COM1003 Java Programming
Autumn Semester 2018-9
Programming Assignment 3

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Learning outcomes

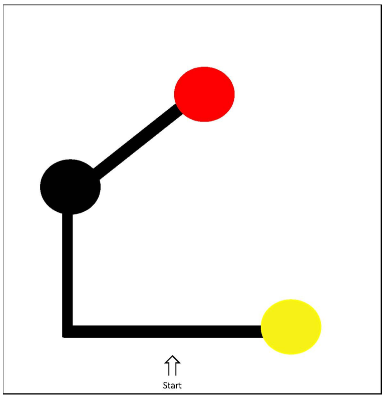
This assignment will assess your ability to:

- Understand how software objects can be used to represent real-world objects;
- Design algorithms;
- Use API documentation to explore what methods are available;
- Work in groups to solve a problem;
- Develop robust systems that involve the interaction of hardware and software, and operate in a real-world environment.

This assignment is worth 20% of your mark for the first semester of the module so 10% of your overall mark. It must be submitted by 18 January 2019. You will find information about the exact deadline, the marking scheme and how you must submit your work at the end of this document.

The Task

You have to make your robot pretend to be an ant collecting food. First it has to find a scent trail represented by a black line in the diagram below.



Once it has found the line it should follow it to the left around the right angled corner to the big black dot. It should then set off from the black dot following the line at about 60 degrees to the line it was following when it entered the dot. It will get to a red dot. This can be thought of as a food source. The ant should express its delight by making a sound of some sort. Obviously real ants are not in the habit of singing but it ensures I know it can recognise the red dot.

In the exact centre of the red dot will be an orange ping pong ball on a tee to stop it rolling away. Your ant should pick it up and take it back to its nest (the yellow dot) by following the trail around in reverse. When it gets to the nest it should put its ping pong ball down and then execute some sort of dance to celebrate.

In order to pick up the ping pong ball the robot will need to have some sort of catcher mechanism that is operated by the small motor when it is properly positioned and some way of releasing the ball at the end. Ping pong balls are not easy to control so most of the marks will be for trying to pick up the ball and trying to release it there will not be many for actually succeeding.

Working in Teams

You must work in teams of three for this assignment. Faculty rules are that, for groups of more than two I have to dictate who you work with. The team list is on the course web page at
https://staffwww.dcs.shef.ac.uk/people/S.North/campus_only/com1003/assignments/teams.html
which is linked from the usual assignment web page.

Teams can decide how to divide responsibilities between themselves. However, all group members must contribute to the development of the software and the contribution of each member must be accounted for (see below). If there is evidence that a member of a group has not contributed equally to the project, that students mark will be adjusted accordingly.

If you have difficulty contacting one of your fellow team members let me know and I will rearrange the teams if I can.

Using the Robots

Groups of students will be allocated a specific robot. The name of the robot will appear on the web page with the list of team members.

You may access your robot during the two practical sessions from now on and on Wednesday afternoons. If there is no Diamond technician in Computer room 3 to unlock the cabinets on Wednesday afternoon go to Engineering Reception on the 3rd floor of the Diamond and ask for someone to help. At the end of the session be very careful to put your robot away and plug it in to charge up otherwise it may not work next session.

During the vacation you will not be allowed to use the robots so there is no advantage to students staying in Sheffield. After the vacation they will also be available

- 1 - 5 on the afternoon of Monday 14 January
- 1 - 5 on the afternoon of Tuesday 15 January

- 1 - 5 on the afternoon of Wednesday 16 January
- 9 - 1 on the morning of 18 January

Please do not take the robot out of the Diamond computer room 3 under any circumstances.

The Program Code

The starting point of your program should be the main method in a class called Assignment3. It should not be part of a package. You can use as many classes as seems sensible to you.

Your program should be well written and commented to show how you designed your algorithms. Put the comments that indicate the algorithm in lines by themselves not at the end of a line so that a printout of the program is also readable.

All public methods should also be commented using the javadoc facility should include a properly used @author tag.

Read your feedback from Assignment 2 as soon as you get it (I will try to mark this assignment before the Christmas vacation) to make sure you learn from it and don't make the same mistakes again. You could also reread the feedback from Assignment 1.

Demonstrating your Code

As well as handing in your code you will need to demonstrate it working at some time on the afternoon of 18 January.

This is an examination and the attendance of all three students is mandatory. All students may be asked questions about their software and how it works and missing students will lose marks. If you are unable to attend for exceptional reasons you should fill in an Extenuating Circumstance Form (see the Undergraduate Handbook).

Submission and deadline

You should hand in your solution using the standard departmental hand in procedures (see the Undergraduate Handbook) so it will be both on paper and electronic. Only one copy of the paper and electronic submission is required per team and it doesn't matter which of you submits it.

The electronic hand in should be uploaded to MOLE (Click on the Assignment 3 icon where you downloaded this piece of paper from and attach your file(s)). It should consist of the file Assignment3.java with a main method to provide the starting point for the program. If you use any other classes you should upload their .java files as well. The upload must consist of separate .java files, do not upload a directory in any form.

The deadline for the electronic hand in is 3pm on 18 January 2019. You do not need to upload anything except the program code.

The paper hand in should be stapled together and consist of

- The usual bar coded cover sheet on top of everything else;
- A title page with the names of your team members on it;

- Printouts of any code you upload in a readable form (so if the lines are too long to printout legibly then print it in landscape format);
- A statement containing a sentence or two from each team member, explaining his/her contribution to the project effort. This statement should be signed by all team members to indicate that it is a fair and accurate record.

The deadline for the paper hand in is also 3pm on 18 January 2019. You have to submit your work in both forms to get a mark and the paper and electronic versions of the .java files must be identical.

Late work will be penalised using the standard University scale (see Undergraduate Handbook). Your work will be considered to have been handed in on the day the second of the two forms (paper or electronic) is handed in.

Marking Scheme

The mark for this assignment is worth 20% of your mark for the first semester of the module so 10% of your overall mark.

The marks will be allocated as follows

Programming Style	
Program structure (good use of classes and methods)	15 marks
Correct use of variables, types and constants	15 marks
Use of appropriate selection and repetition statements	5 marks
Readability (so it must be easy to understand)	10 marks
Matches Specification	5 marks
Working Demonstration	
The robot can find the line	3 marks
It can turn left	3 marks
And follow the line	3 marks
Around a right angled corner	3 marks
It can respond to the black dot	3 marks
And find its way out on the new line	3 marks
It can recognise the red dot by singing	3 marks
And attempt to pick up its ping pong ball	6 marks
The robot can retrace its steps	8 marks
And recognise the yellow dot	3 marks
It attempts to release the ball when it gets there	6 marks
And dances	3 marks
Bonus for actually succeeding in moving the ball from the red dot to the yellow one	3 marks