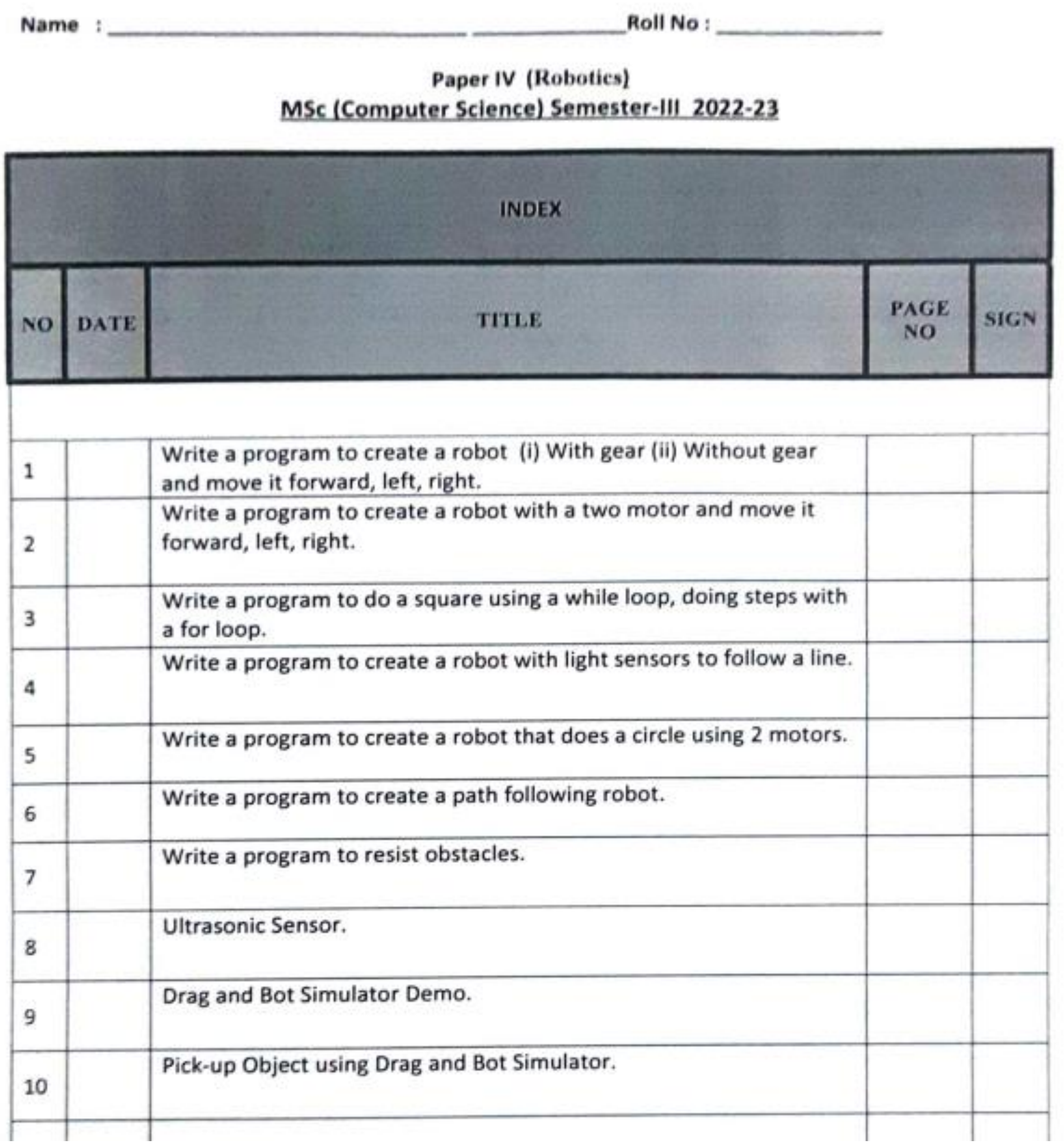
PRINCE JOHNSON **ROLL NO- 535**



Name : ______________________ **Roll No :** __________

Paper IV (Robotics)

MSc (Computer Science) Semester-III 2022-23

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PRACTICAL 1a

AIM: WRITE A PROGRAM TO CREATE A ROBOT WITH GEAR AND MOVE IT FORWARD, LEFT, RIGHT.

DESC:

NxtRobot() - Constructor for class ch.aplu.robotsim.NxtRobot

Gear() - Constructor for class ch.aplu.robotsim.Gear

Creates a gear instance with right motor plugged into port A, left motor plugged into port B.

addPart(Part) - Method in class ch.aplu.robotsim.LegoRobot

Assembles the given part into the robot.

setSpeed(int) - Method in class ch.aplu.robotsim.Gear

Sets the speed to the given value (arbitrary units).

forward() - Method in class ch.aplu.robotsim.Gear

Starts the forward movement.

left() - Method in class ch.aplu.robotsim.Gear

Starts to rotate left (center of rotation at middle of the wheel axes).

right() - Method in class ch.aplu.robotsim.Gear

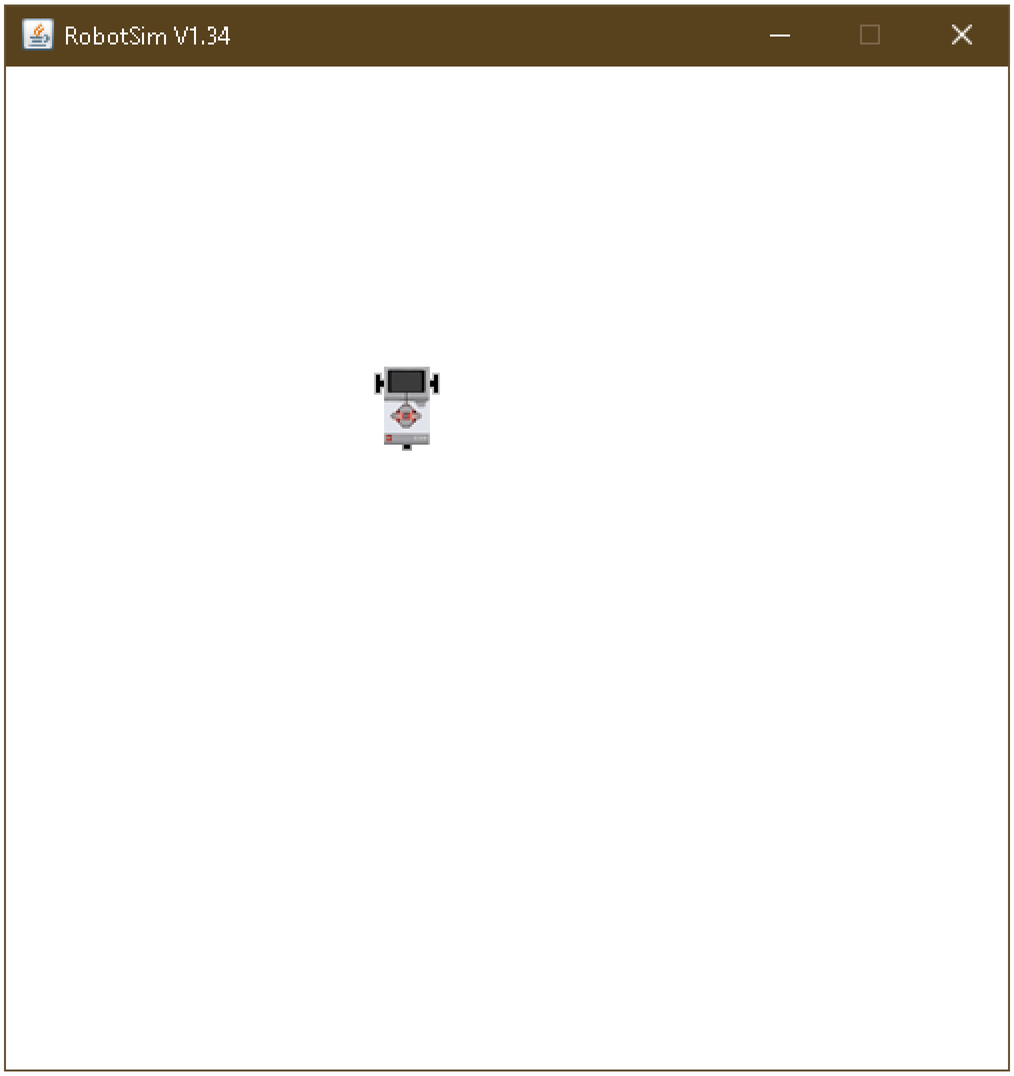
Starts to rotate right (center of rotation at middle of the wheel axes).

CODE:

```
import ch.aplu.robotsim.*;


public class Prac_1a {
   Prac_1a(){
      NxtRobot robot = new NxtRobot();
      Gear g = new Gear();
      robot.addPart(g);
      g.setSpeed(100);
      g.forward(500);
      g.left(250);
      g.forward(500);
      g.right(250);
      g.forward(500);
   }
```

```
    public static void main (String[] args) {
        new Prac_1a();
    }
}
```

OUTPUT:



PRACTICAL 1b

AIM: WRITE A PROGRAM TO CREATE A ROBOT WITHOUT GEAR AND MOVE IT FORWARD, LEFT, RIGHT.

DESC:

TurtleRobot() - Constructor for class ch.aplu.robotsim.TurtleRobot

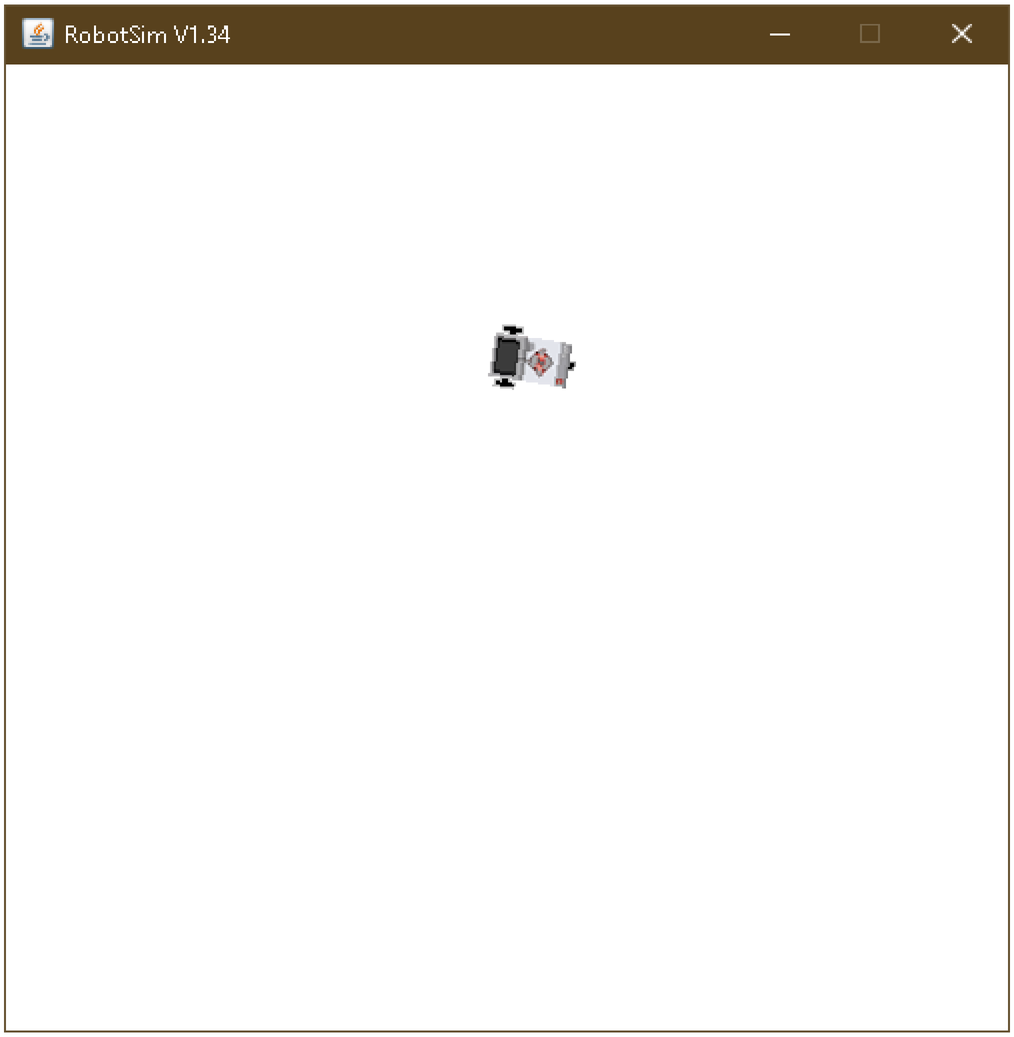
Creates a turtle robot instance.

CODE:

```
import ch.aplu.robotsim.*;

public class Prac_1b {
   Prac_1b(){
      TurtleRobot t = new TurtleRobot();
      t.forward(100);
      t.left(90);
      t.forward(100);
      t.right(90);
      t.forward(100);
```

```
    }


    public static void main (String[] args) {
        new Prac_1b();
    }
}
```

OUTPUT:



PRACTICAL 2

AIM: WRITE A PROGRAM TO CREATE A ROBOT WITH 2 MOTORS AND MOVE IT FORWARD, LEFT, RIGHT.

DESC:

Motor - Class in ch.aplu.robotsim

Class that represents one of the NXT motors.

Motor(MotorPort) - Constructor for class ch.aplu.robotsim.Motor

Creates a motor instance that is plugged into given port.

Tools() - Constructor for class ch.aplu.robotsim.Tools

delay(int) - Static method in class ch.aplu.robotsim.Tools

Suspends execution of the current thread for the given amount of time (unless the game grid window is disposed).

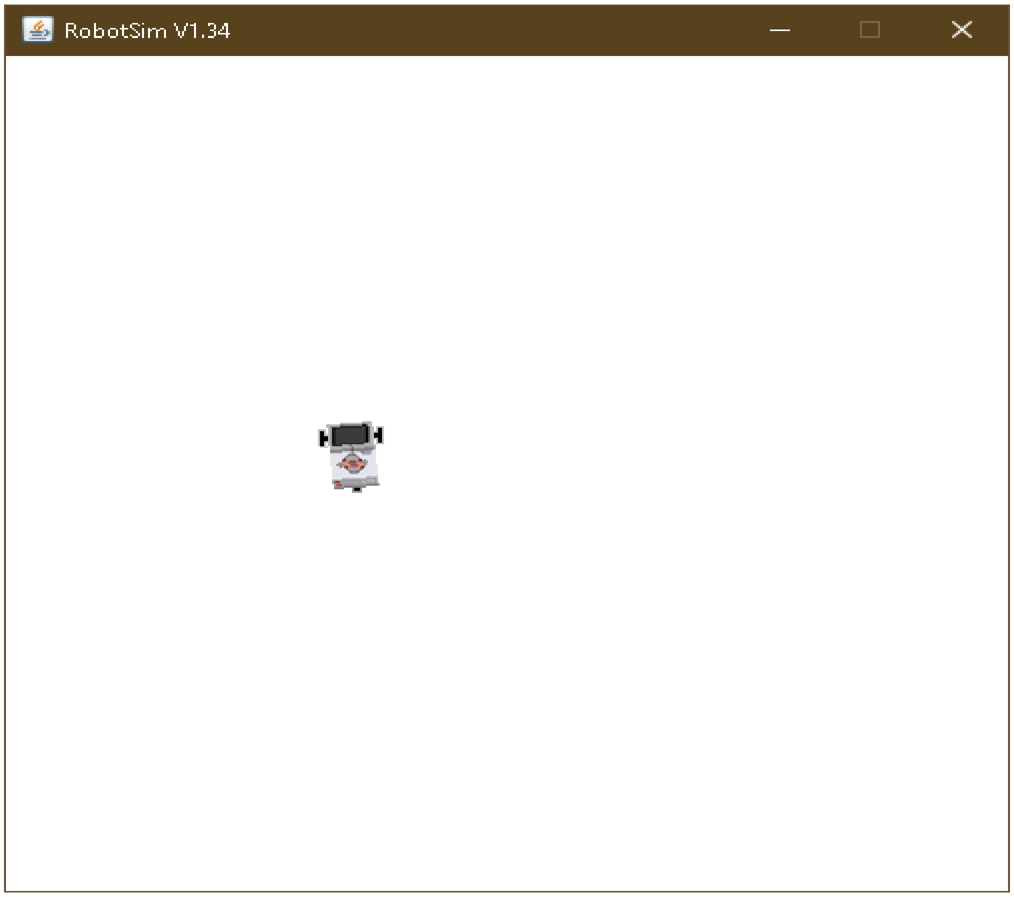
stop() - Method in class ch.aplu.robotsim.Motor

Stops the rotation.

CODE:

```
import ch.aplu.robotsim.*;


public class Prac_2 {
    Prac_2(){
        NxtRobot r = new NxtRobot();
        Motor m1 = new Motor(MotorPort.A);
        Motor m2 = new Motor(MotorPort.B);
        r.addPart(m1);
        r.addPart(m2);

        m1.forward();
        Tools.delay(1090);
        m2.forward();

        Tools.delay(1090);
        m1.stop();

        m2.forward();
        Tools.delay(1090);
        m1.forward();
        m1.stop();

        m2.stop();

    }


    public static void main(String args[]){

        new Prac_2();

    }

}
```

OUTPUT:



PRACTICAL 3

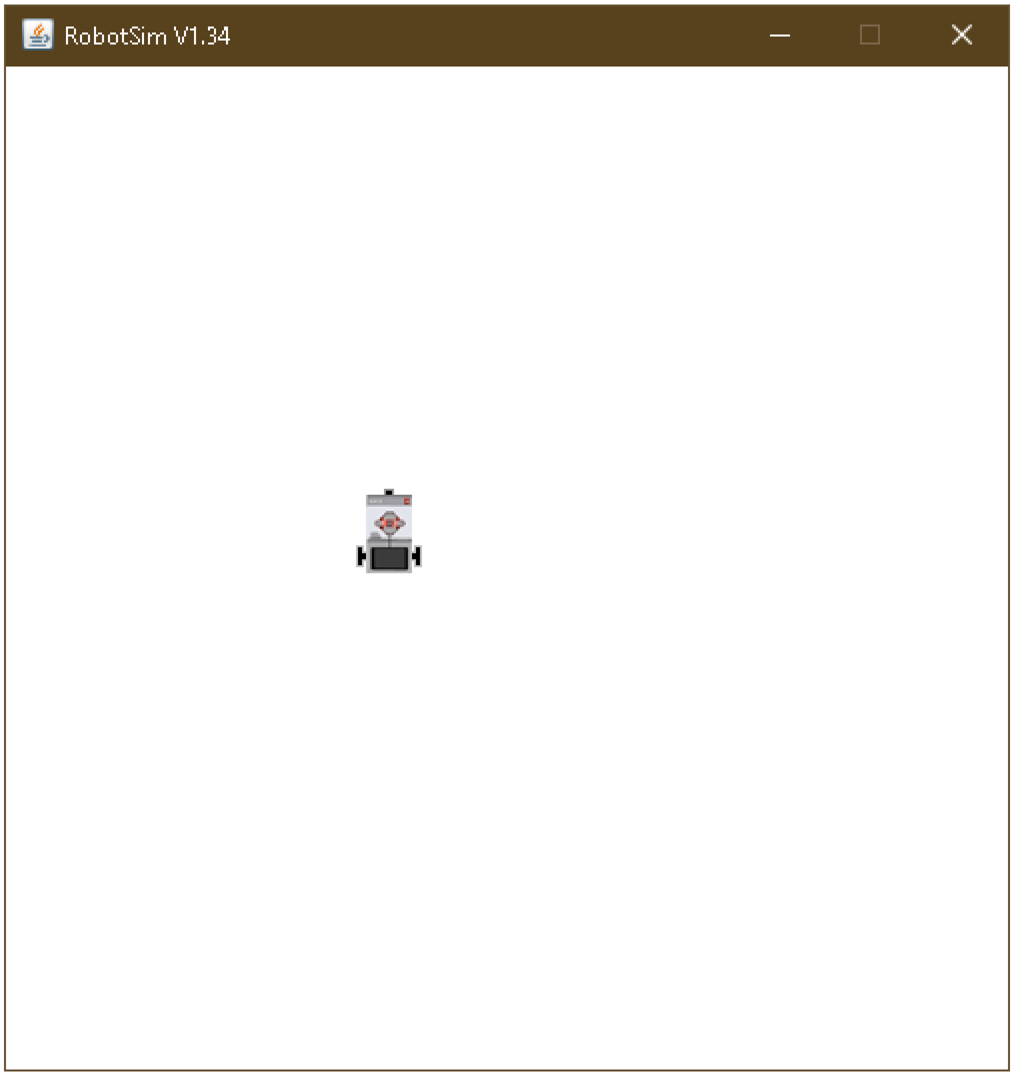
AIM: WRITE A PROGRAM TO DO A SQUARE USING A WHILE LOOP.

CODE:

```
import ch.aplu.robotsim.*;

public class Prac_3 {
   Prac_3(){
      NxtRobot robot = new NxtRobot();
      Gear g = new Gear();
      robot.addPart(g);
      g.setSpeed(100);
      while (true){
         g.forward(600);
         g.left(280);
      }
   }

   public static void main (String[] args) {
      new Prac_3();
```

```
    }
}
```

OUTPUT:



PRACTICAL 4

AIM: WRITE A PROGRAM TO CREATE A ROBOT WITH LIGHT SENSORS TO FOLLOW A LINE.

DESC:

RobotContext() - Constructor for class ch.aplu.robotsim.RobotContext

Creates a RobotContext instance.

setStartPosition(int, int) - Static method in class ch.aplu.robotsim.RobotContext

Sets the Nxt starting position (x-y-coordinates 0..500, origin at upper left).

useBackground(String) - Static method in class ch.aplu.robotsim.RobotContext

Use the given image as background (playground size 501 x 501).

LegoRobot() - Constructor for class ch.aplu.robotsim.LegoRobot

Creates a robot with its playground using defaults from RobotContext.

LightSensor(SensorPort) - Constructor for class ch.aplu.robotsim.LightSensor

Creates a sensor instance pointing downwards connected to the given port.

getValue() - Method in class ch.aplu.robotsim.LightSensor

For sensor ports 1, 2, 3, 4: returns the brightness of the background at the current location.

leftArc(double) - Method in class ch.aplu.robotsim.Gear

Starts to move to the left on an arc with given radius.

rightArc(double) - Method in class ch.aplu.robotsim.Gear

Starts to move to the right on an arc with given radius.

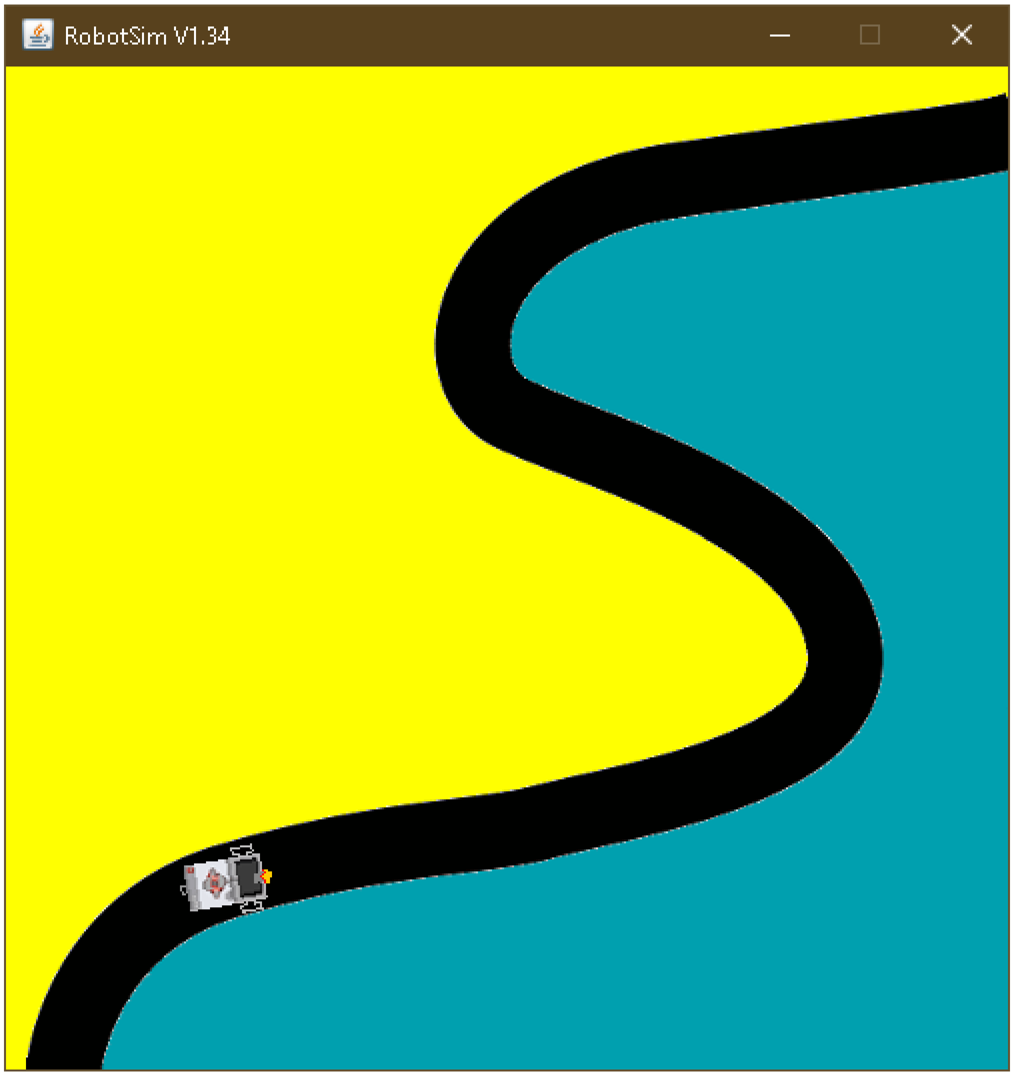
CODE:

```
import ch.aplu.robotsim.*;

public class Prac_4 {
   static {
      RobotContext.setStartPosition(32,495);
      RobotContext.useBackground("sprites/road.gif");
    }
```

```
Prac_4(){
    LegoRobot r=new LegoRobot();
    Gear g = new Gear();
    LightSensor ls= new LightSensor(SensorPort.S3);
    r.addPart(g);
    r.addPart(ls);
    g.forward();
    g.setSpeed(50);
    while(true){
        int v =ls.getValue();
        if(v < 100)
            g.forward();
        if(v > 350 && v<750)
            g.leftArc(0.005);
        if(v > 800)
            g.rightArc(0.005);
    }
}

public static void main (String args[]){
    new Prac_4();
}
```

```
}
```

OUTPUT:



PRACTICAL 5

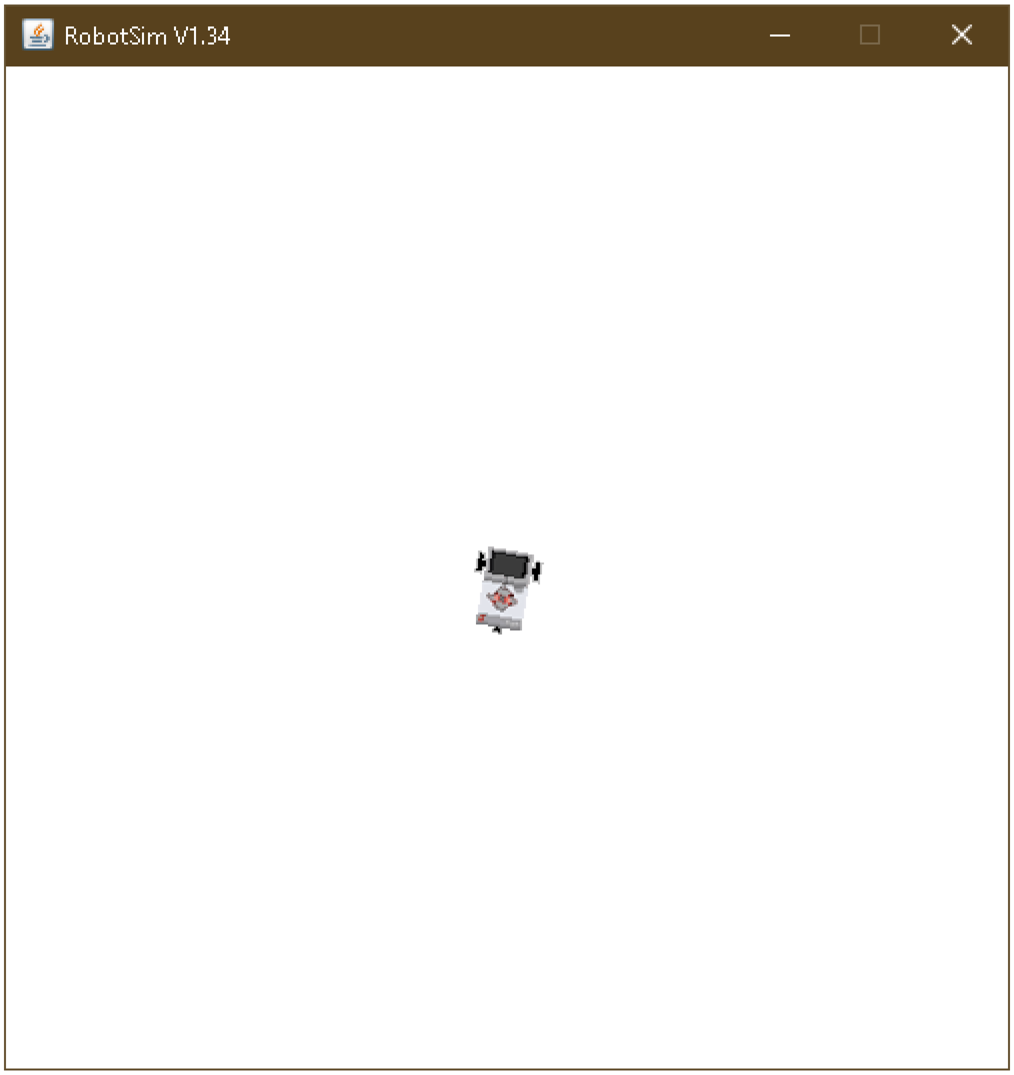
AIM: WRITE A PROGRAM TO CREATE A ROBOT THAT DOES A CIRCLE USING 2 MOTORS.

CODE:

```
import ch.aplu.robotsim.*;


public class Prac_5 {

   Prac_5() {

      NxtRobot r = new NxtRobot();

      Motor A = new Motor(MotorPort.A);

      Motor B = new Motor(MotorPort.B);

      r.addPart(B);

      r.addPart(A);

      A.setSpeed(100);

      B.setSpeed(100);

      A.forward();

      B.forward();

      while (true){

         Tools.delay(200);

         A.stop();

         Tools.delay(200);
```

```
            A.forward();
        }
    }


    public static void main(String arg[]) {
        new Prac_5();
    }


}
```

OUTPUT:


RobotSim V1.34

PRACTICAL 6

AIM: WRITE A PROGRAM TO CREATE A PATH FOLLOWING ROBOT.

DESC:

NxtContext() - Constructor for class ch.aplu.robotsim.NxtContext

setStartDirection(double) - Static method in class ch.aplu.robotsim.RobotContext

Sets the Nxt starting direction (zero to EAST).

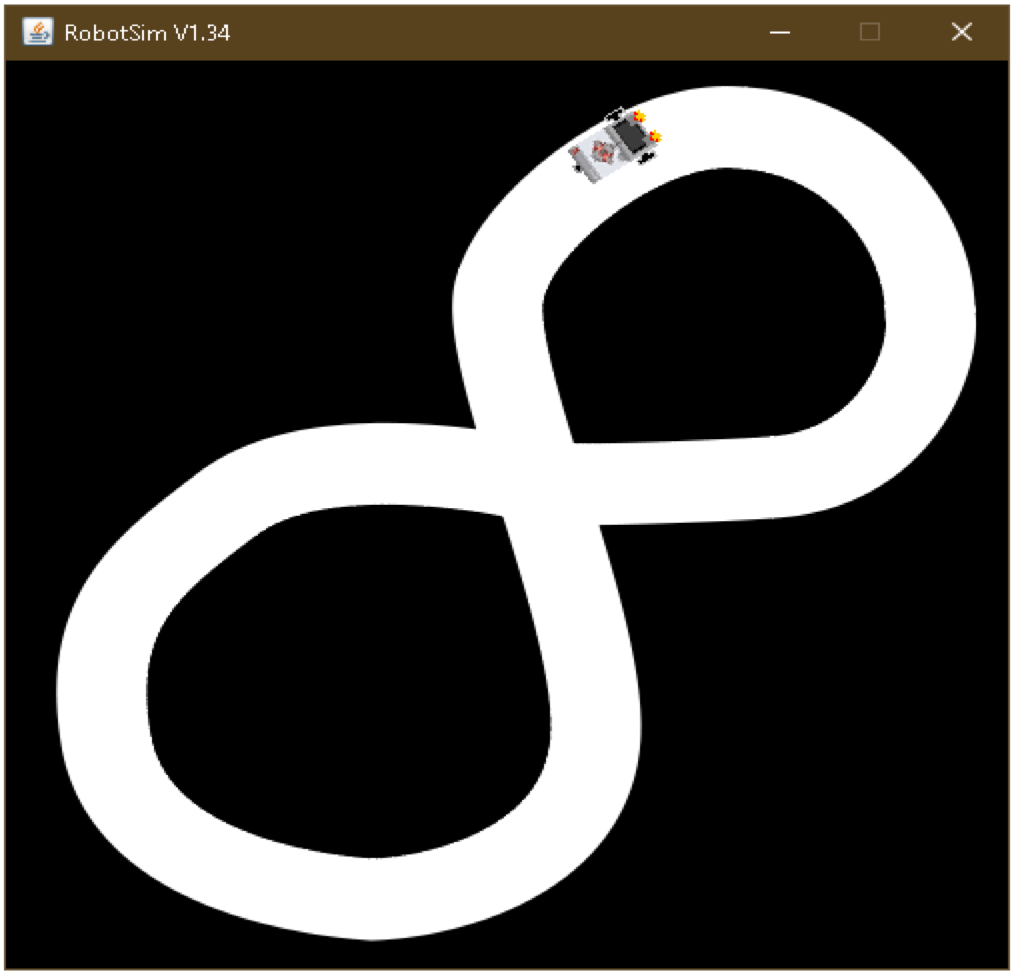
CODE:

```
import ch.aplu.robotsim.*;

public class Prac_6 {
   Prac_6(){
      NxtRobot robot=new NxtRobot();
      Gear gear=new Gear();
      LightSensor ls1=new LightSensor(SensorPort.S1);
      LightSensor ls2=new LightSensor(SensorPort.S2);
```

```
    robot.addPart(gear);
    robot.addPart(ls1);
    robot.addPart(ls2);
    gear.forward();
    gear.setSpeed(100);

    while(true)
    {
        int rightValue=ls1.getValue();
        int leftValue=ls2.getValue();
        if(leftValue < 10)
            gear.rightArc(0.05);
        if(rightValue < 10)
            gear.leftArc(0.05);
        if(leftValue > 10 && rightValue > 10)
            gear.forward();
    }
}
public static void main(String args[])
{
    new Prac_6();
}
```

```
    static
    {
        NxtContext.setStartPosition(267,232);
        NxtContext.setStartDirection(-90);
        NxtContext.useBackground("sprites/path.gif");
    }
}
```

OUTPUT:



PRACTICAL 7

AIM: WRITE A PROGRAM TO RESIST OBSTACLES.

DESC:

TouchSensor(SensorPort) - Constructor for class ch.aplu.robotsim.TouchSensor

Creates a sensor instance connected to the given port.

isPressed() - Method in class ch.aplu.robotsim.TouchSensor

Polls the touch sensor and returns true, if there is a collision with any of the collision obstacles.

backward() - Method in class ch.aplu.robotsim.TurtleRobot

Starts moving backward and returns immediately.

useObstacle(Obstacle) - Static method in class ch.aplu.robotsim.RobotContext

Defines the given obstacle to be used as touch obstacle.

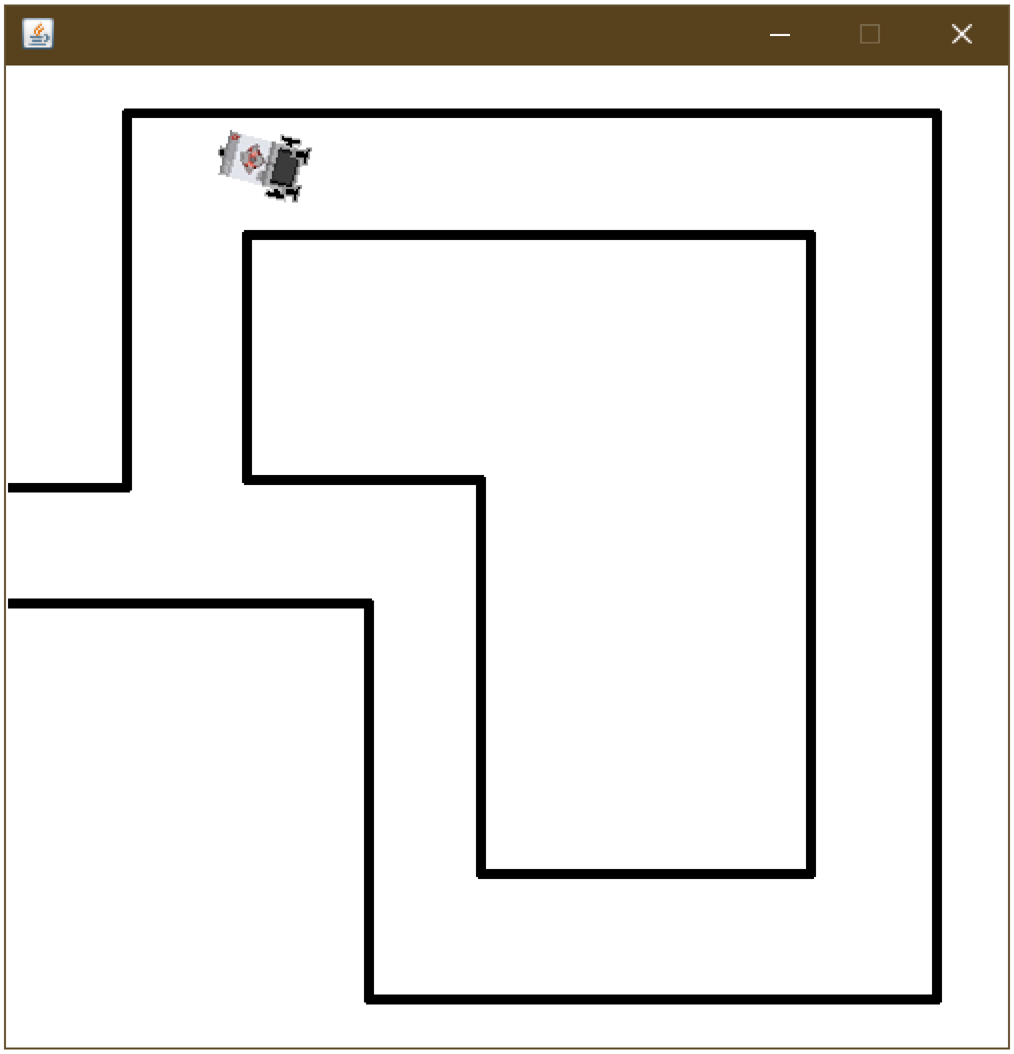
channel - Static variable in class ch.aplu.robotsim.RobotContext

CODE:

```
import ch.aplu.robotsim.*;


public class Prac_7 {
    Prac_7(){
        LegoRobot r=new LegoRobot();
        Gear g = new Gear();
        TouchSensor t1= new TouchSensor(SensorPort.S1);
        TouchSensor t2 = new TouchSensor(SensorPort.S2);
        r.addPart(g);
        r.addPart(t1);
        r.addPart(t2);
        g.forward();
        g.setSpeed(50);

        while(true){
            Boolean b1 = t1.isPressed();
            Boolean b2 = t2.isPressed();

            if(b1 && b2){
```

```
            g.backward(150);

            g.right(400);

            g.forward();

        }


        if(b1){

            g.backward(150);

            g.left(200);

            g.forward();

        }


        if(b2){

            g.backward(150);

            g.right(200);

            g.forward();

        }

    }

}


static {

    RobotContext.setStartPosition(100,250);

    RobotContext.useObstacle(RobotContext.channel);
    }


   public static void main(String args[]){
      new Prac_7();
   }
}
```

OUTPUT:



PRACTICAL 8

AIM: ULTRASONIC SENSOR.

DESC:

UltrasonicSensor(SensorPort) - Constructor for class ch.aplu.robotsim.UltrasonicSensor

The port selection determines the position of the sensor and the direction of the beam axis.

setBeamAreaColor(Color) - Method in class ch.aplu.robotsim.UltrasonicSensor

Sets the color of the beam area (two sector border lines and axis).

setProximityCircleColor(Color) - Method in class ch.aplu.robotsim.UltrasonicSensor

Sets the color of the circle with center at sensor location and radius equals to the current distance value.

getDistance() - Method in class ch.aplu.robotsim.UltrasonicSensor

Returns the distance to the nearest target object.

useTarget(String, Point[], int, int) - Static method in class ch.aplu.robotsim.RobotContext

Creates a target for the ultrasonic sensor using the given sprite image.

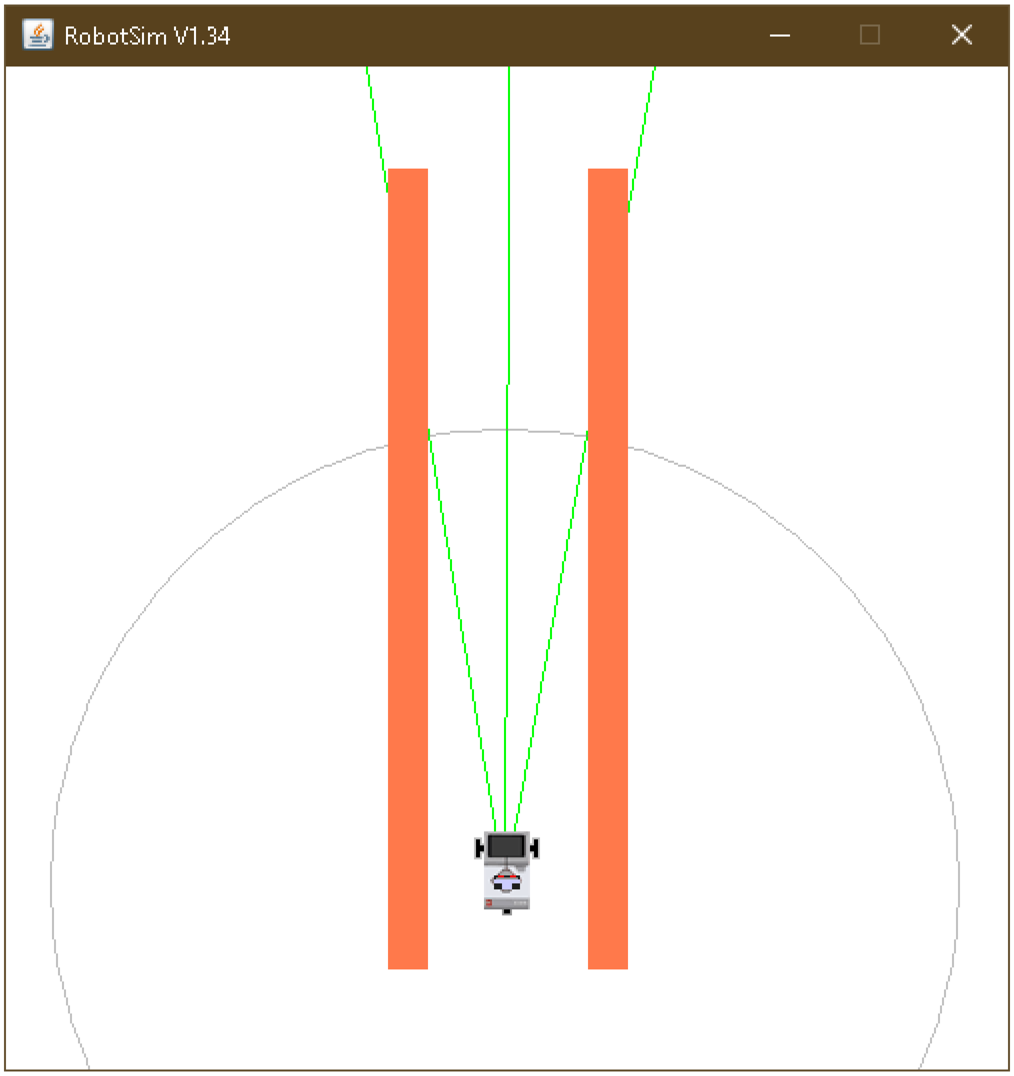
CODE:

```
import ch.aplu.robotsim.*;

import java.awt.Color;

import java.awt.Point;


public class Prac_8 {

   Prac_8() {

      LegoRobot robot = new LegoRobot();

      Gear gear = new Gear();

      robot.addPart(gear);

      UltrasonicSensor us = new UltrasonicSensor(SensorPort.S1);

      robot.addPart(us);

      us.setBeamAreaColor(Color.green);

      us.setProximityCircleColor(Color.lightGray);


      double arc = 0.5;

      gear.setSpeed(50);

      gear.rightArc(arc);
```

```
boolean isRightArc = true;


int oldDistance = 0;

while (true)

{

  Tools.delay(100);

  int distance = us.getDistance();

  if (distance == -1)

    continue;

  if (distance < oldDistance)

  {

    if (isRightArc)

    {

      gear.leftArc(arc);

      isRightArc = false;

    }

    else

    {

      gear.rightArc(arc);

      isRightArc = true;

    }

  }
```

```
        oldDistance = distance;
      }
    }

    static{
      Point[] mesh_bar =
      {
        new Point(10, 200), new Point(-10, 200),
        new Point(-10, -200), new Point(10, -200)
      };
      RobotContext.useTarget("sprites/bar1.gif", mesh_bar, 200, 250);
      RobotContext.useTarget("sprites/bar1.gif", mesh_bar, 300, 250);

      RobotContext.setStartPosition(250, 460);
    }

  public static void main(String[] args) {
      new Prac_8();
  }
}
```

OUTPUT:



ASSIGNMENT 1A

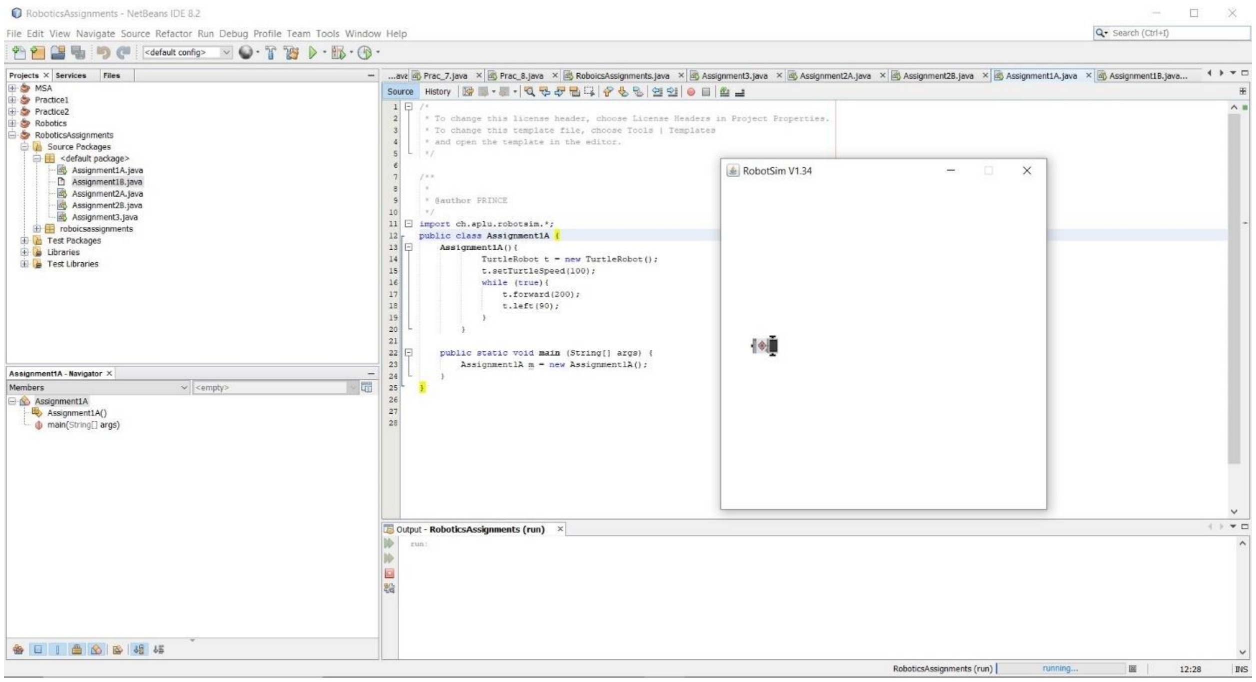
AIM: WRITE A PROGRAM TO CREATE A ROBOT TO PERFORM SQUARE MOTION WITHOUT USING GEAR.

CODE:

```
import ch.aplu.robotsim.*;


public class Assignment1A {
   Assignment1A(){
         TurtleRobot t = new TurtleRobot();
         t.setTurtleSpeed(100);
         while (true){
            t.forward(200);
            t.left(90);
         }
      }


   public static void main (String[] args) {
      new Assignment1A();
   }
```

}

OUTPUT:



```
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */

/**
 *
 * @author PRINCE
 */
import ch.aplu.robotsim.*;
public class Assignment1A {
    Assignment1A(){
            TurtleRobot t = new TurtleRobot();
            t.setTurtleSpeed(100);
            while (true){
                t.forward(200);
                t.left(90);
            }
        }

    public static void main (String[] args) {
        Assignment1A m = new Assignment1A();
    }
}
```

```
run:
```

RoboticsAssignments - NetBeans IDE 8.2
RobotSim V1.34
Output - RoboticsAssignments (run)
running...

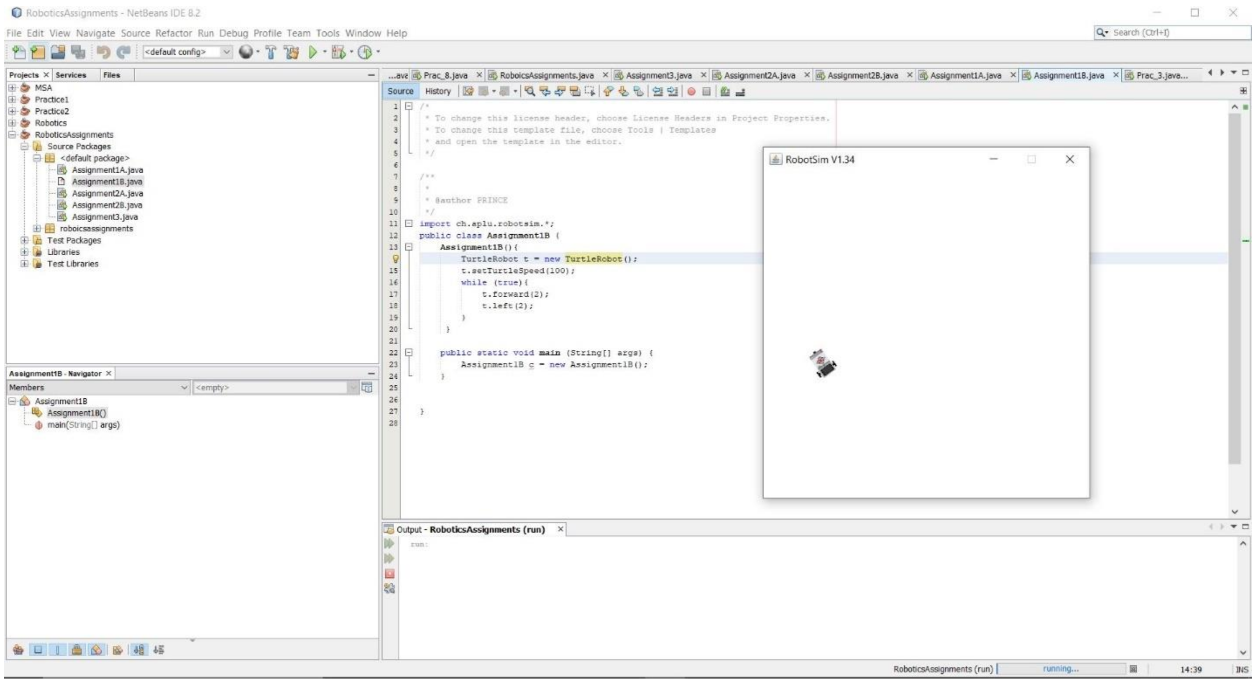
ASSIGNMENT 1B

AIM: WRITE A PROGRAM TO CREATE A ROBOT TO PERFORM CIRCULAR MOTION WITHOUT USING GEAR.

CODE:

```
import ch.aplu.robotsim.*;


public class Assignment1B {
  Assignment1B(){
      TurtleRobot t = new TurtleRobot();
      t.setTurtleSpeed(100);
      while (true){
         t.forward(2);
         t.left(2);
      }
   }


   public static void main (String[] args) {
      new Assignment1B();
   }
}
```

OUTPUT:


RoboticsAssignments - NetBeans IDE 8.2
RobotSim V1.34
Output - RoboticsAssignments (run)
running...

```
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */

/**
 *
 * @author PRINCE
 */
import ch.aplu.robotsim.*;
public class Assignment1B {
    Assignment1B(){
        TurtleRobot t = new TurtleRobot();
        t.setTurtleSpeed(100);
        while (true){
            t.forward(2);
            t.left(2);
        }
    }

    public static void main (String[] args) {
        Assignment1B c = new Assignment1B();
    }


}
```

```
run:
```

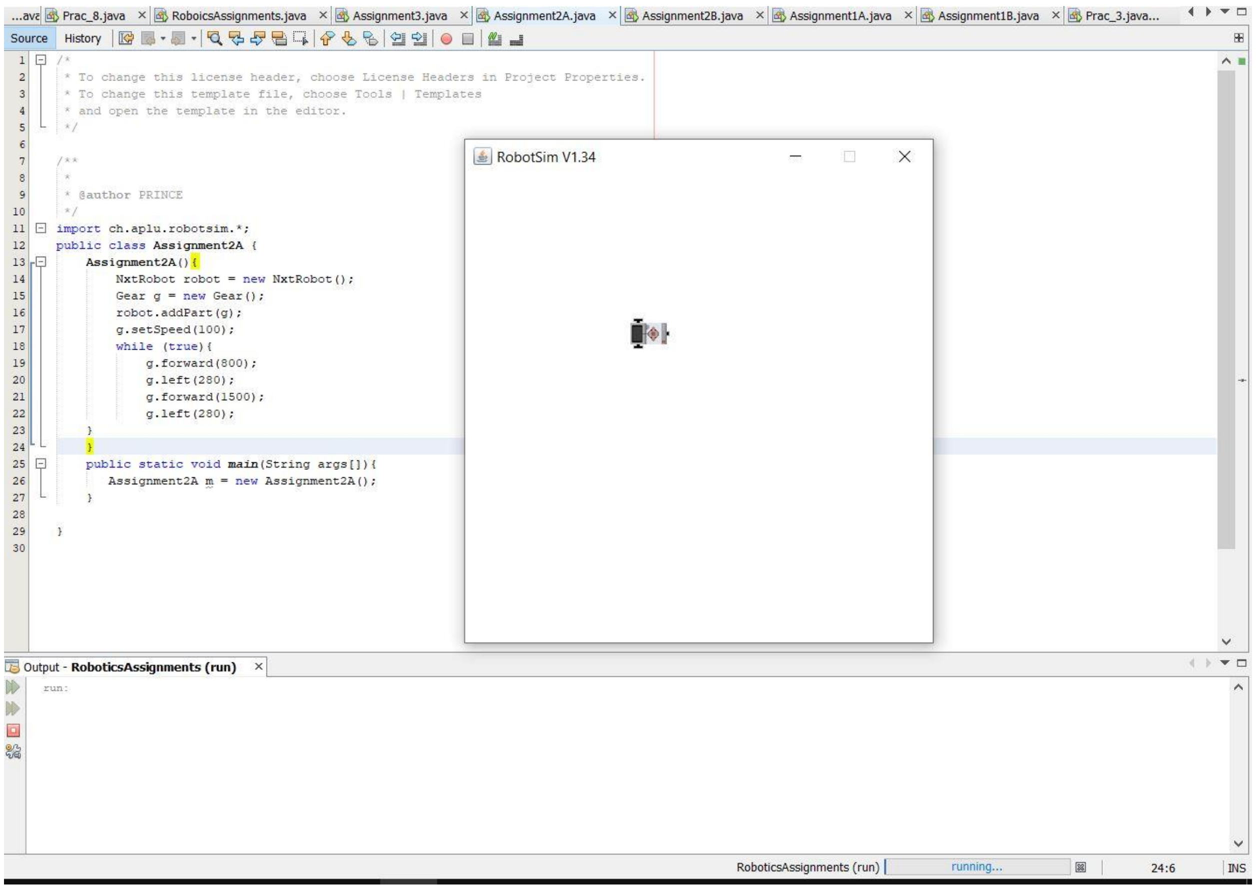
ASSIGNMENT 2A

AIM: CREATE A ROBOT TO PERFORM RECTANGULAR MOTION USING GEARS.

CODE:

```
import ch.aplu.robotsim.*;


public class Assignment2A {
    Assignment2A(){
        NxtRobot robot = new NxtRobot();
        Gear g = new Gear();
        robot.addPart(g);
        g.setSpeed(100);
        while (true){
            g.forward(800);
            g.left(280);
            g.forward(1500);
            g.left(280);
        }

    }

    public static void main (String[] args) {
        Assignment2A m = new Assignment2A();
    }
}
```

OUTPUT:



```
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */

/**
 *
 * @author PRINCE
 */
import ch.aplu.robotsim.*;
public class Assignment2A {
    Assignment2A(){
        NxtRobot robot = new NxtRobot();
        Gear g = new Gear();
        robot.addPart(g);
        g.setSpeed(100);
        while (true){
            g.forward(800);
            g.left(280);
            g.forward(1500);
            g.left(280);
        }
    }
    public static void main(String args[]){
       Assignment2A m = new Assignment2A();
    }

}
```

```
run:
```

ASSIGNMENT 2B

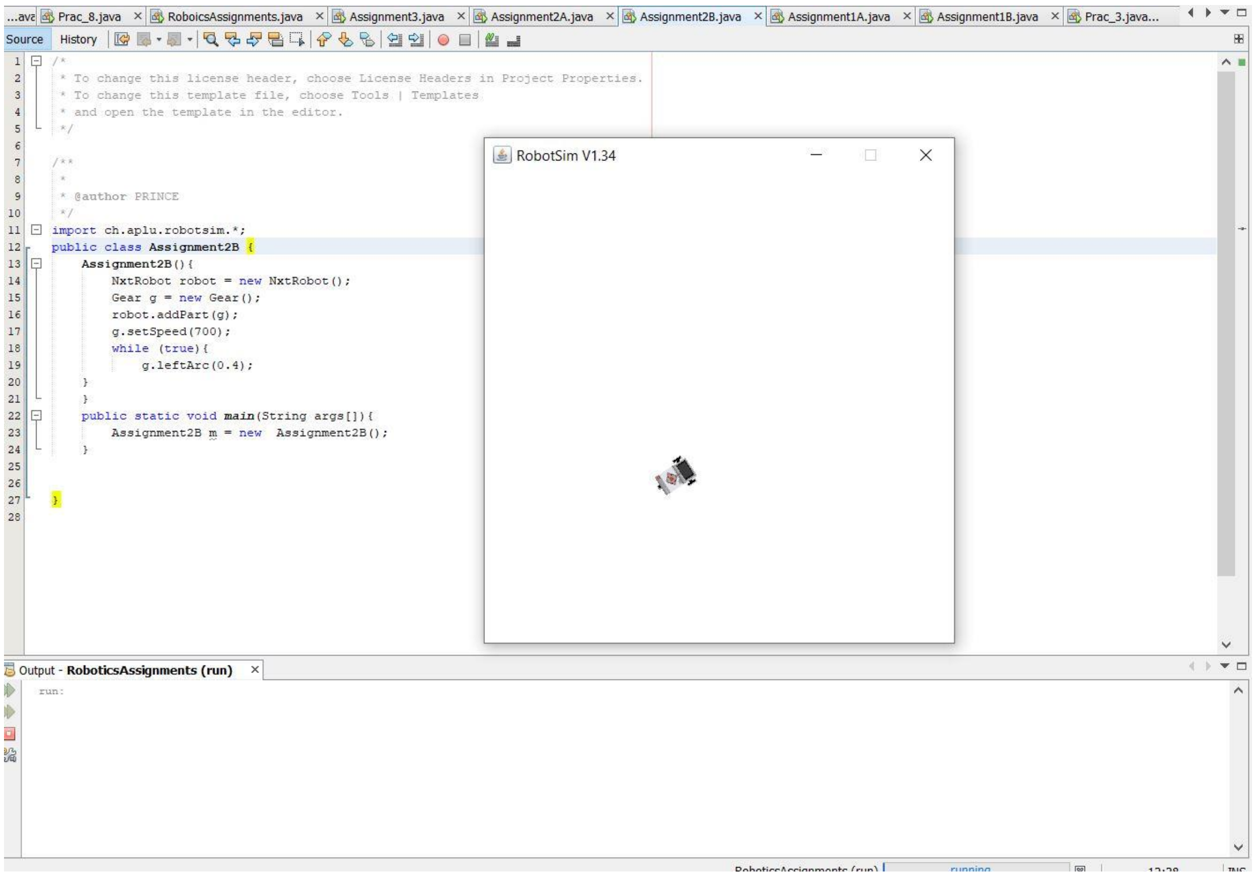
AIM: CREATE A ROBOT TO PERFORM CIRCULAR MOTION USING GEARS.

CODE:

```
import ch.aplu.robotsim.*;
```

```
public class Assignment2B {
   Assignment2B (){
      NxtRobot robot = new NxtRobot();
      Gear g = new Gear();
      robot.addPart(g);
      g.setSpeed(700);
      while (true){
         g.leftArc(0.4);
      }

   }

   public static void main (String[] args) {
      Assignment2B m = new Assignment2B();
   }
}
```

OUTPUT:



```java
/*
 * To change this license header, choose License Headers in Project Properties.
 * To change this template file, choose Tools | Templates
 * and open the template in the editor.
 */

/**
 *
 * @author PRINCE
 */
import ch.aplu.robotsim.*;
public class Assignment2B {
    Assignment2B(){
        NxtRobot robot = new NxtRobot();
        Gear g = new Gear();
        robot.addPart(g);
        g.setSpeed(700);
        while (true){
            g.leftArc(0.4);
    }
    }
    public static void main(String args[]){
        Assignment2B m = new  Assignment2B();
    }


}
```

```
run:
```

ASSIGNMENT 3

AIM: WRITE A PROGRAM TO DO A SQUARE USING WHILE OR FOR LOOP, CHANGE DIRECTION BASED ON CONDITION AND CONTROL MOTOR MOVEMENT USING SWITCH CASE.

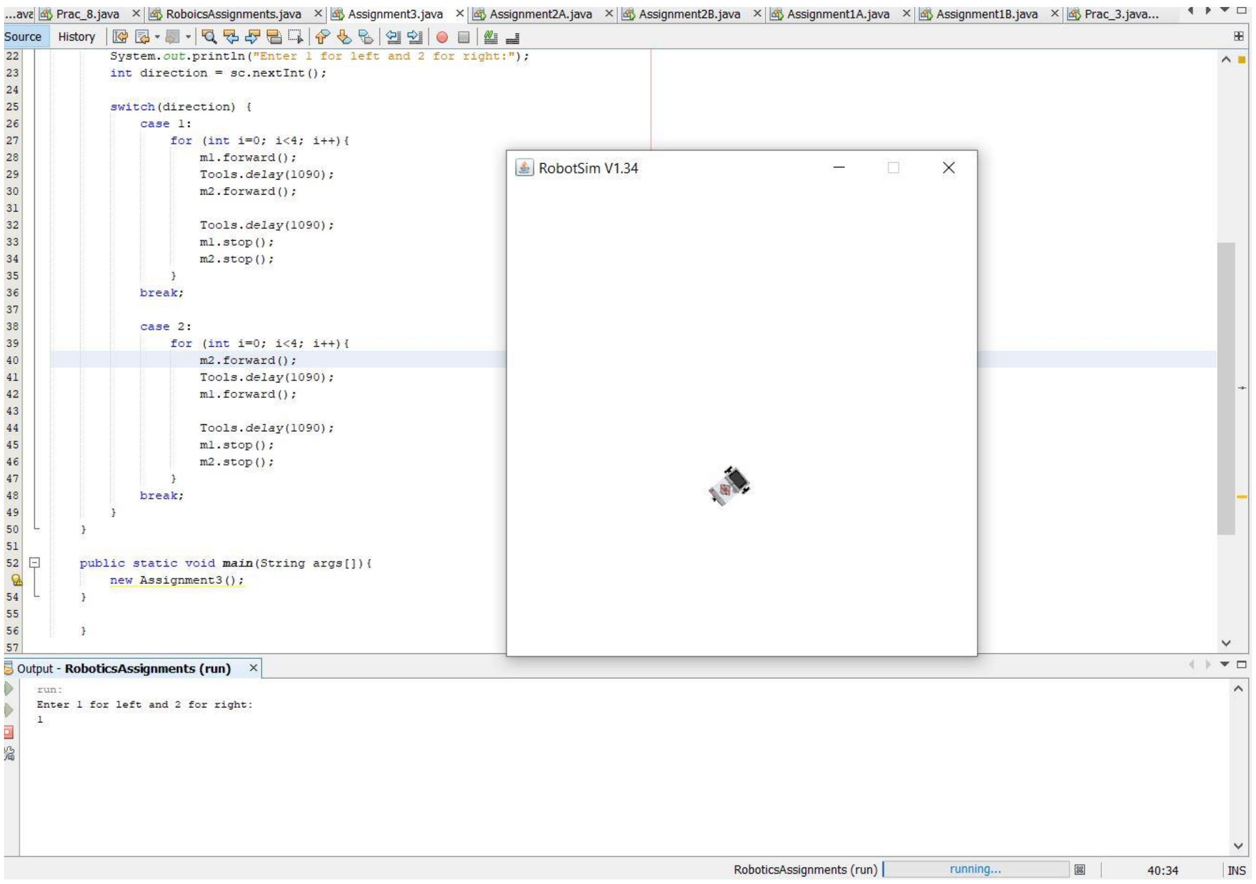
CODE:

import ch.aplu.robotsim.*;

import java.util.*;

```
public class Assignment3 {
    Assignment3(){
        Scanner sc = new Scanner(System.in);
        NxtRobot r = new NxtRobot();
        Motor m1 = new Motor(MotorPort.A);
        Motor m2 = new Motor(MotorPort.B);
        r.addPart(m1);
        r.addPart(m2);

        System.out.println("Enter 1 for left and 2 for right:");
        int direction = sc.nextInt();

        switch(direction) {
            case 1:
                for (int i=0; i<4; i++){
                    m1.forward();
                    Tools.delay(1090);
                    m2.forward();

                    Tools.delay(1090);
                    m1.stop();
                    m2.stop();
                }
            break;

            case 2:
                for (int i=0; i<4; i++){
                    m2.forward();
                    Tools.delay(1090);
                    m1.forward();

                    Tools.delay(1090);
                    m1.stop();
                    m2.stop();
                }
            break;
        }
    }

    public static void main(String args[]){
        new Assignment3();
    }
}
```

OUTPUT:



```
        System.out.println("Enter 1 for left and 2 for right:");
        int direction = sc.nextInt();

        switch(direction) {
            case 1:
                for (int i=0; i<4; i++){
                    m1.forward();
                    Tools.delay(1090);
                    m2.forward();

                    Tools.delay(1090);
                    m1.stop();
                    m2.stop();
                }
            break;

            case 2:
                for (int i=0; i<4; i++){
                    m2.forward();
                    Tools.delay(1090);
                    m1.forward();

                    Tools.delay(1090);
                    m1.stop();
                    m2.stop();
                }
            break;
        }
    }

    public static void main(String args[]){
        new Assignment3();
    }

    }
```

```
run:
Enter 1 for left and 2 for right:
1
```