Introduction to robotics project

Lp IV

2008-04-01

Purpose

- To implement some of the theory you have studied during the last 7 weeks in a real, physical robot, in order to consolidate what you have learned!
- ... and it's fun too :-)

Today's activities

- Brief introduction to the robotics work during quarter IV.
- Form project groups (3-5 students per group)
- Distribution of robot kits.
- Assemble the robots and start with the programming!

Contents of quarter IV:

- There will be **two major robotics assignments** to carry out for the students, and each project group *must* participate, with their robot, in the robotics project demonstration events:

- **Assignment 1**: 2008-04.22
- **Assignment 2**: 2008-05-20 (preliminary date)

- It is **mandatory** for *each* student to participate in the project demonstration events (and in the construction/programming work!), in order to pass!

Schedule

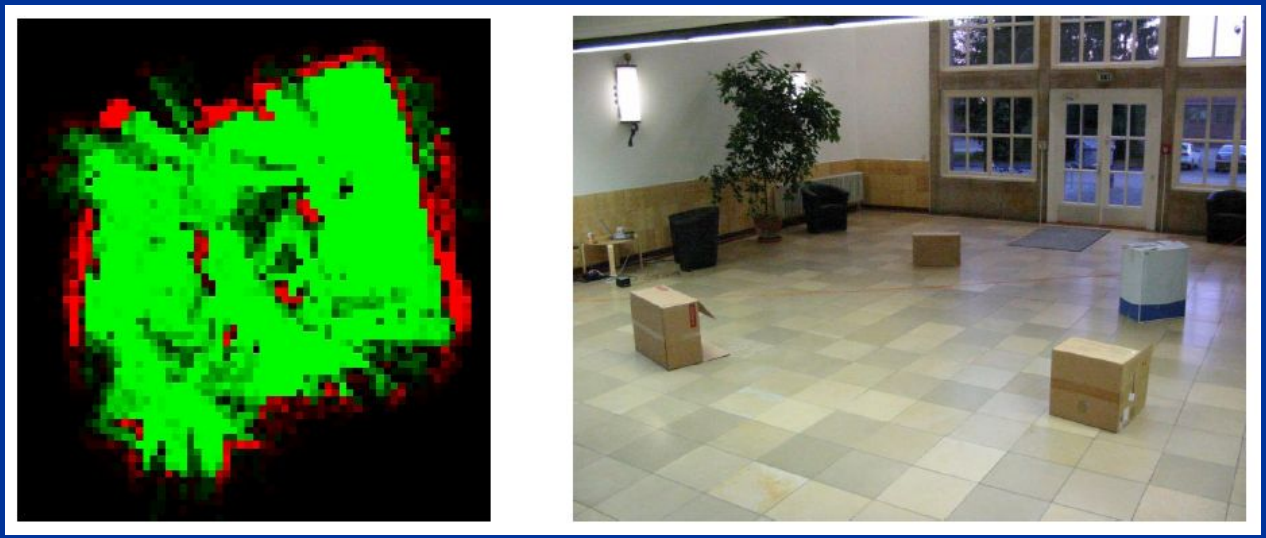
- Teaching hours and location:
  - Tuesday 08.00-11.45, F7105A (ET-lab).
  - and some extra time if the lab is availible.
- Will be used entirely for project work:
  - Support time, and:
  - Robot demonstrations.
- Teachers:
  - Krister Wolff and David Sandberg

Assignment 1

- **Mine sweeper navigation: 2008-04-22**
- Your robot will be placed in an arena with a light floor, with small areas of black (symbolizing mines) scattered about. The arena will be surrounded by walls.
- The robot is then to roam this area, and whenever a mine is identified the robot shall signal this by blinking a LED.
- The Boe-Bot shall then move away from the mine in search for other mines. The robot shall not run over any mines and not crash into any of the surrounding walls.
- See the web page for the details...

Assignment 2

- **Robotic mapping: 2008-05-20 (prel.)**



- The task of your robot is to build a map of a given arena, using the robot's sensors!

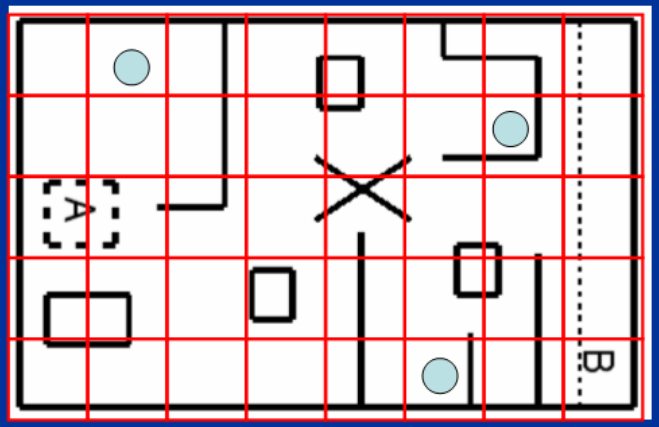
Assignment 2

- Your robot will be placed in an arena (labyrinth). The size of the arena will be approximately 3x6 m.
- The arena will contain **obstacles** (walls) as well as certain identifiable **objects** (metal cylinders)
- The task of your robot is to explore the arena and generate a map of it, with the obstacles and objects marked in the correct position in the map.
- Your robot will be given **3x10 minutes** to do this!

Assignment 2

- **Occupancy grid** framework:

  unkown, free, occupied, object: **10x20 cells**



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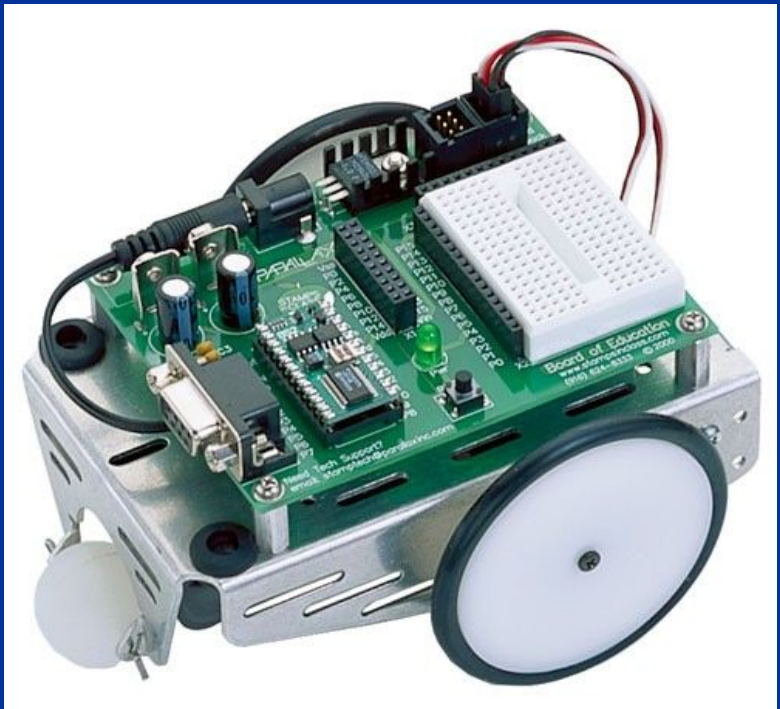
Detailed information will be announced soon (on the web page)

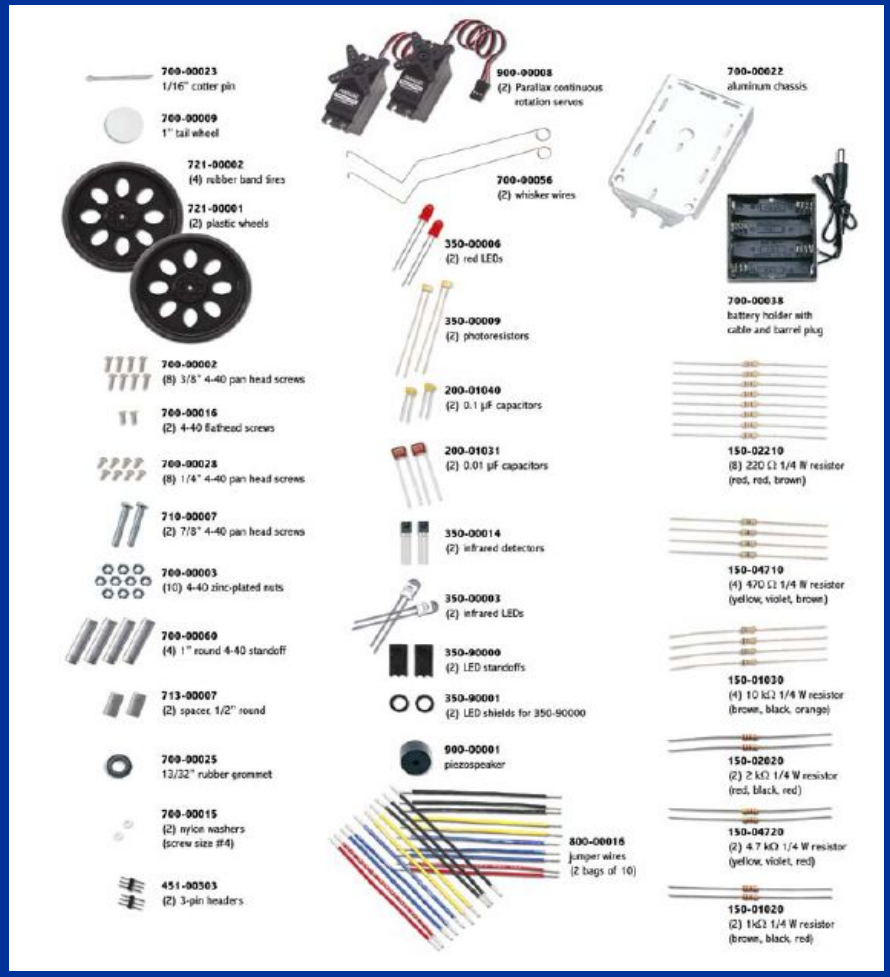
The hardware

- In this quarter you will start using the **Boe-Bot,** with the **Basic Stamp** processor and later on with the **BasicX** processor:



The hardware

- Each group will be given (as a *LOAN* !) a **Boe-Bot kit** and a **BasicX** processor (you will have to sign a "contract")
- The kit contains everything needed for constructing the robot
- Each group will be given a **budget of 800 SEK** to use for buying sensors etc.



The hardware

- We will use the Boe-Bot as starting point:
- Assignment 1: You can use the standard Boe-Bot kit with the **Basic Stamp** processor.
- Assignment 2: We will switch over to the **BasicX** processor. You can (in principle) use the standard **Boe-Bot** (+BasicX), or use your own modified version of the robot (build sensors etc).

Buying stuff:

- Links to the suppliers will be provided on the web page (in the first place we will use these suppliers). Krister will then order the materials for you.
- **Specific dates** will be announced for when to buy the stuff. Each group who wants to buy components should send a list to Krister prior to that date!
- A clear **motivation** for how you are going to use the components should be provided.

Reading guidance:

- In order to prepare for the assignments, **read/do** the following from the Boe-Bot manual (robotics with the boe-bot):

- Read/understand **Ch. 1-8**
- Do the following exercises/projects:
- **Ch.2**: P.1, **Ch.3**: P.2, **Ch.4**: P.2, **Ch.5**: P.2, **Ch.6**: P.1, **Ch.7**: P.2, **Ch.8**: P.1.
- Especially, knowing how **distance detection** works (using IR LED/detector pair) is essential!

The ET lab

- Each group has access to (at least) one PC with the necessary software to program your Basic Stamp/BasicX.
- Each group also has its own work bench with multimeter, oscilloscope, tone generator, etc.
- Printed circuit boards (PCBs) can be fabricated!
- Making metal parts might be harder...
- Remember, we are **guests** here!

Examination on AA part II:

- Each project group **must participate**, with their robot, in the robotics project demonstration events. During robot demonstrations (2008-04-22, 2008-05-20), *all* the group members must be present (and participate).

- Each project group is also required to hand in a **brief report**, by the end of the 4:th quarter, regarding their robot construction and programming activities.

- Each member of a project group can be given up to three (3) **extra points** for good work with the design of their robot.

Note (1):

- Note that the robot construction/ programming part of the course is supposed to be a **team work**:

- It is **ESSENTIAL** that each student knows how the robot works (i.e. each student must participate actively in the project). **YOU** might be asked to explain how your robot works, during the robot demonstrations...

Note (2):

- Each member of the project group is **responsible** for returning the robot kit and all other parts they have used, by the end of quarter IV.

- **No grades** will be reported, for any member of the project group, until their robot kit and other components have been returned!

Final remark:

Have **FUN!**