

# COMP101 Lab5: Robot movement report

Jakub Janisz

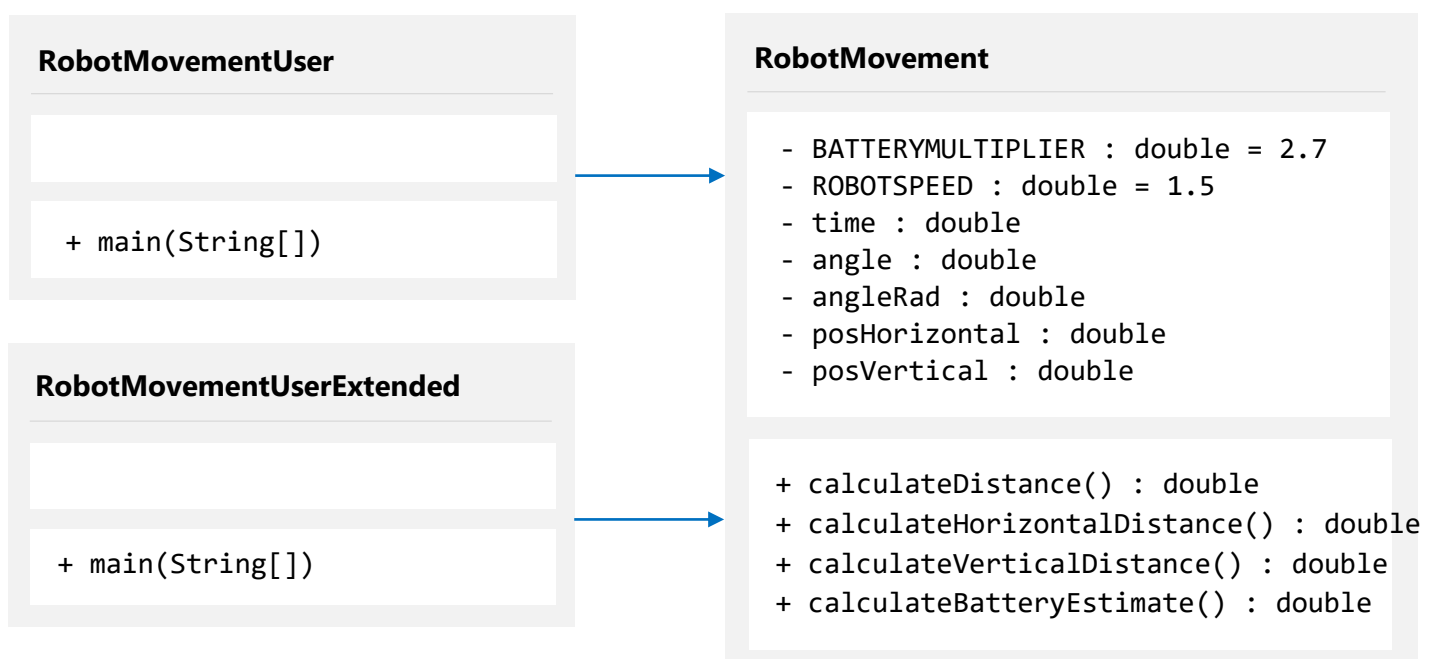
## Requirements

The problem to solve were to write a program that after giving an angle (in degrees,  $0^{\circ}$ - $90^{\circ}$ ) and time (in seconds) calculate and print out the distance travelled by robot, horizontal and vertical distance from starting point and finally, battery usage. As extended requirements, it is needed to allow to input three times and angles from keyboard that second and third movement is from the previous place, not from the beginning and display total time and distance travelled, vertical and horizontal position from the beginning and total battery usage.

## Analysis and design

I created a program in two classes. In RobotMovement class I've made a calculations of distance, horizontal distance, vertical distance and battery usage in four methods. In RobotMovementUser class I've made an input from keyboard of angle and time. Then I created an RobotMovement object and printed out the returned values of methods from this object. Additionally, I created third class, RobotMovementUserExtended where I created three instances of the RobotMovement class that second and third instance takes returned values from previous instance as their argument. Then I added times, distances and battery usages from each instance together. Finally, I printed out the results.

## Class diagram



# Pseudocode

```
CLASS RobotMovement
    LOCAL DATA BATTERYMULTIPLIER = 2.7, ROBOTSPEED = 1.5 - all of these are double constants
    LOCAL DATA time, angle, angleRad, posHorizontal, posVertical - double variables
    METHOD RobotMovement(Constructor method)
        INPUT inputAngle, inputTime, inputPosHorizontal, inputPosVertical - all of these are double
        OUTPUT
    CALCULATE and RETURN the distance, horizontal distance, vertical distance, battery estimate - each of them in separate methods.
```

```
CLASS RobotMovementUser
    METHOD main
        INPUT args
        OUTPUT
        READ angle, time from the keyboard (doubles)
        CREATE an object of RobotMovement class
        PRINT the distance, horizontal distance, vertical distance and estimated battery usage.
```

```
CLASS RobotMovementUserExtended
    METHOD main
        INPUT args
        OUTPUT
        READ angle1, time1, angle2, time2, angle3, time3 from the keyboard(doubles)
        CREATE 3 instances of RobotMovement class
        CALCULATE total distance and battery usage estimate by adding the values together from each instance of RobotMovement class
        CALCULATE total time by adding together time1, time2 and time3
        PRINT the total distance, total time, horizontal and vertical distance from the initial position and total estimated battery usage.
```

# Testing

INPUT VALUES	EXPECTED RESULT
time = 0, angle = 0 OR time = 0, angle = 90 OR time = 0, angle = 30	Distance = 0.00 Horizontal distance = 0.00 Vertical distance = 0.00 Battery usage = 0.00
time = 4, angle = 0	Distance = 6.00 Horizontal distance = 0.00 Vertical distance = 6.00 Battery usage = 10.80
time = 4, angle = 60	Distance = 6.00 Horizontal distance = 5.20 Vertical distance = 3.00 Battery usage = 10.80

INPUT VALUES	EXPECTED RESULT
time1 = 4, angle1 = 60 time2 = 3, angle2 = 45 time3 = 2, angle3 = 30	Total time = 9.00 Total distance = 13.50 Horizontal distance = 9.88 Vertical distance = 8.78 Total battery usage = 24.30

The finally working program returned:

## CONSOLE – java RobotMovementTest

```
angle = 0.00 , time = 0.00
distance = 0.00
horizontal distance = 0.00
vertical distance = 0.00
battery usage = 0.00
-----
angle = 90.00 , time = 0.00
distance = 0.00
horizontal distance = 0.00
vertical distance = 0.00
battery usage = 0.00
-----
angle = -90.00 , time = 0.00
distance = 0.00
horizontal distance = 0.00
```

```
vertical distance = 0.00
battery usage = 0.00
-----
angle = 30.00 , time = 0.00
distance = 0.00
horizontal distance = 0.00
vertical distance = 0.00
battery usage = 0.00
-----
angle = -30.00 , time = 0.00
distance = 0.00
horizontal distance = 0.00
vertical distance = 0.00
battery usage = 0.00
-----
angle = 0.00 , time = 4.00
distance = 6.00
horizontal distance = 0.00
vertical distance = 6.00
battery usage = 10.80
-----
angle = 0.00 , time = -4.00
distance = 6.00
horizontal distance = 0.00
vertical distance = 6.00
battery usage = 10.80
-----
angle = 60.00 , time = 4.00
distance = 6.00
horizontal distance = 5.20
vertical distance = 3.00
battery usage = 10.80
-----
angle = 60.00 , time = -4.00
distance = 6.00
horizontal distance = 5.20
vertical distance = 3.00
battery usage = 10.80
-----
angle = -60.00 , time = 4.00
distance = 6.00
horizontal distance = 5.20
vertical distance = 3.00
battery usage = 10.80
-----
angle = -60.00 , time = -4.00
distance = 6.00
horizontal distance = 5.20
vertical distance = 3.00
battery usage = 10.80
-----
```

===== ROBOT MOVEMENT =====

This program calculates the speed, horizontal distance, vertical distance, battery estimate of the robot.

--- MOVEMENT 1 ---

Give me the angle from vertical in a clockwise direction in degrees (0-90) inclusive:

60

Give me the time to do this task in seconds:

4

--- MOVEMENT 2 ---

Give me the angle from vertical in a clockwise direction in degrees (0-90) inclusive:

45

Give me the time to do this task in seconds:

3

--- MOVEMENT 3 ---

Give me the angle from vertical in a clockwise direction in degrees (0-90) inclusive:

30

Give me the time to do this task in seconds:

2

You gave me all the parameters so I would like to calculate some data for you:

The total distance travelled by the robot is: 13.50

The total time traveled is: 9.00

The horizontal distance from its starting point is: 9.88

The vertical distance from its starting point is: 8.78

The estimated battery usage (idle time) is: 24.30

## Encountered problems

1. I wrote Math class with first capital letter while importing.
2. Constants didn't have defined type (I wrote private final only)
3. I was about to initialise time and angle variables in constructor method so they wouldn't be seen on the other methods
4. During calculating sine and cosine of degree I haven't converted the degrees into radians
5. I haven't referred sin() and cos() into math class (instead Math.sin(), Math.cos())