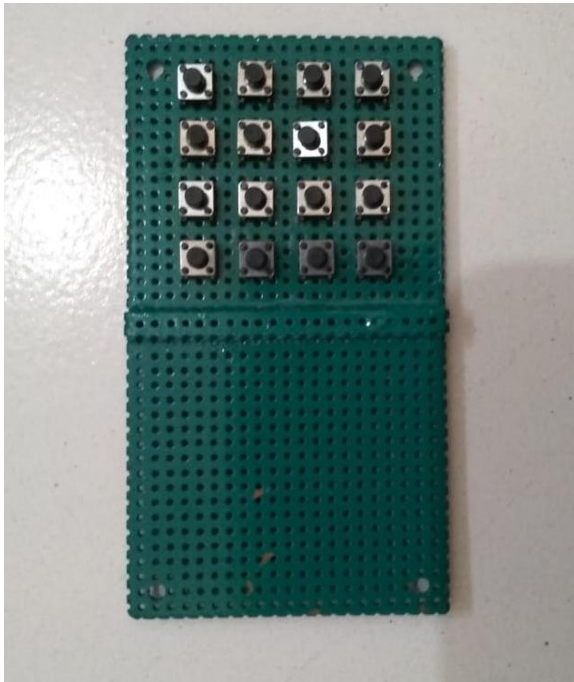


Gambar 5.8



Gambar 5.9 Komponen Face PCB Interface





Gambar 5.10 Push Button Switch



Gambar 5.11 Akuator Pergelangan tangan tampak atas



Gambar 5.12 Akuator Pergelangan tangan tampak samping



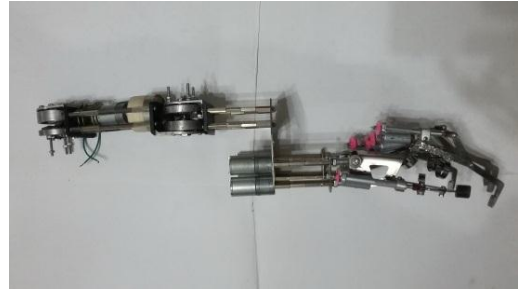
Gambar 5.13 Akuator jari jemari tampak atas



Gambar 5.14 Gabungan akuator jari jemari dan akuator pergelangan tangan



Gambar 5.15 Akuator jari jemari, pergelangan tangan dan Siku tampak atas



Gambar 5.16 Akuator jari jemari, pergelangan tangan dan Siku tampak samping



Gambar 5.17 Mekanik Jari jemari



Gambar 5.18 Mekanik jari jemari dan pergelangan tangan



Gambar 5.19 Dudukan potensiometer



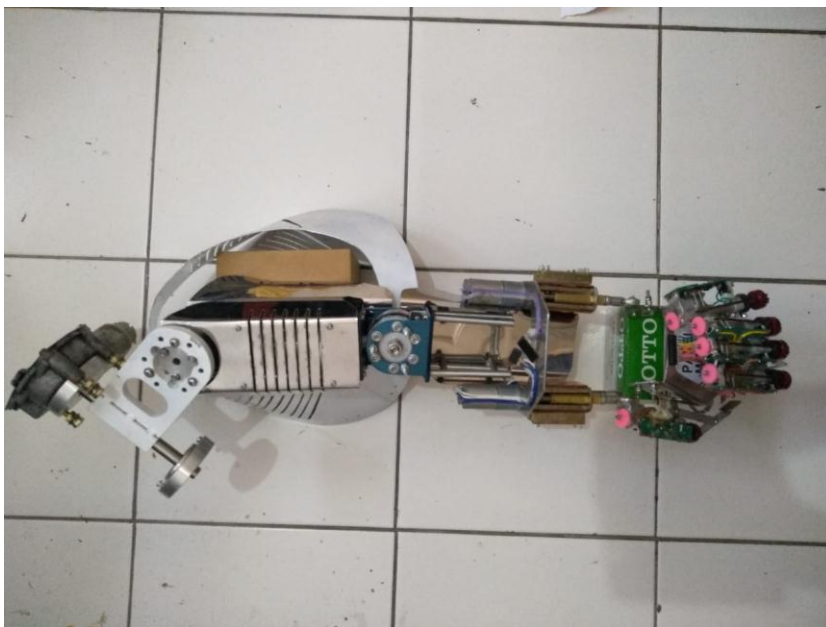
Gambar 5.20 Cover depan



Gambar 5.21



Gambar 5.22 Mekanik seluruh akuator



Gambar 5.23 Mekanik akuator tampak samping

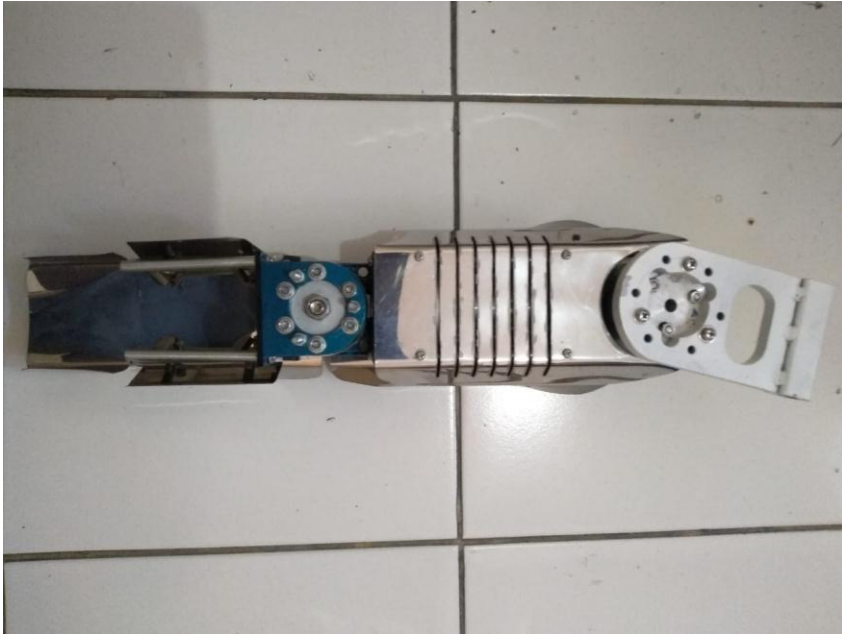


Gambar 5.24 Pelana

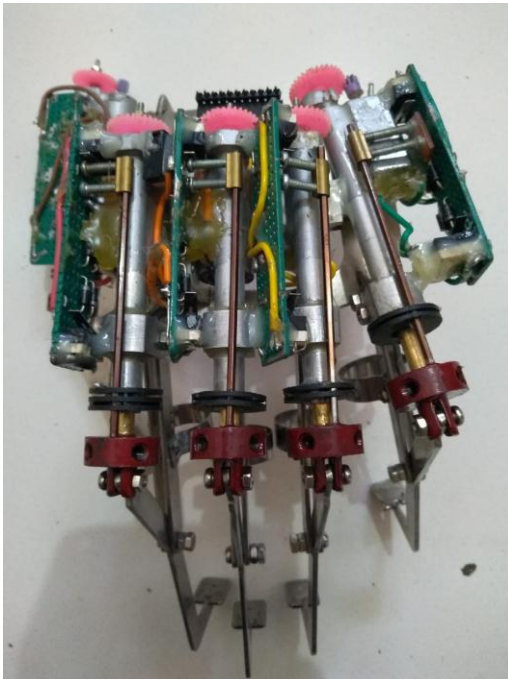


Gambar 5.25 Akuator Bahy





Gambar 5.26 Akuator siku tampak atas



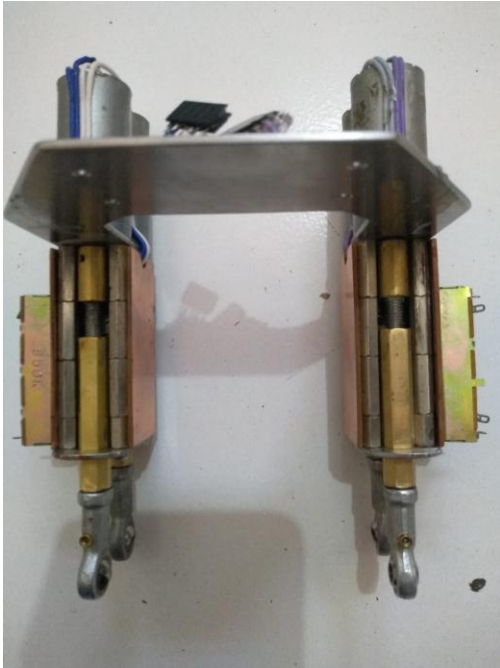
Gambar 5.27 Akuator jari jemari dan rangkaian kontrol



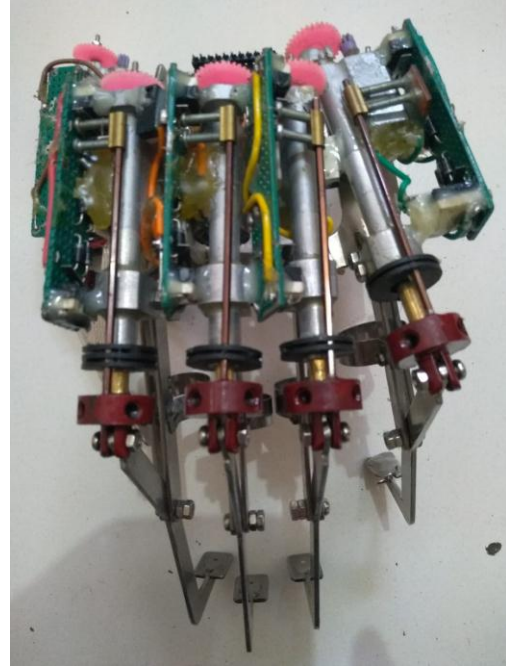
Gambar 5.28 Motor akuator pergelangan tangan



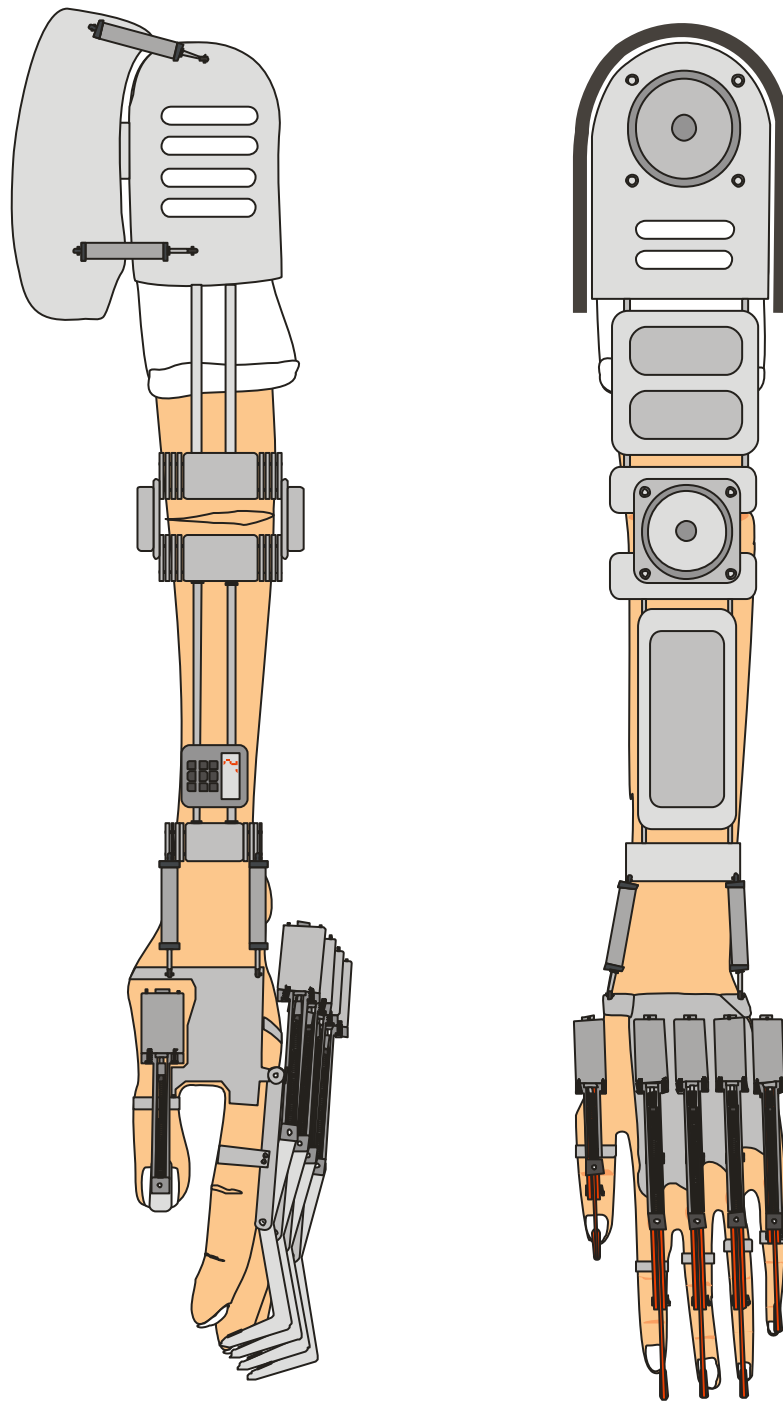
Gambar 5.29 Akuator pergelangan tangan dan motor penggerak



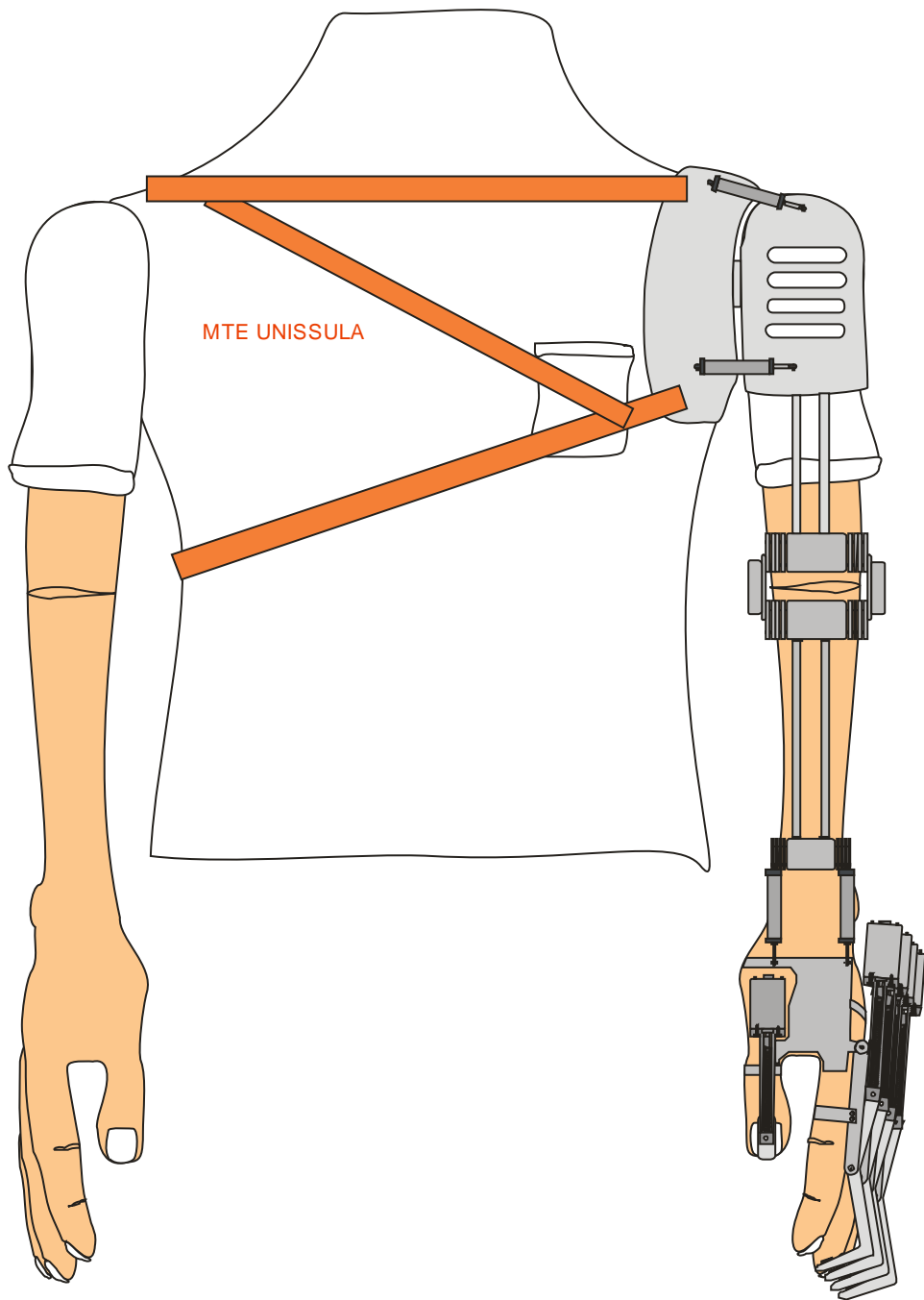
Gambar 5.30 Akuator pergelangan tangan terpadu



Gambar 5.31 Akuator Jari Jemari Terpadu



**Gambar 5.32.** Akuator Tangan Robotik Terpadu



**Gambar 5.33.** Penerapan Akuator Tangan Robotik