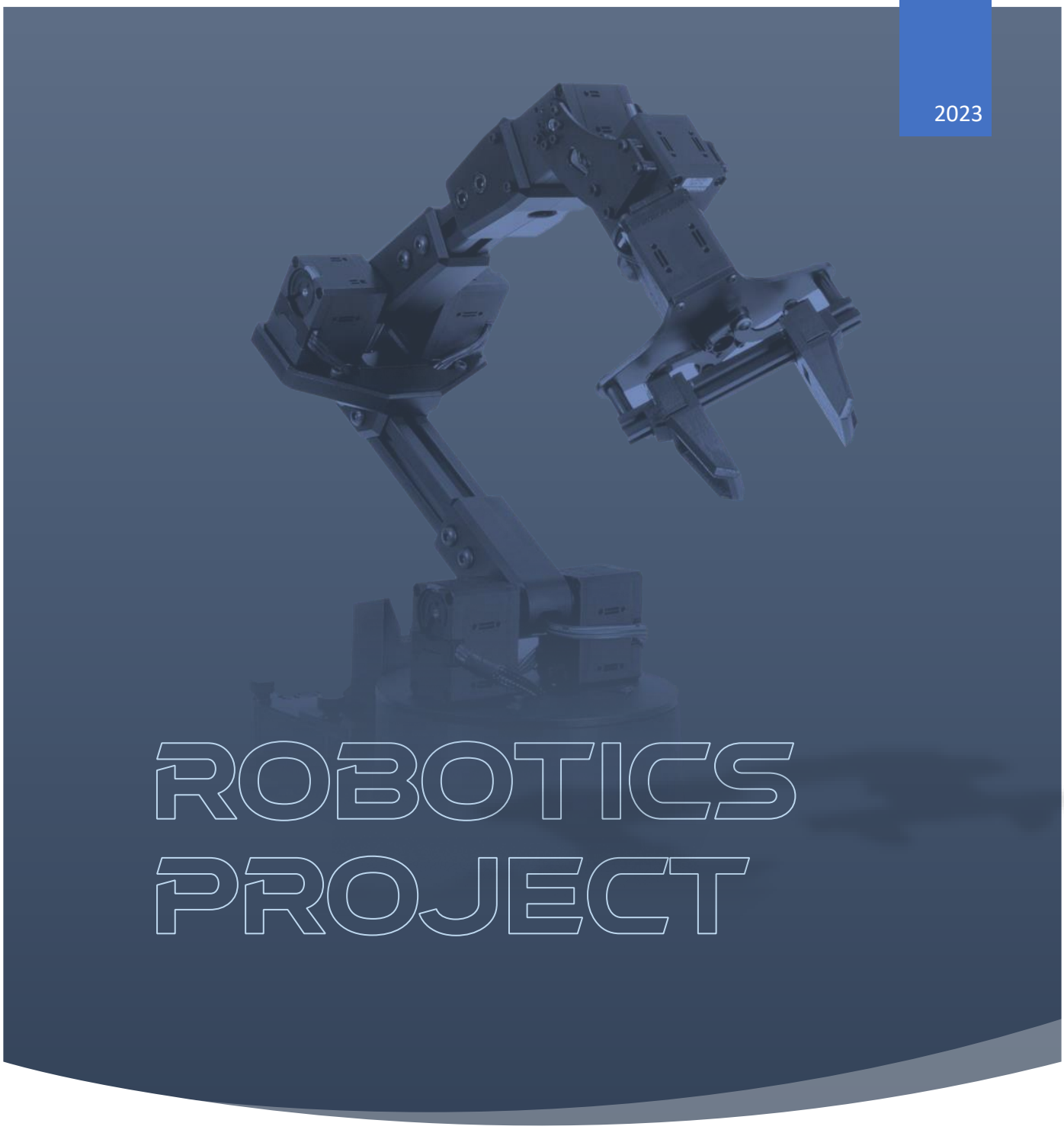
2023



ROBOTICS PROJECT

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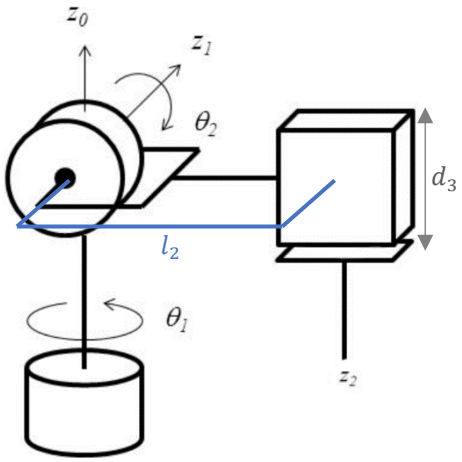
4	أبانوب إبراهيم يني عبدالملاك	18010001
5	أسماء جمال عبد الحليم مبروك ناجي	15010473
6	وسام مصطفي محمد علي	18012063
7	أحمد حسام أحمد	18010089
8	أحمد محمود عبد العزيز السيد احمد	18010241
9	محمد ابراهيم محمد السعيد ابراهيم	18011342
10	حسن مصطفى حسن علي	18010573

ROBOT SPECS

Two joints are rotational, and one is translational (RRP). The axes of all three joints are parallel.



Frame (i)	θ_i	d_i	a_i	α_i
1	θ_1	l_2	0	90°
2	θ_2	0	l_2	90°
3	0	d_3	0	0

θ_1 and θ_2 are limited to $0 - 180°$ range.

SIMULATION CODE

```
L1=9;
L2=9;
L3=10;
min=10;
max=15;

L(1)=Link([0 L2 0 pi/2 ]);
L(1).qlim=[0 pi];
L(2)=Link([0 0 L2 pi/2 ]);
L(2).qlim=[0 pi];
L(3)=Link([0 L3 0 0 1]); %%1== prismatic %%0==revolute
L(3).qlim = [min,max];

Rob=SerialLink(L);
Rob.name='RRP Arm';
Rob.teach
%% Forward Kinematics

for th=0:0.1*pi:pi
   for d=min:1:max
     Rob.plot([th th th d ],'workspace',[-20 20 -20 20 -20 20]);
     pause(0.1)
    end
end

%% Inverse Kinematics

X= input("Enter the value of X_axis for end effector: ");
Y= input("Enter the valueh of Y_axis for end effector: ");
Z= input("Enter the value of Z_axis for end effector: ");

T=transl([X Y Z]);
INV = Rob.ikine(T ,[0 0 0],'mask',[1 1 1 0 0 0]);
figure(2)
Rob.plot(INV)
```

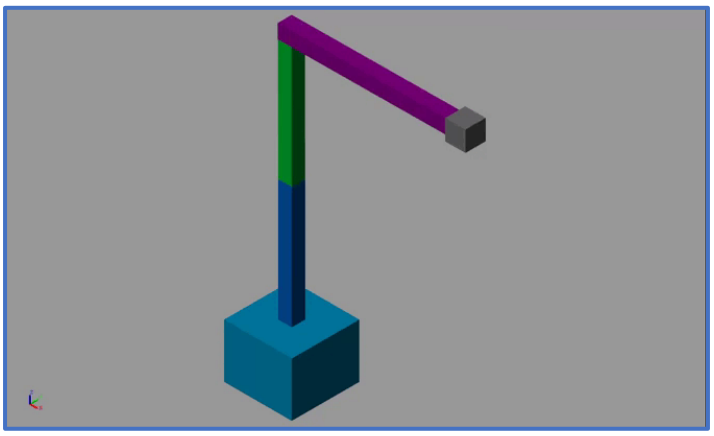
ARDUINO CODE

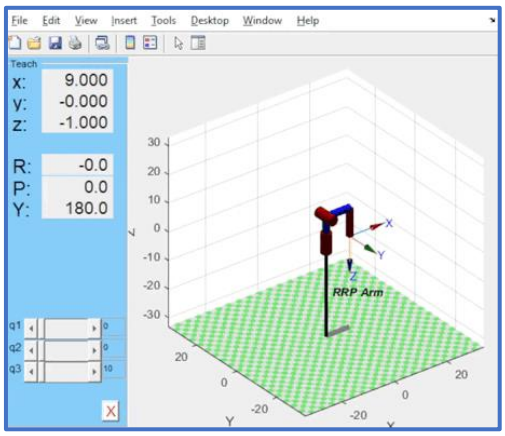
```
#include <Servo.h>
Servo myservo1;
Servo myservo2;
Servo myservo3;

int s1 ;
int s2 ;
int s3 ;
int i=0,j=110,k=0;
void setup()
{
    Serial.begin(9600);
    myservo1.attach(9);
    myservo2.attach(10);
    myservo3.attach(11);
}

void loop()
{
  myservo1.write(i);
  myservo2.write(j);
  myservo3.write(k);

  Serial.println("-------------------------");
    Serial.println("servo 1 = ");

    while (Serial.available() == 0)
    {   }
    s1 = Serial.parseInt(); //Reading the Input string from Serial port.
    Serial.readString();
    if(i<=s1){
    for(i;i<=s1;i++)
    {
      myservo1.write(i);              // tell servo to go to position in variable 'pos'
      delay(30);
    }
    }
    else{
      for(i;i>s1;i--)
    {
      myservo1.write(i);              // tell servo to go to position in variable 'pos'
      delay(30);
    }
    }


    Serial.print("servo 1 go to degree :");
    Serial.println(s1);

  Serial.println("servo 2 = ");

    while (Serial.available() == 0)
    {   }
    s2 = Serial.parseInt(); //Reading the Input string from Serial port.
    Serial.readString();
    if(j<=s2){
    for(j;j<=s2;j++)
    {
      myservo2.write(j);              // tell servo to go to position in variable 'pos'
      delay(30);
    }
    }
    else{
      for(j;j>s2;j--)
    {
      myservo2.write(j);              // tell servo to go to position in variable 'pos'
      delay(30);
```

```
    }
    }


    Serial.print("servo 2 go to degree :");
    Serial.println(s2);



  Serial.println("servo 3 = ");

    while (Serial.available() == 0)
    {   }
    s3 = Serial.parseInt(); //Reading the Input string from Serial port.
    Serial.readString();
    if(k<=s3){
    for(k;k<=s3;k++)
    {
      myservo3.write(k);              // tell servo to go to position in variable 'pos'
      delay(30);
    }
    }
    else{
      for(k;k>s3;k--)
    {
      myservo3.write(k);              // tell servo to go to position in variable 'pos'
      delay(30);
    }
    }


    Serial.print("servo 3 go to degree :");
    Serial.println(s3);









   }
```

FIGURES

Forward Kinematics



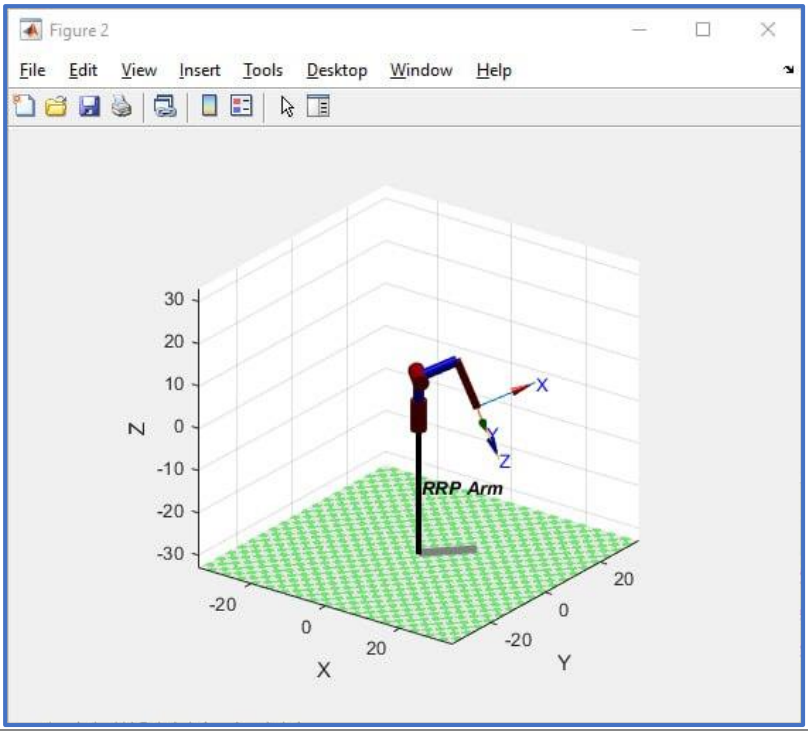


Inverse Kinematics

- Input:

```
Enter the value of X_axis for end effector: 9
Enter the valueh of Y_axis for end effector: 9
Enter the value of Z_axis for end effector: 1
```

- Output:




```
X= input("Enter the value of X_axis for end effector: ");
Y= input("Enter the valueh of Y_axis for end effector: ");
Z= input("Enter the value of Z_axis for end effector: ");

T=transl([X Y Z]);
INV = Rob.ikine(T ,[0 0 0],'mask',[1 1 1 0 0 0]);
figure
Rob.plot(INV)
```