Exercise for course day 4, 25-feb-2009

Implementing a simple behavioural robot using leJOS' facilities, and adding a bit of communication

1 First exercise

Use leJOS to program a new version of the area-cleaning robot that is described in the exercise from Feb 11. Consider this as an investigation of leJOS's facilities for "behavioral programming", rather that a task of making the smartest cleaning robot.

Consider the following questions:

- Is it easier to program the robot with leJOS rather than Lego's toy language? And if "yes", in which sense and why?
- The leJos code uses names such as "arbitrator" and "subsumption"; consider if the authors use these terms in he same way as our textbook [Jones].

If time permits, you may consider extending your robot with more and-or perhaps more sophisticated behaviours.

2 Communication

Take a look at the communication facilities described in the leJOS tutorial [leJOS]. Use them to establish a communication between the program on the robot and a Java program running on your own computer. Use the Bluetooth version if you computer supports this, otherwise USB. You may have the Java program on you computer to perform one or more of the following functions.

- start and stop the robot's cleaning actions at arbitrary times (don't terminate the program, but change what it is doing, e.g. waiting).
- make a simple GUI on your computer so you can click buttons to start and stop (as above).
- extend this GUI so that it displays how many times the push-object-out behaviour has been triggered. If possible, modify this so that the GUI displays the number of objects it has pushed out.

3 A difficult question

In the rest of the course we should also experiment with different architectures that involves communication. The following principles (and others as well), may be considered.

- Distributed control, so that a program on your computer provides a (dynamic) planning for a task to be done, and the robot has a behavioural program that makes it "survive" and execute parts of the plan, when the situation indicates that this is relevant.
- Robot cooperation. Two or more robots coordinate their actions by sending messages to each other. This may be helping each other in emergencies, or solving a common task in the optimal way.
- Other suggestions?

Come up with suggestions for interesting (toy) tasks that may make it possible to test such architectures. This is not at all easy with the selection of sensors that are available. If you can convince you teacher that there is a very good reason for using an alternative kind of sensor, it may be the case that the course can buy one; see http://shop.lego.com/ByCategory/Leaf.aspx?cn=389&d=292

Literature

[Jones] Joseph L. Jones: *Robot programming, A practical guide to behavior-based robotics*. McGraw-Hill, 2004.

[leJOS] *The leJOS NXJ Tutorial*, internet document, http://lejos.sourceforge.net/nxt/nxj/tutorial/index.htm