Name : Mahesh Kenar Roll No : 527

Paper IV (Robotics)

MSC (Computer Science) Semester-III 2022-23

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PRACTICALS

Practical No.: 1a

AIM: Write a program to create a robot with gear and move it forward, left and right.

DESCRIPTION:

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

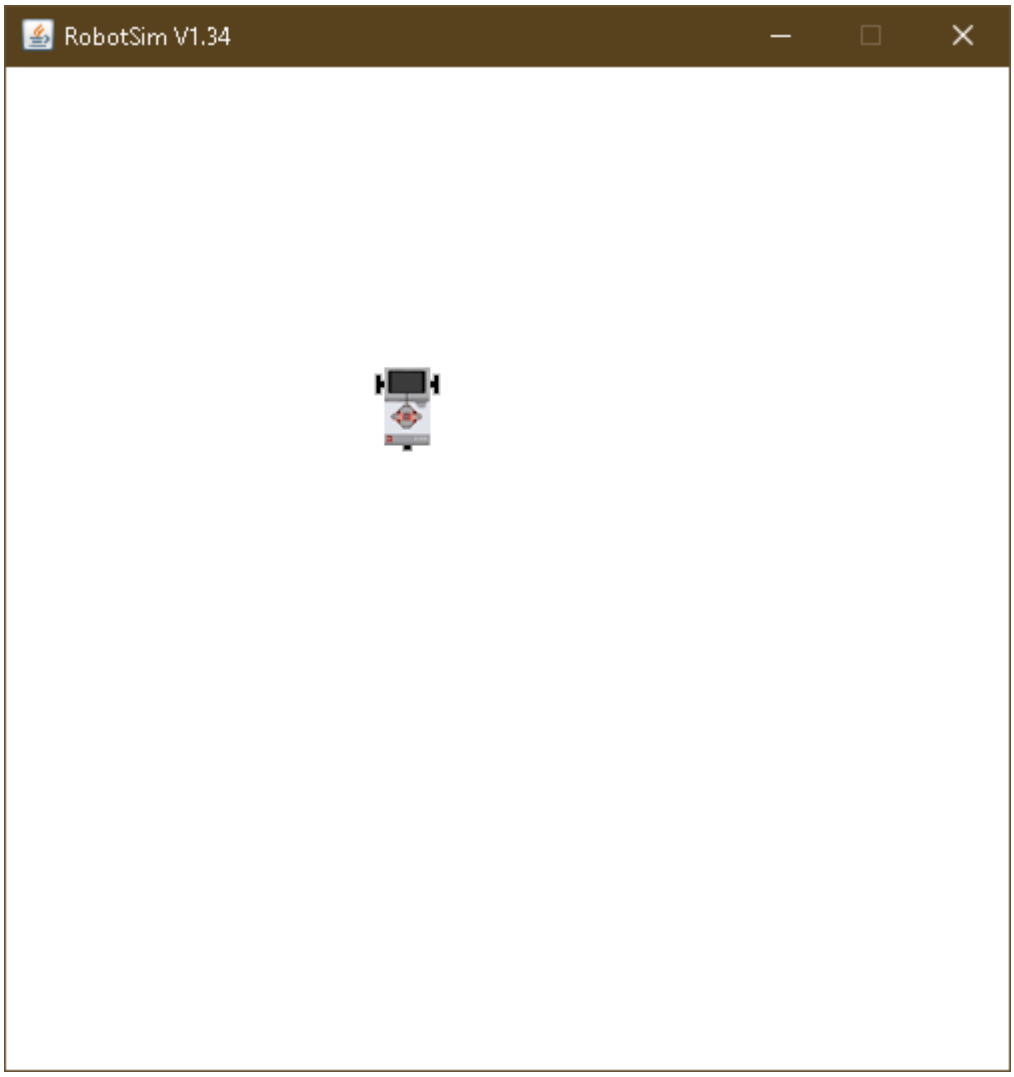
Starts to rotate right (center of rotation at middle of the wheel axes).

CODE:

```
package robotics;

import ch.aplu.robotsim.*;

public class movement {

   movement(){

      TurtleRobot t = new TurtleRobot();

      Gear g = new Gear();

      t.addPart(g);

      g.forward(400);

      g.left(180);

      g.forward(400);

      g.left(180);

      g.forward(400);

      g.right(180);

      g.forward(500);

      g.right(180);

      g.forward(400);

      t.exit();

   }

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

```
    new movement();
}
}
```

OUTPUT:



Practical No.: 1b

AIM: Write a program to create a robot without gear and move it forward, left and right.

DESCRIPTION:

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

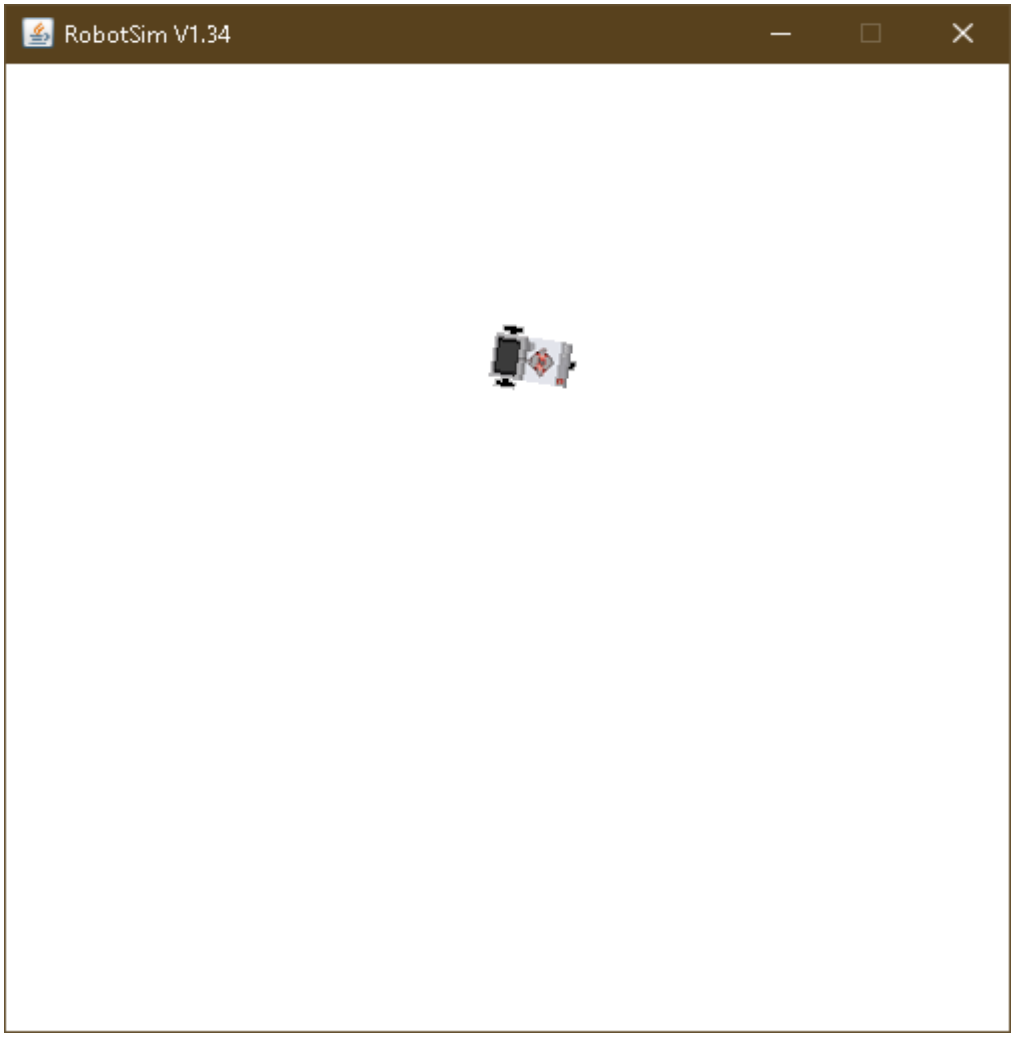
Creates a turtle robot instance.

CODE:

```
package robotics;

import ch.aplu.robotsim.*;

public class withoutGear {

   withoutGear(){

      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 withoutGear();

}
```

}

OUTPUT:



Practical No.: 2

AIM: Write a program to create a robot with 2 motors and move it forward, left and right.

DESCRIPTION:

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

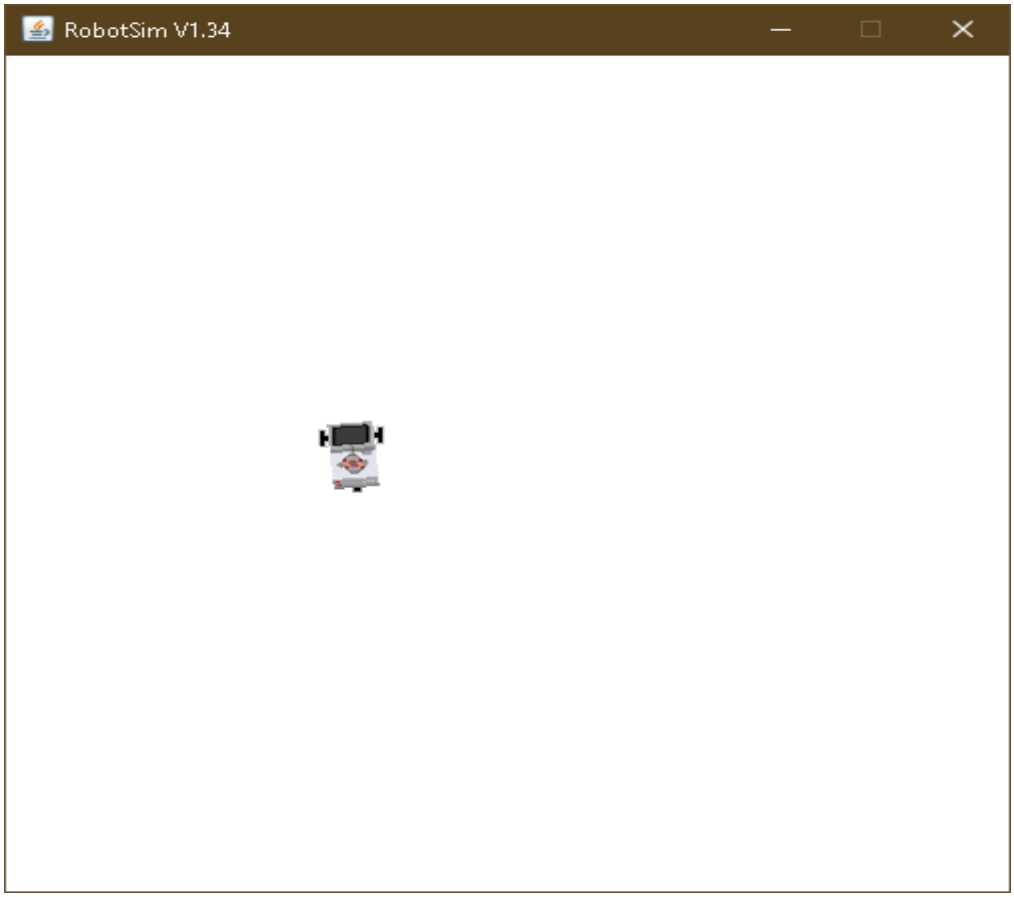
Stops the rotation.

CODE:

```
package robotics;

import ch.aplu.robotsim.*;

public class MoveWithMotors {
```

```
    MoveWithMotors(){
     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(1000);
     m2.forward();
     m1.stop();
     Tools.delay(200);
     m1.forward();
    }
public static void main(String[] args){
    new MoveWithMotors();
}
}
```

OUTPUT:



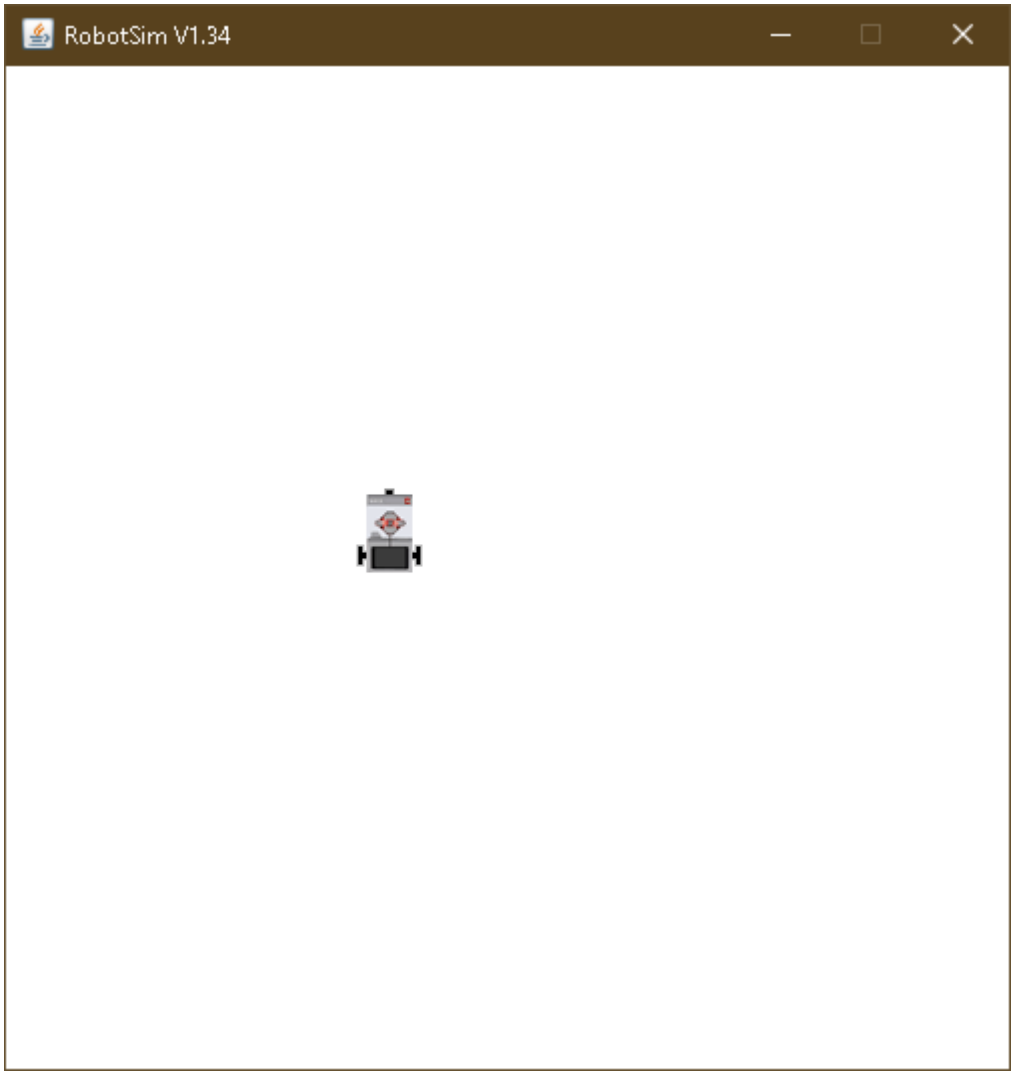
Practical No.: 3

AIM: Write a program to do a square using a while loop.

CODE:

```
package robotics;
import ch.aplu.robotsim.*;
public class movementSquare {
   public movementSquare(){
      NxtRobot robot = new NxtRobot();
      Gear g = new Gear();
      robot.addPart(g);
      g.setSpeed(50);
      while (true){
         g.forward(600);
         g.left(280);
      }
   }
public static void main(String[] args){
   new movementSquare();
}
}
```

OUTPUT:



Practical No.: 4

AIM: Write a program to create a robot with light sensors to follow a line.

DESCRIPTION:

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

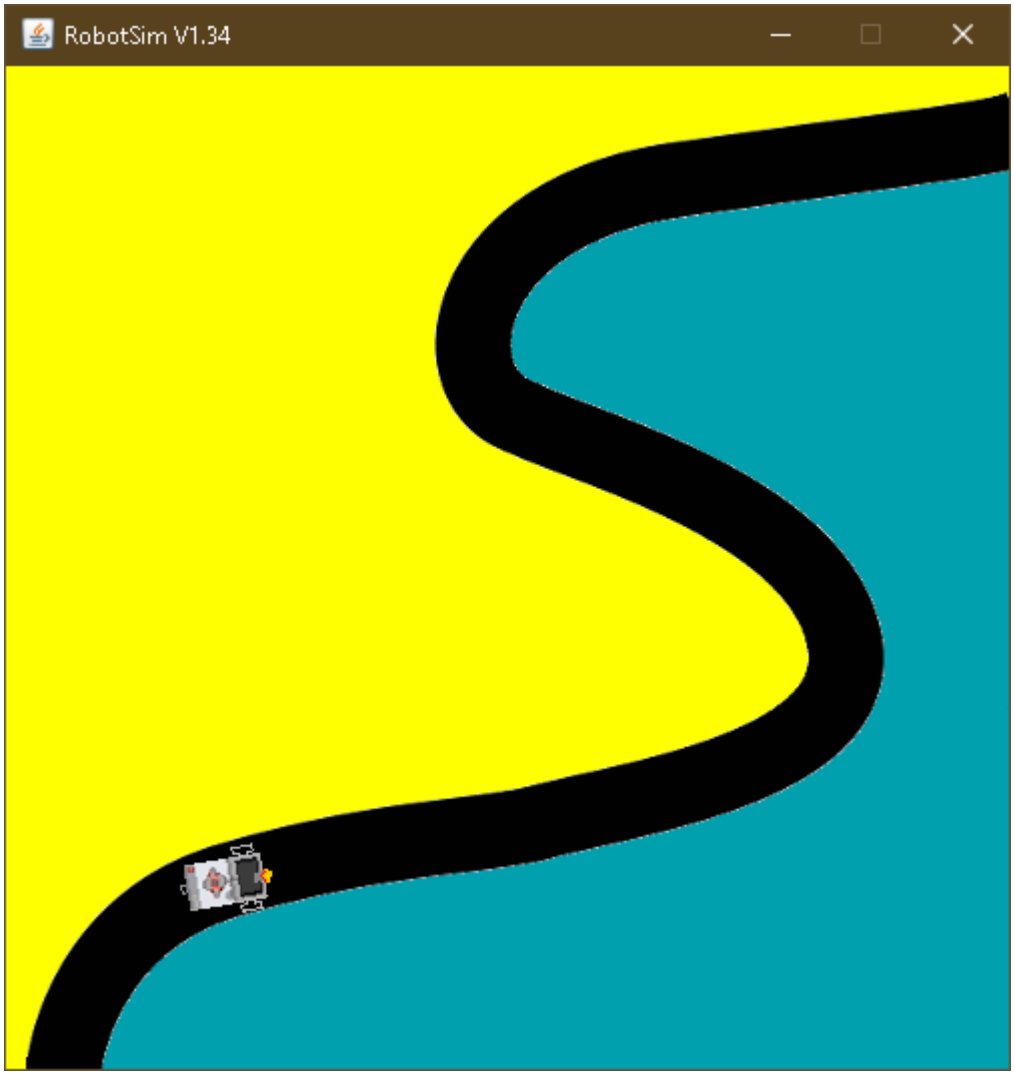
Starts to move to the right on an arc with given radius.

CODE:

```
package robotics;
import ch.aplu.robotsim.*;
public class LineFollower {
   LineFollower(){
      LegoRobot r =new LegoRobot();
      Gear g = new Gear();
      LightSensor ls = new LightSensor(SensorPort.S3);
      r.addPart(g);
      r.addPart(ls);
      g.forward();
      g.setSpeed(90);
      while(true){
         int v = ls.getValue();

         if(v < 100){
```

```
            g.forward();
        }
        if(v>300 && v<750){
            g.leftArc(0.05);
        }
        if(v>800){
            g.rightArc(0.05);
        }
      }
    }
    static{
      RobotContext.setStartPosition(50,470);
      RobotContext.useBackground("sprites/road.gif");
    }

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

OUTPUT:



Practical No.: 5

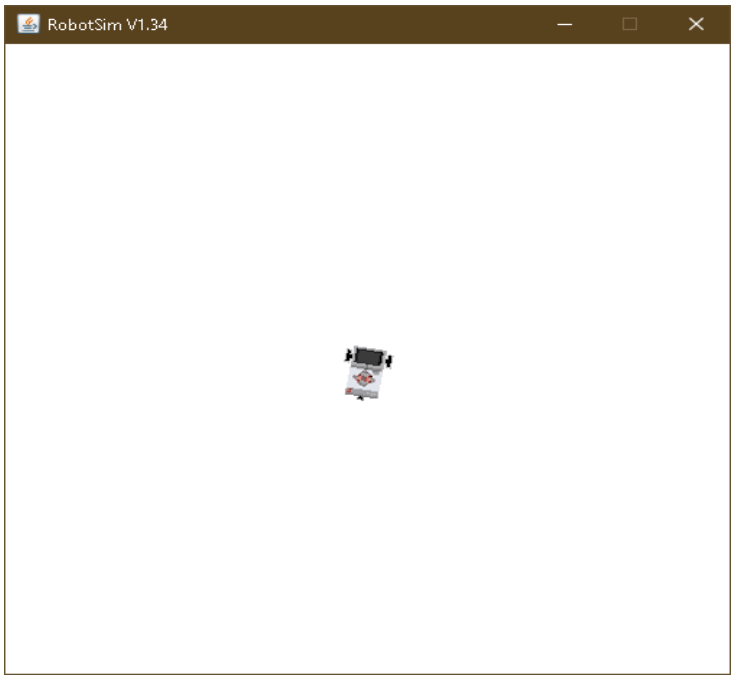
AIM: Write a program to create a robot that does a circle using 2 motors.

CODE:

```
package robotics;

import ch.aplu.robotsim.*;

public class RobotMotorCircle {

   RobotMotorCircle(){

      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 RobotMotorCircle();
    }
}
```

OUTPUT:



Practical No.: 6

AIM: Write a program to create a path following robot.

DESCRIPTION:

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).

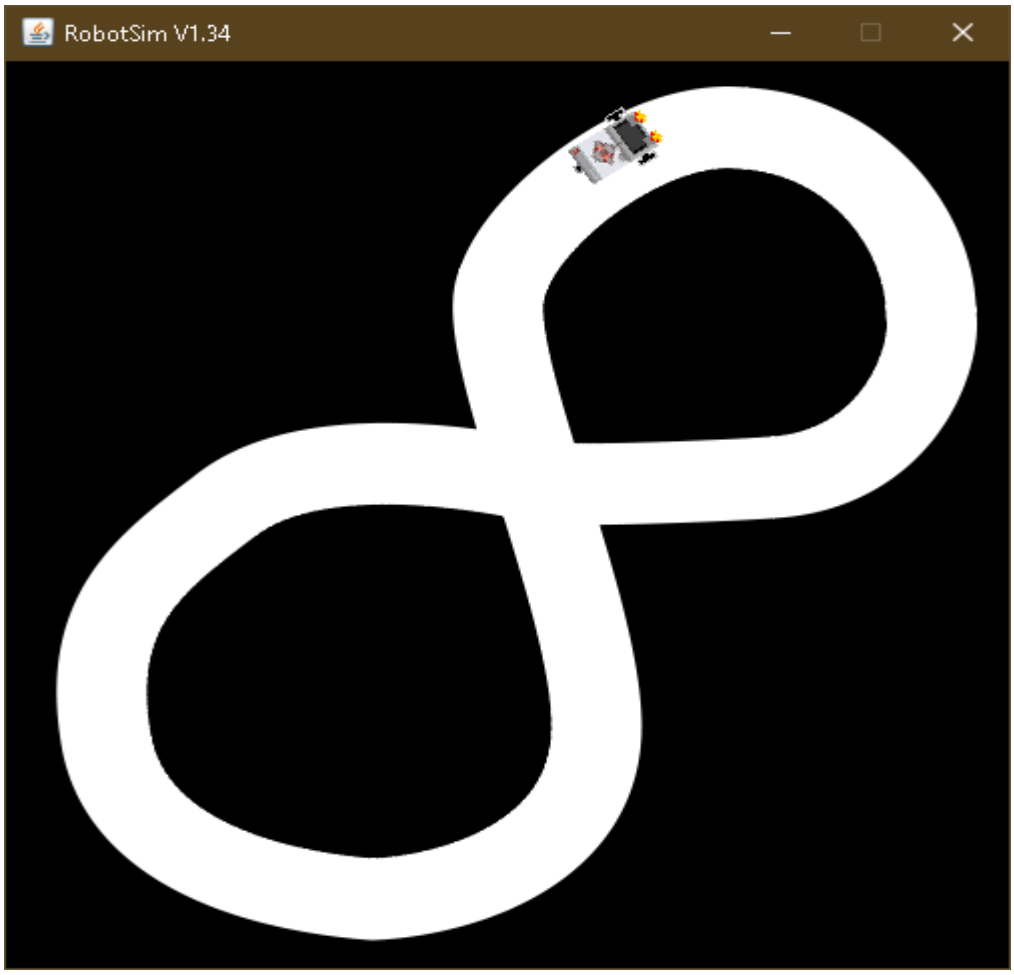
CODE:

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


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

```
    }
}
```

OUTPUT:



Practical No.: 7

AIM: Write a program to resist obstacles.

DESCRIPTION:

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

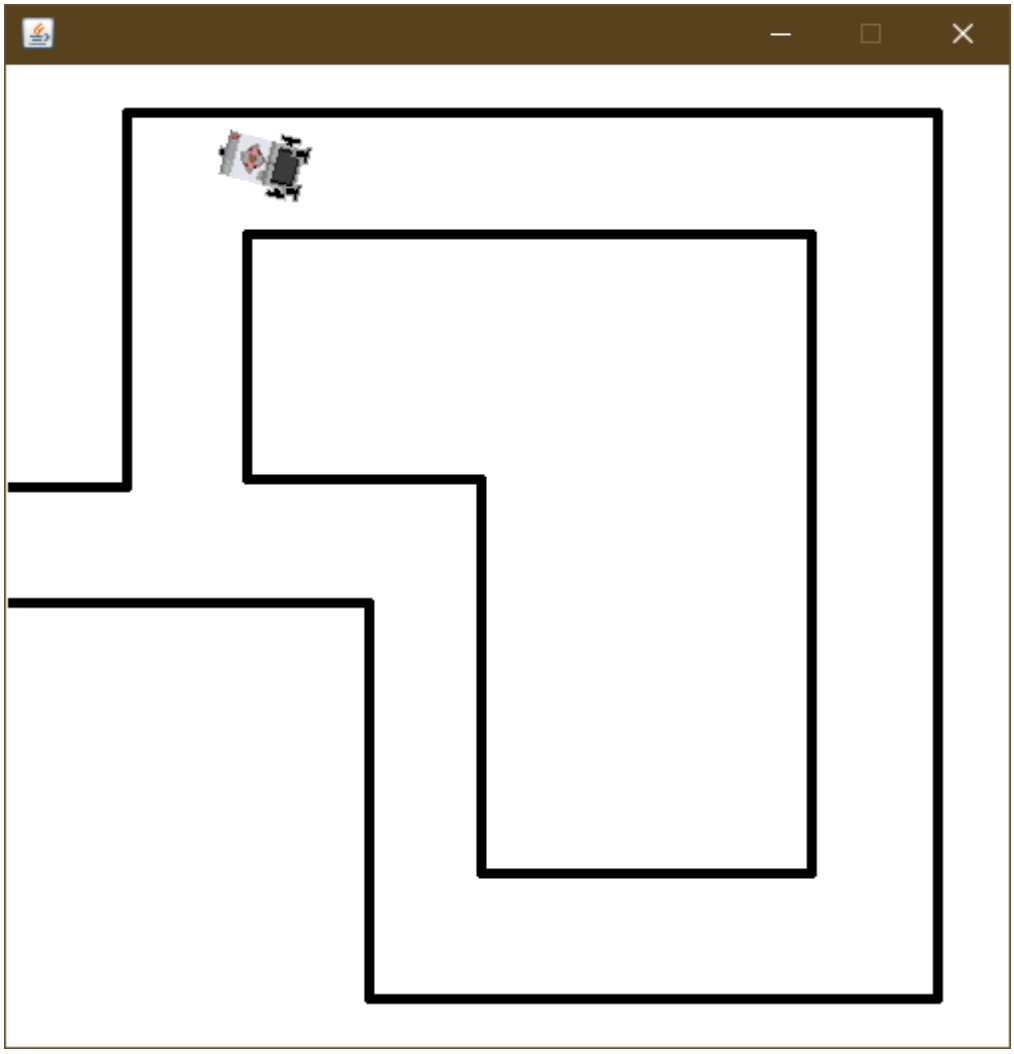
CODE:

```
package robotics;

import ch.aplu.robotsim.*;

public class Obstacles {
```

```
Obstacles(){
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 Obstacles();
  }

}
```

OUTPUT:



Practical No.: 8

AIM: ULTRASONIC SENSOR.

DESCRIPTION:

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.

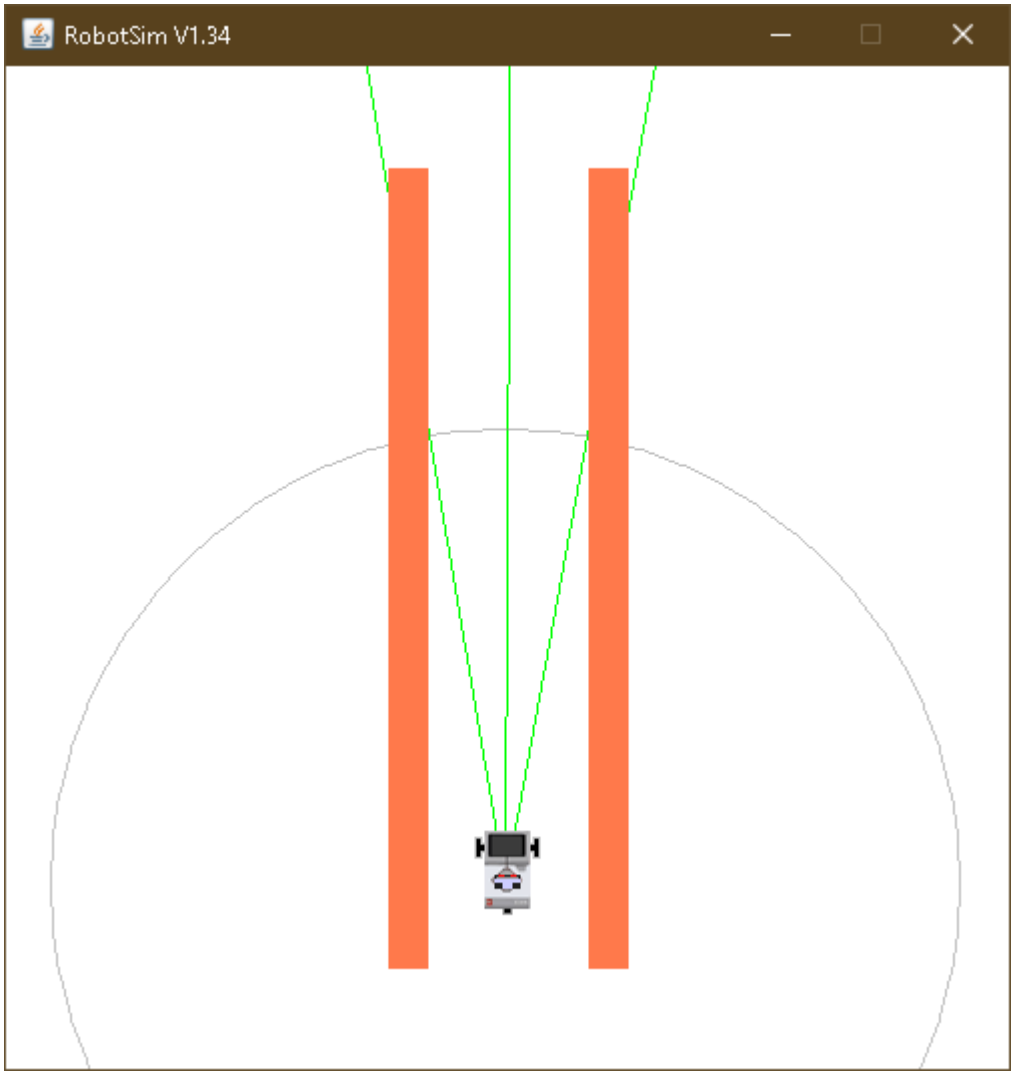
CODE:

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

import java.awt.Color;

import java.awt.Point;


public class Practical_8 {

   Practical_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 Practical_8();
    }
}
```

OUTPUT:



ASSIGNMENTS

Assignment 1

AIM: Write a program to make use of track image and move in white area.

CODE:

```
package robotics;

import ch.aplu.robotsim.*;
public class RobotSensorTrackFollower {
   static {
      RobotContext.setStartPosition(80, 438);
      RobotContext.useBackground("sprites/track.png");
   }

   public RobotSensorTrackFollower() {
      LegoRobot legoRobot = new LegoRobot();
      Gear gearBox = new Gear();
      LightSensor lightSensor = new LightSensor(SensorPort.S3);

      legoRobot.addPart(gearBox);
      legoRobot.addPart(lightSensor);

      gearBox.forward();
      gearBox.setSpeed(100);

      while (true) {
         if(lightSensor.getValue() > 10){
            gearBox.forward();
         }
         else{
            gearBox.rightArc(0.03);
         }

      }

   }

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

```
    }
}
```

OUTPUT:

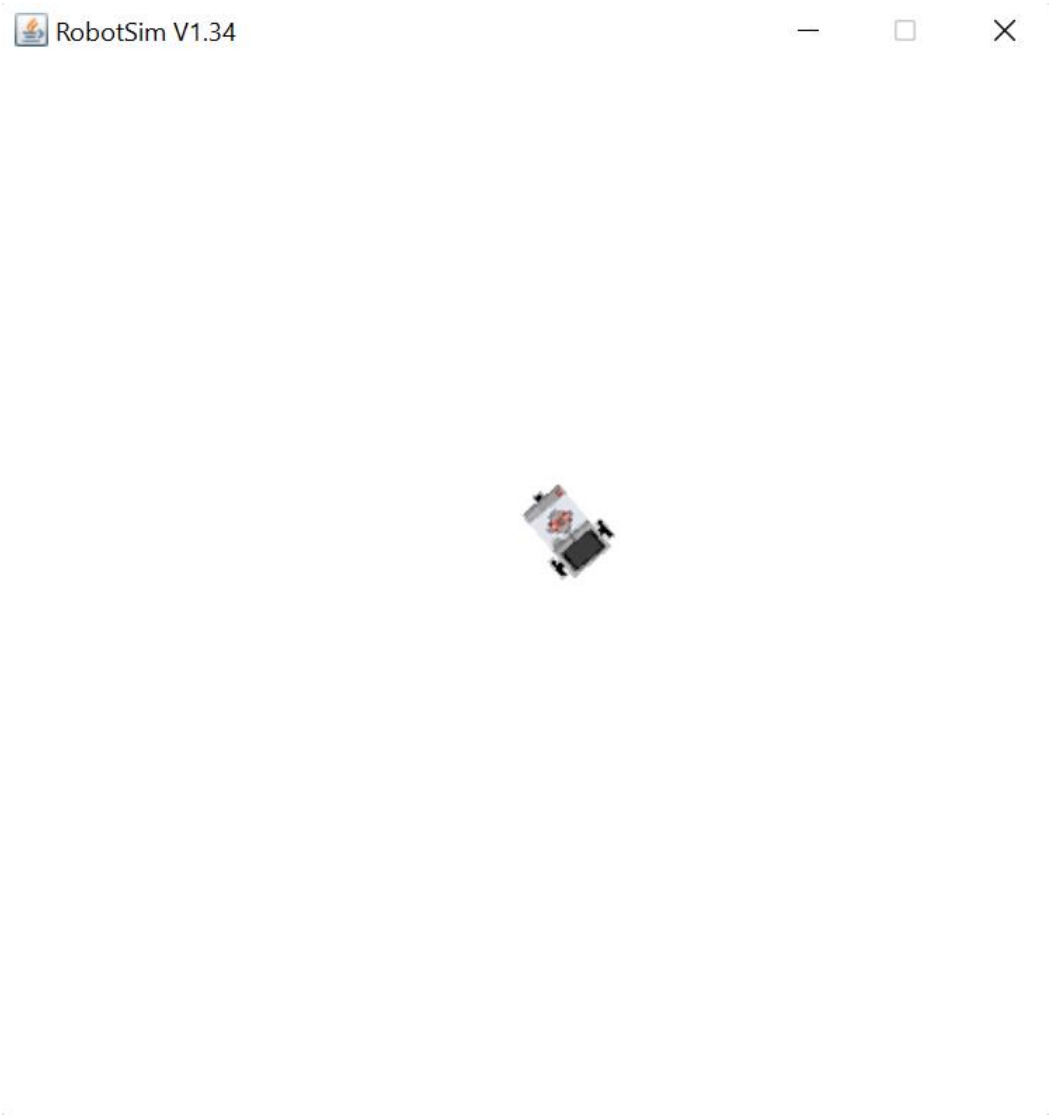
Assignment 2

AIM: Write a program to create a robot with gear that does a circle.

CODE:

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

public class MoveWithGearCircle {
   public MoveWithGearCircle(){
      NxtRobot robot = new NxtRobot();
      Gear g = new Gear();
      robot.addPart(g);
      for(int i =1;i!=0;i++){
         g.forward(200);
         g.right(200);
      }

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

}
```

OUTPUT:



Assignment 3

AIM: Write a program to create a robot that does a rectangle.

CODE:

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

public class MoveWithGearRect {
   public MoveWithGearRect(){
      NxtRobot robot = new NxtRobot();
      Gear g = new Gear();
      robot.addPart(g);
      g.right(550);
      g.forward(2500);
      g.left(550);
      g.forward(1000);
      g.left(550);
      g.forward(2500);
      g.left(550);
      g.forward(1000);
      robot.exit();
   }
public static void main (String [] args){
   new MoveWithGearRect();

}

}
```

OUTPUT: