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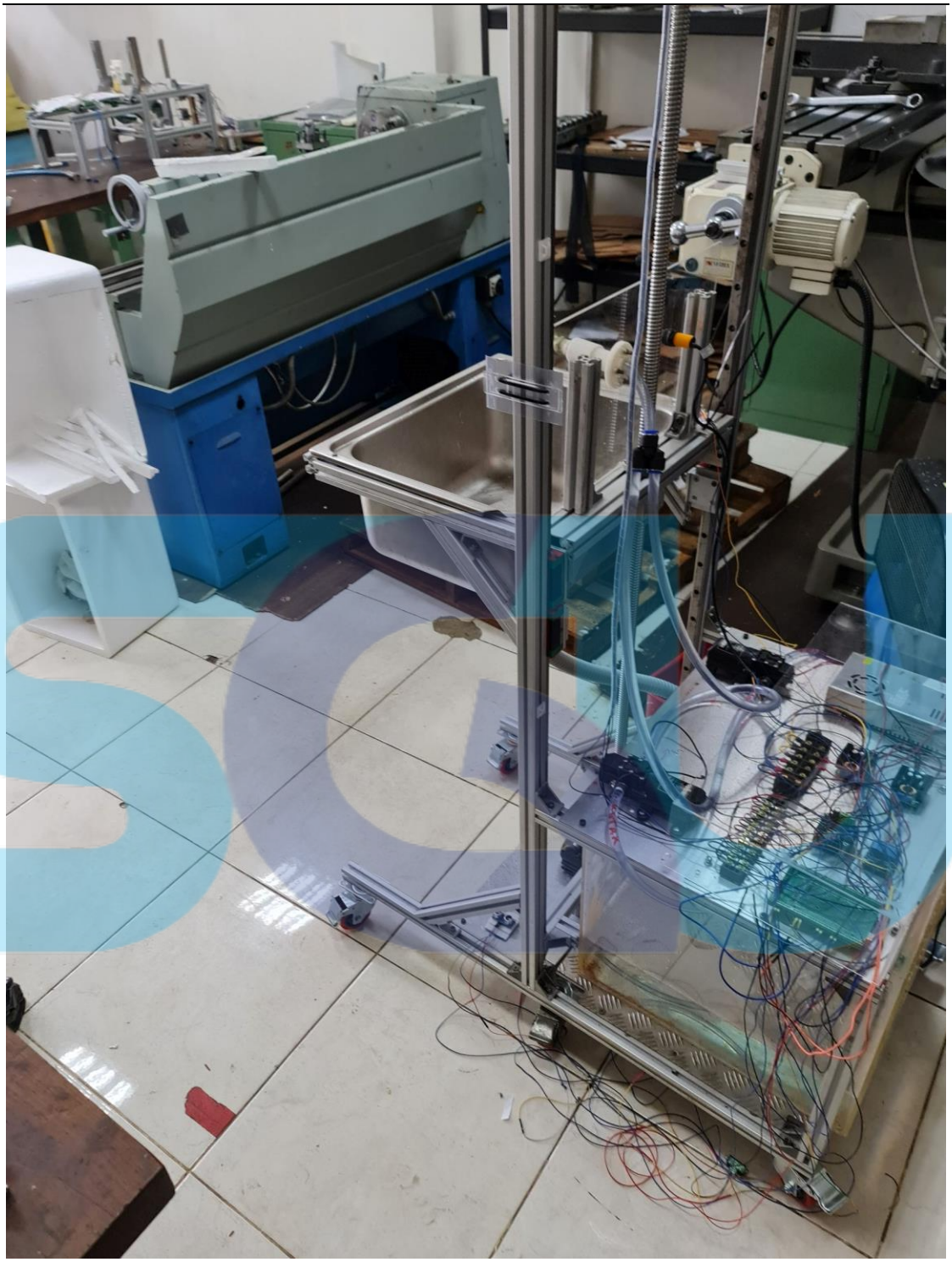
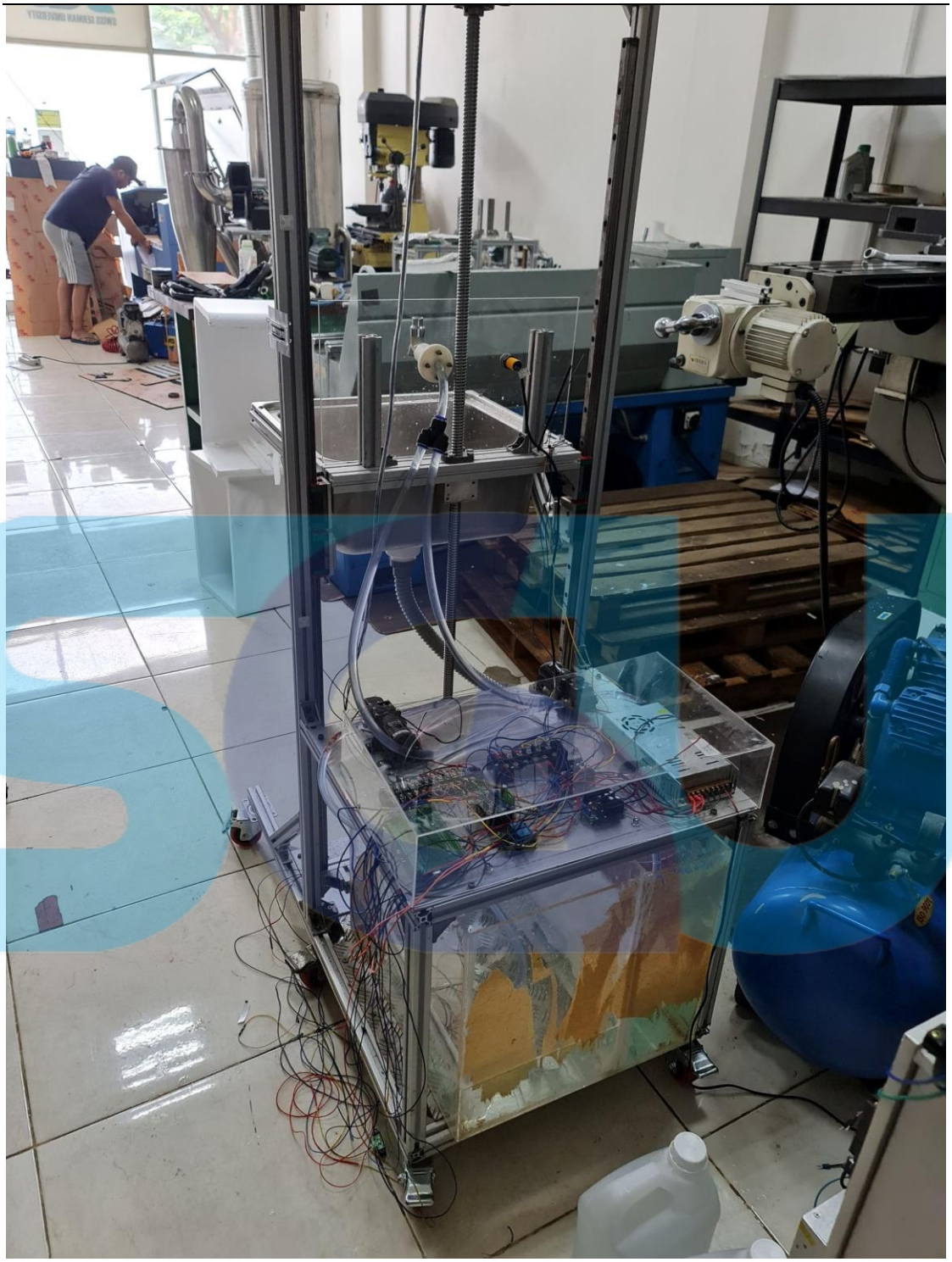
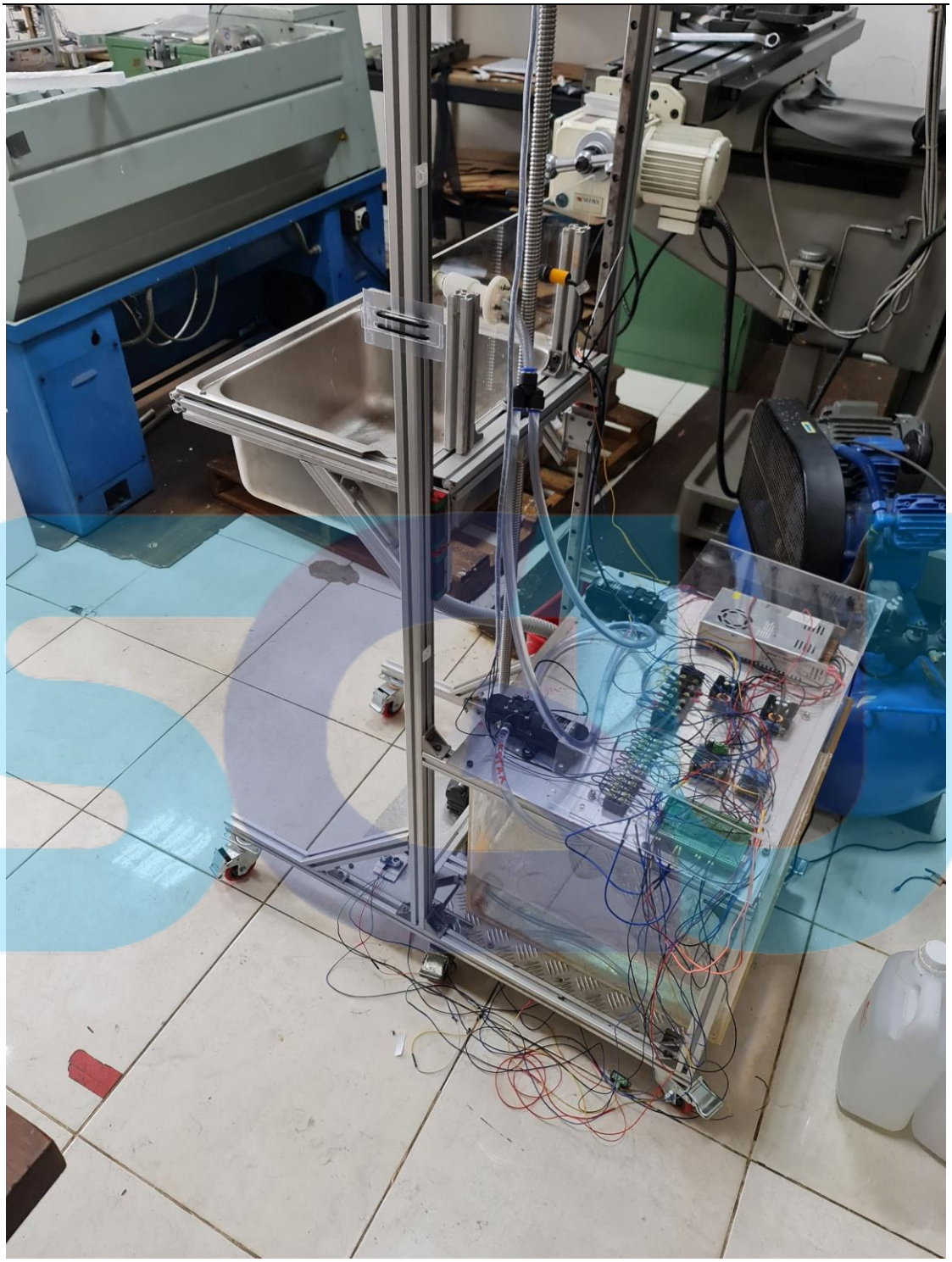
APPENDICES

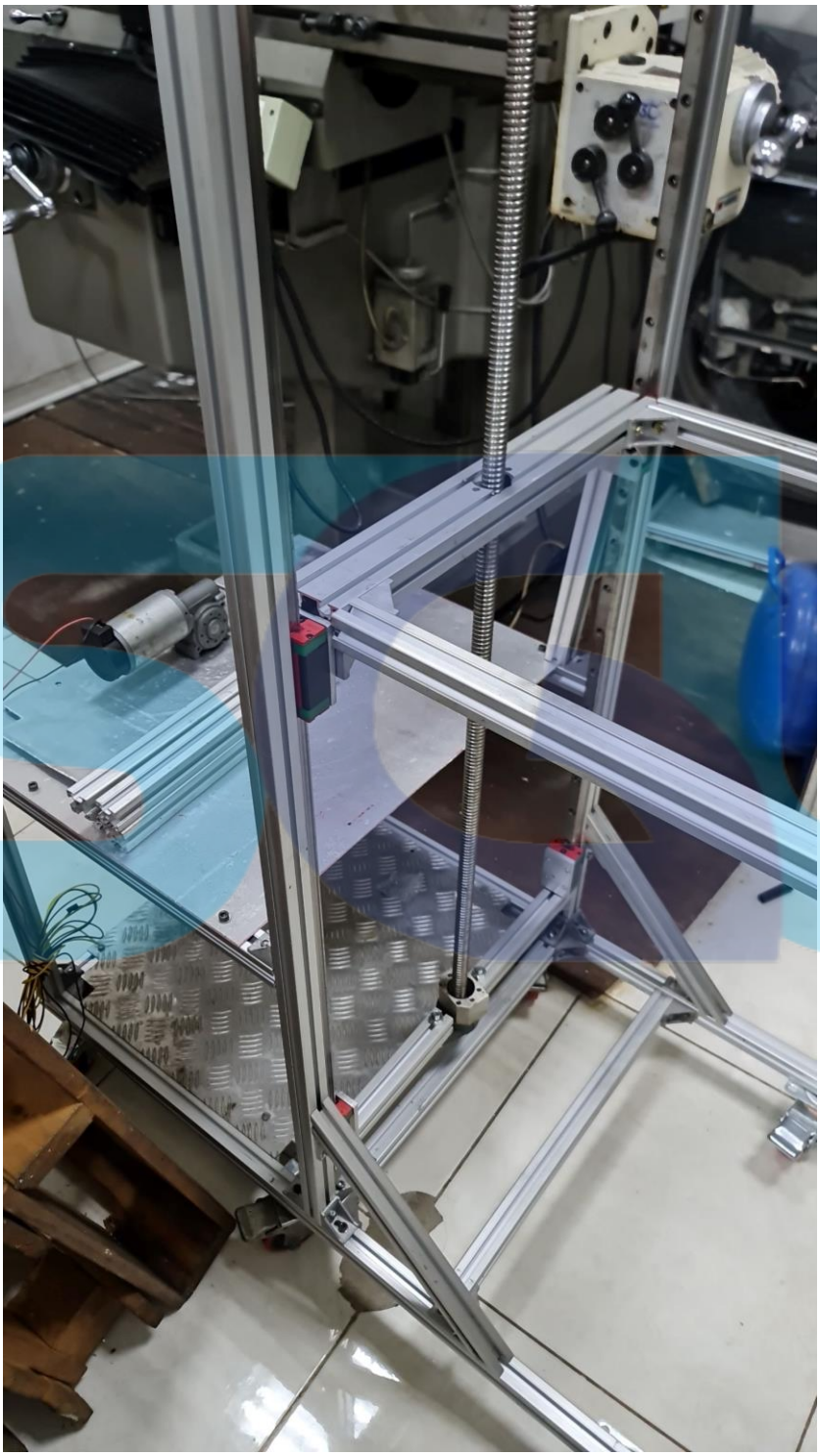
APPENDIX 1: Photos of automatic height sink washer

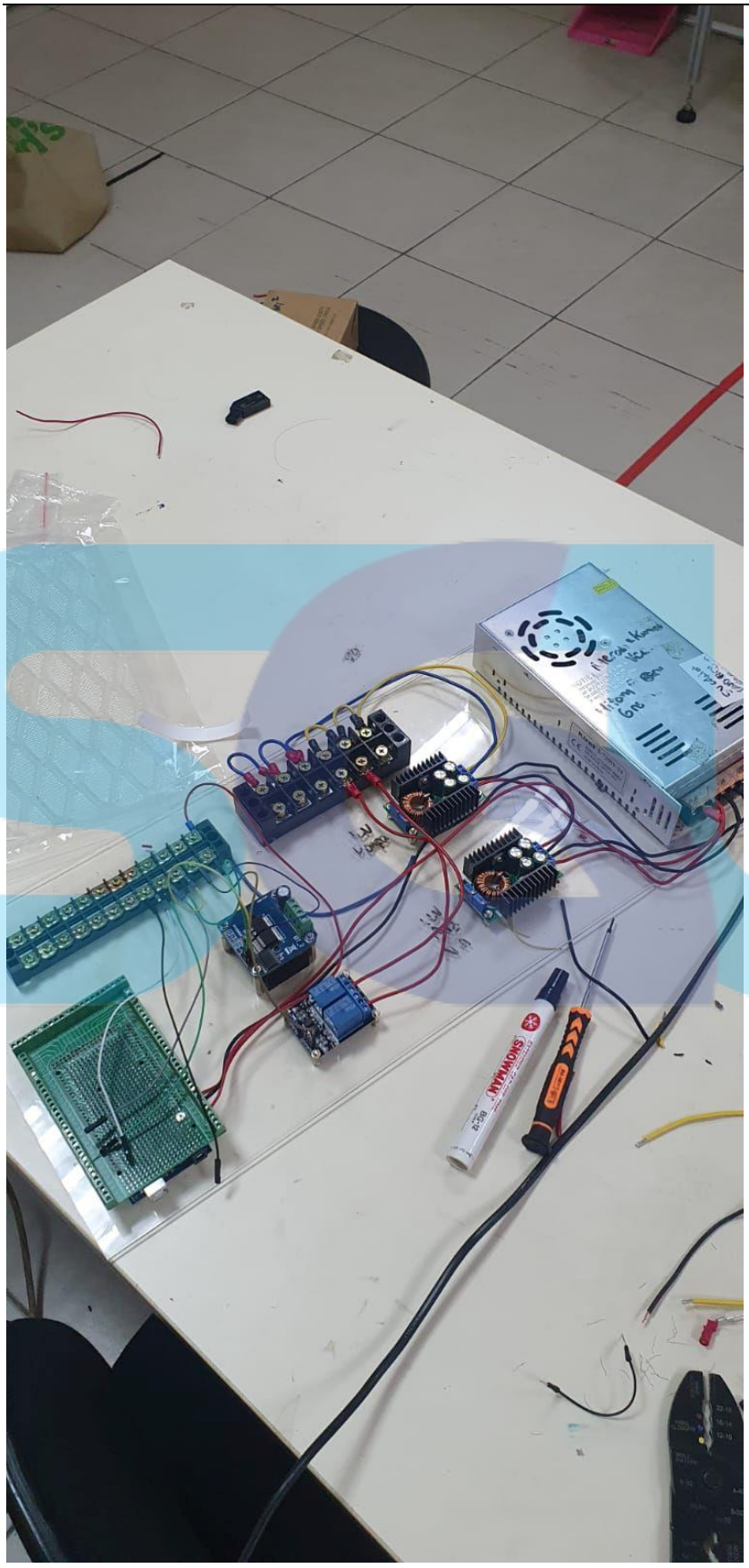


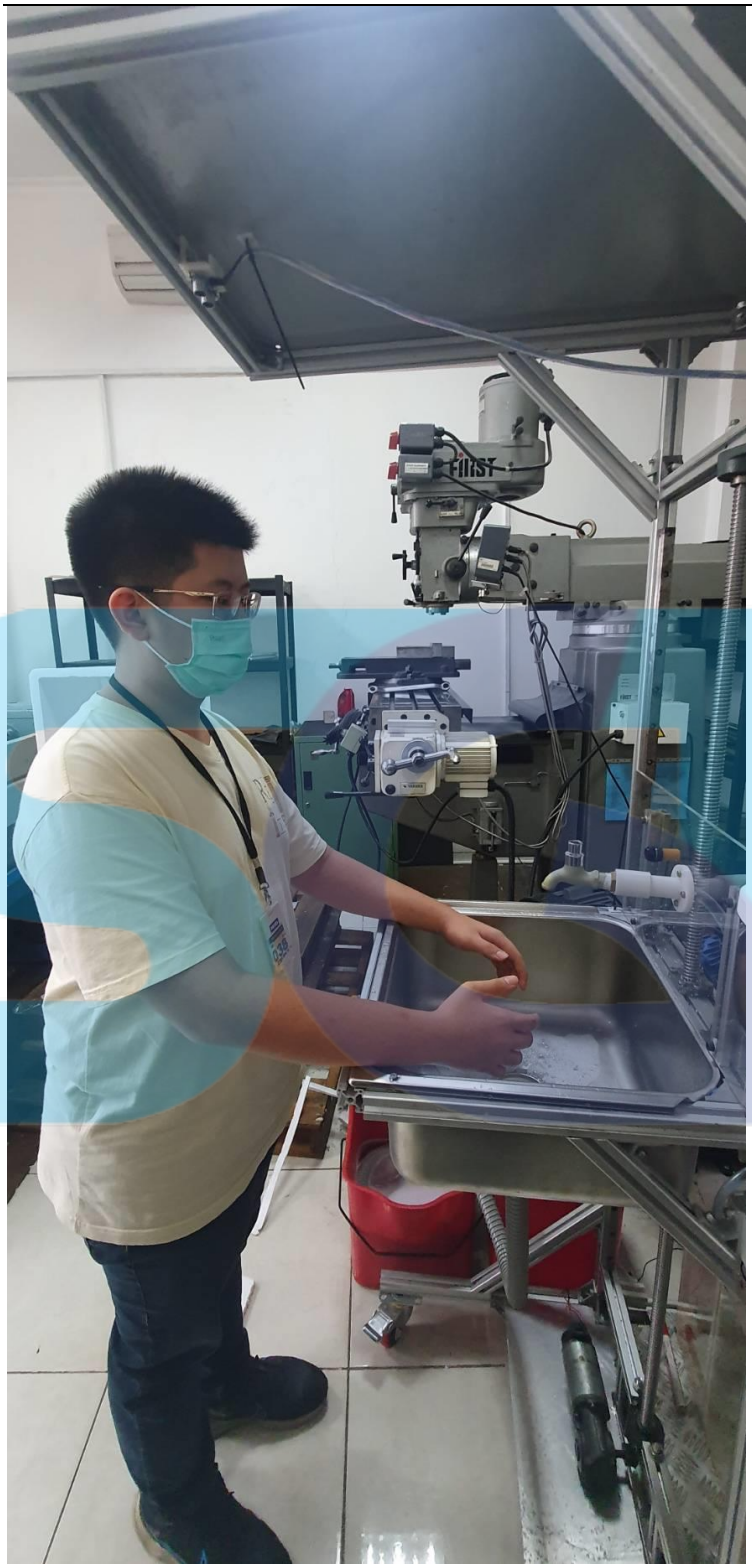




APPENDIX 2: Photos of construction & testing progress




SNOWMAN



APPENDIX 3: Arduino Code

```
#include <NewPing.h>

#define MAX_DISTANCE 194
int LMOTOR = 33; //ibt2 signal
int RMOTOR = 32; //ibt2 signal
const int wtriggerPin = 4; //tinggi
const int wechoPin = 3; //tinggi
const int ptriggerPin = 9; //sink
const int pechoPin = 8; //sink
int SENSOR = 24; //user
int SNSR = 25; //cuci
int RELAY = 17; //air
int RLY = 18; //air + sabun
int iterationw = 5;
int iterationp = 5;
float wdistance;
float pdistance;
float tinggiorang;
float tinggisink;
long wduration;
long pduration;
float target;
int var = 1;

NewPing sonar2(wtriggerPin, wechoPin,MAX_DISTANCE);
NewPing sonar1(ptriggerPin, pechoPin,MAX_DISTANCE);

float sinkheight() { //sink height pake signal p
  pdistance = pduration = sonar1.ping_median(iterationp);
  pdistance = (pduration * 0.034828 / 2) + 35;
  return pdistance;
  delay(500);
}

float heightsens() { //tinggi orang pake signal w
  wdistance = wduration = sonar2.ping_median(iterationp);
  wdistance = (wduration * 0.034828 / 2);
  tinggiorang = MAX_DISTANCE - wdistance;
  return tinggiorang;
  delay(500);
}
```

```
float calculateTarget() {
  float heightSens = heightsens();
  target = (heightSens * 0.6);
  return target;
  delay(500);
}

void setup(){
Serial.begin(9600);
Serial.println("TESTING");
pinMode(LMOTOR,OUTPUT);
pinMode(RMOTOR,OUTPUT);
pinMode(wtriggerPin, OUTPUT);
pinMode(wechoPin, INPUT);
pinMode(ptriggerPin, OUTPUT);
pinMode(pechoPin, INPUT);
pinMode(SENSOR, INPUT);
pinMode(SNSR,INPUT);
pinMode(RELAY,OUTPUT);
pinMode(RLY,OUTPUT);
}

void loop(){
Serial.println(" ==== ");
Serial.print("tinggi:");
Serial.println(heightsens());
Serial.print("sink:");
Serial.println(sinkheight());
Serial.print("target:");
Serial.println(calculateTarget());

int A=digitalRead(24);
int B=digitalRead(25);
float height = heightsens();
float sink = sinkheight();
float currentTarget = calculateTarget();
if(A == LOW & B == HIGH){
Serial.println("USER DETECTED");
```

```
  if (var == 1){
    if (height >= 90 && height <= 185) {
      if (sinkheight() < currentTarget){
        Serial.println("naik");
        digitalWrite(LMOTOR,1); // naik
        digitalWrite(RMOTOR,0);
      } if (sinkheight() > currentTarget) {
        Serial.println("turun");
        digitalWrite(LMOTOR,0);
        digitalWrite(RMOTOR,1); // turun
      } if((sinkheight() > currentTarget - 3.00) && (sinkheight() < currentTarget + 3.00)){
        Serial.println("stop");
        digitalWrite(LMOTOR,0); // Stop
        digitalWrite(RMOTOR,0); // Stop
        var = 2;
      }
    }
  }
}
  if (B == LOW & A == LOW){
   Serial.println("HAND DETECTED");
     digitalWrite(LMOTOR,0);
     digitalWrite(RMOTOR,0);
     digitalWrite(18,HIGH);
   Serial.println("Relay ON") ;
     delay(5000);
     digitalWrite(18,LOW);
   Serial.println("Relay OFF");
     delay(500);
     digitalWrite(17,HIGH);
   Serial.println("Relay 2 ON");
     delay(12000);
     digitalWrite(17,LOW);
   Serial.println("Relay 2 OFF");
     delay(500);
     digitalWrite(18,HIGH);
   Serial.println("Relay ON") ;
     delay(10000);
     digitalWrite(18,LOW);
   Serial.println("Relay OFF");
     delay(5000);
     var = 1;
}
```

APPENDIX 4: Bill of Material

Description	Quantity	Price per unit	Subtotal
3D Printing fee (grams)	225	Rp 1,000	Rp 225,000
Laser Cut Fee (Inc. acrylic)	1	Rp 585,000	Rp 585,000
Aluminum profile (30x30) 4 meter	1	Rp 428,000	Rp 428,000
HGH20CA Block linear guide rail	3	Rp 136,000	Rp 408,000
Caster wheel set 3 inches	2	Rp 140,000	Rp 280,000
SFU2005 Ball Screw 1500 mm & nut housing	1	Rp 980,000	Rp 980,000
Ring Washer M6	140	Rp 150	Rp 21,000
Nut L M6	140	Rp 750	Rp 105,000
Nut L M4	8	Rp 500	Rp 4,000
Nut L M10	2	Rp 1,600	Rp 3,200
T-Nut M6	100	Rp 1,775	Rp 177,500
3030 Bracket gusset angle 45 degrees	12	Rp 20,000	Rp 240,000
3030 Bracket gusset angle 90 degrees	20	Rp 5,500	Rp 110,000
Ultrasonic sensor HC-SR05	4	Rp 20,000	Rp 80,000
Arduino Shield	1	Rp 300,000	Rp 300,000
Relay 5VDC Dual Channel	1	Rp 12,000	Rp 12,000
AWG 18 Wire	5	Rp 5,000	Rp 25,000
AWG 22 Wire	10	Rp 2,000	Rp 20,000
Dinamo Nagasaki Pump 12 V	1	Rp 107,000	Rp 107,000
DC step down buck converter	2	Rp 47,000	Rp 94,000
Terminal block 12 poles 25 Ampere	1	Rp 11,000	Rp 11,000
Terminal block 6 pole 60 Ampere	1	Rp 32,000	Rp 32,000
Spacer brass PCB M2 & M3	30	Rp 1,300	Rp 39,000
Skun ferrule terminal (100 unit/pack)	1	Rp 20,000	Rp 20,000
Spiral cable wrapping 10 m	1	Rp 30,000	Rp 30,000
Cable clamp	20	Rp 1,000	Rp 20,000
Acrylic sealant & glue	1	Rp 80,000	Rp 80,000
Afur plastic sink	1	Rp 36,000	Rp 36,000
1.5 M Drain hose	1	Rp 151,500	Rp 151,500
D51 Tissue toilet box	1	Rp 25,800	Rp 25,800
Fitting hose	1	Rp 37,000	Rp 37,000
Water hose 1/2" 1 meter	1	Rp 10,000	Rp 10,000
		Total	**Rp 4,978,500**

CURRICULUM VITAE

William Christian Huta

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21 December 2001

Interest on the continuous development of mechanical and electrical technology, also eager to learn more about industrial management. Final year student in Mechatronics Engineering at Swiss German University, I have completed internships within Indonesia and Germany where those experience has enhanced my skills and knowledge in this field.

In addition, I believe with my strong character and self-motivation could help me to learn more and contribute on automation technology as long-term goals.

Work Experience

Engineer Intern • Deutsche E-Bike Akkuservice

March 2022 - August 2022

-Specialized in battery cell replacement for different kinds of E-Bike battery packs (Panasonic, BionX, Giant, etc.).
-Capable of repairing multiple battery cell packs in under 2 hours for efficient service time.
-Improving the production line service to maximize the final product's quality.

Internship Trainee • Akademi Teknik Mesin Industri Cikarang (ATMI)

November 2021 - December 2021

-Trained in handling and operating milling and lathe machines.
-Learning about PCB Design, Safety Technique, Welding, Technical Drawing, Reverse Engineering, Assembly, Mechanical and Electrical Benchwork

Maintenance Intern • PT. Karya Indah Multiguna

June 2021 - July 2021

-Performed weekly machine inspections to ensure smooth operation and a longer operating life.
-Chosen to participate in assembling Heidelberg Easymatrix 106 C/CS cutting machine.
-Gained lots of knowledge regarding the production process and the mechanical field.

Education

Swiss German University 2019 - 2023
Mechanical Engineering - Mechatronics Concentration

Karangturi Senior High School 2016 - 2019
Natural Science

Skills

- Microsoft Office
- SolidWorks
- Technical Drawing
- Phyton
- C++
- FluidSim
- Proteus

Languages

- Indonesian — Native
- English — Fluent
- Javanese — Fluent
- German — Beginner
- Chinese — Beginner