12-10-2011

Education and Culture DG

Lifelong Learning Programme

EUCVEST

Comenius Robot-Project

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Introduction

We are working on the COMENIUS-Project and we built LEGO-NXT-Robots. This project is sponsored by the EU. We spent 10 days in Esbjerg und we worked 3 days on the project. In April the Danish students spent 10 days in Dortmund and we've worked on another Project that shows the main differences between Germany and Denmark in the job world.
In the days were we have been together, we have presented some of Denmark's sights. One of the days we have heard about lego, because Lego is the third biggest toy company in the world, and it is pretty amassing, that it is in Denmark is started, and since then it have just grown bigger and bigger. We heard about lego and sore how they were making the bricks, and that lego is for everyone, so we would try to se, If they were right in that, so we are going to build a robot for ourselves.

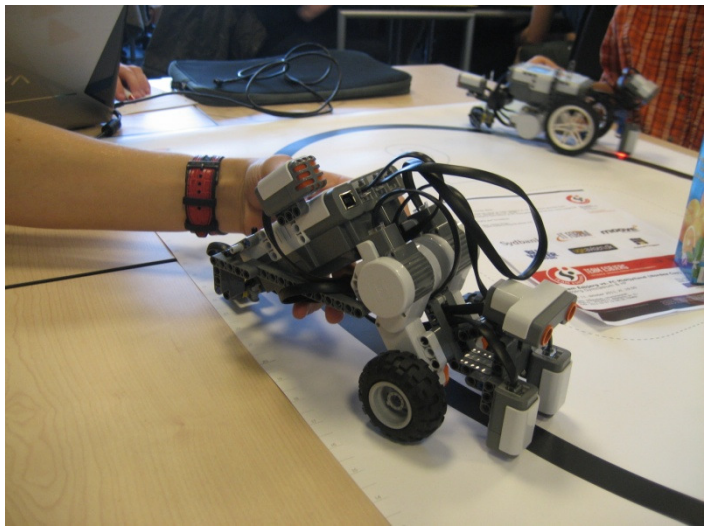
The list of available is in annex

Final solution suggestion

We want to build a LEGO-NXT-Robot for our project. We got a box with bricks, sensors and the microcontroller. We want the robot to follow the line in two directions. It must see the track with Two light sensors we have to install. After that we can put some other function to the robot, like a microphone and then eyes, and give the robot a function so it starts when we clap in our hands.

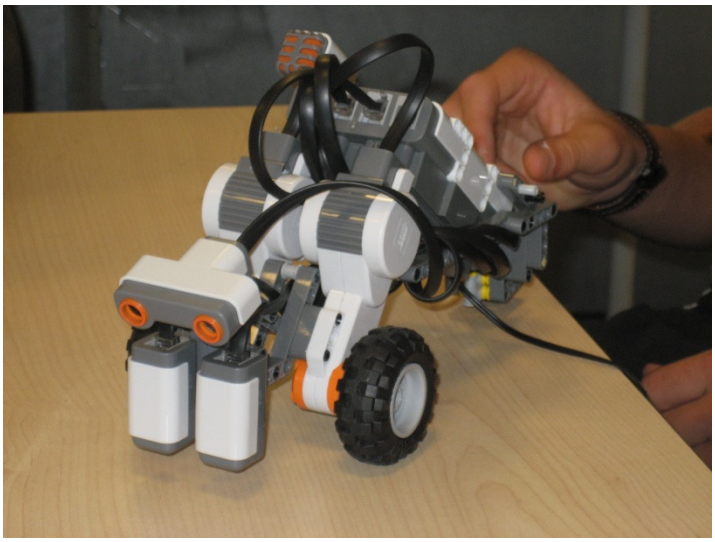
Product evolving process description

Monday we started the day, with idea evaluation and plan searching, where Jesper underwent a power point, we did that from 8; 15 to 9; 00. After that we started testing the program, we did that from 9; 00 to 9; 30.And after that we could start with building the robot, where Søren build it, and the rest of us find the different pieces that he should use, we did that out from a building plan, we built the robot from 10; 00 to 12; 15. Then the hard work with programming the robot started, and Lukas was in chart, because he has tried it before. And then we made some chances with the robots design.



Tuesday we started make some chances with the programming, because the robot didn't do what we wanted it to do. But at 09; 09 we made some progress, the robot follow the black line, but now it was too slow. And we still had to make some chances with the program. We made some chances with the censors, they had to be further apart, but that didn't help so we were back to the old design. Lucas made some chances with the program and now was the robot quicker. At 09; 29 we got the robot to go faster and it was now following the black line perfectly. So now we were going to make the eyes to work, and then the microphone, we did that from 10; 00 to 11; 00. At 11; 00 to 12; 00 we tried to get the microphone to work. And 13; 00 we had an good example on a robot, but we still tried to make it better, we tried to make an harder black line it should follow, but it was too hard for the robot.

Wednesday we started to write the documentation, we used the whole day to do that.



Problem formulation

We have been given the task to build a robot, which is able to follow a line. A robot with these capabilities can be used for many tasks, as for example modern trains, hospital beds or fun rides. We will build a simple model in Lego Mindstroms and try and make it as fast as possible and thereby effective.

In this project we will try to solve the problem of robots not being able to without a human controlling them. The aim is make it move by itself and in this case follow a line. The product will be a robot that uses light sensors to see where the black line is.

Project boundaries

We are going to start out by brainstorming how to build the robot. We will also try and find a build plan on the internet to give inspiration for our robot. When we know, how we are going build the robot, Lukas will start the programming process, while Søren and Fabian builds the robot. Anne-Mette will document what is happening and take fotos.

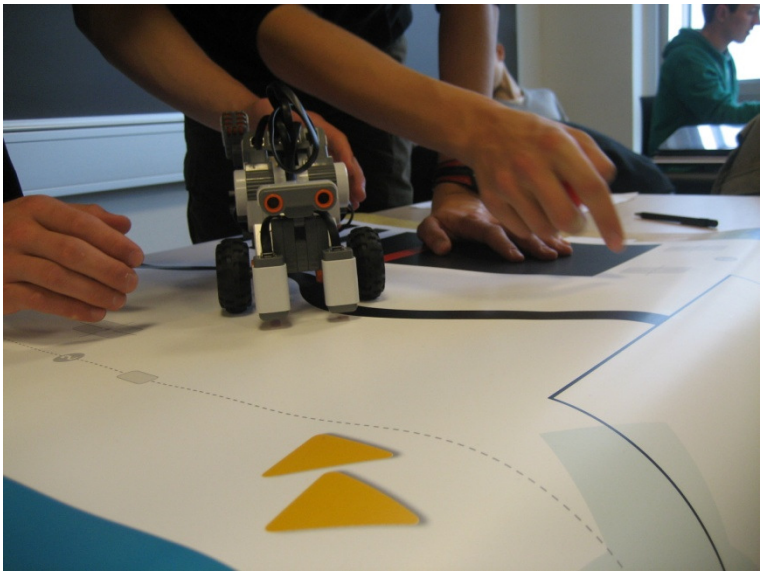
When the robot has been build Søren will help Lukas program and adjust the robot, while Fabian helps Anne-Mette document the process.

Demands

Strict demands

it must be able to:

- Drive around a track
- Follow a black line on its own
- Turn around corners



Soft demands

It must be able to:

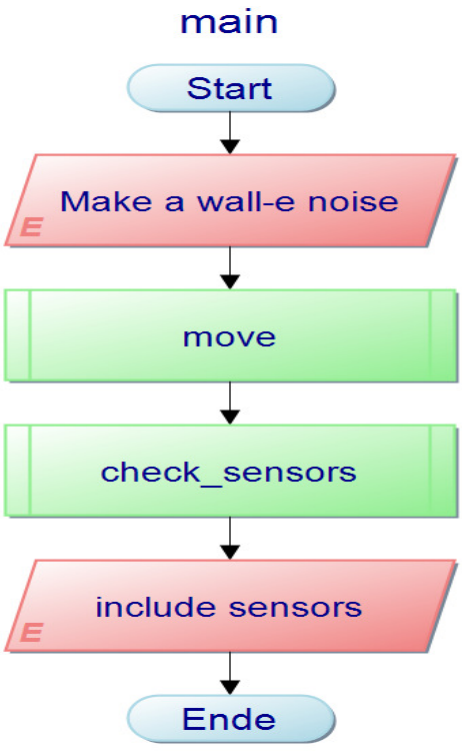
- Start after it heard a a sound
- See a wall and stop then
- Say WALL-E

Program description

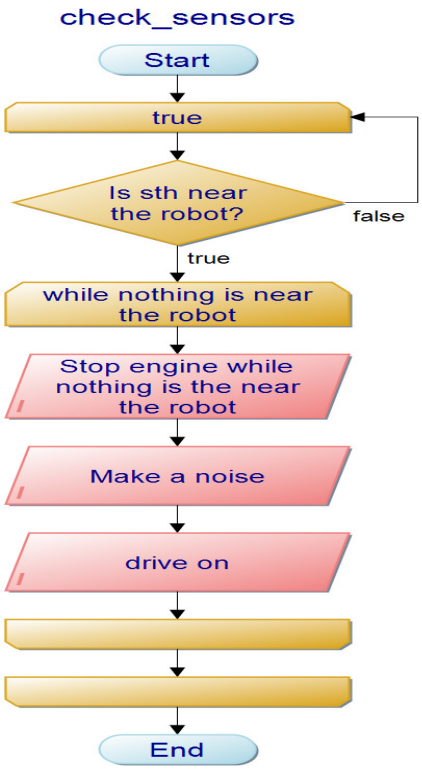
We built a robot, which can hear noises with a microphone, see with a distance sensor and can distinguish white light from black light. So it can drive along a line.
With the distance sensor he can recognize items and stops if an item is crossing the way of the robot. It will start if you make a loud noise.
The robot will be able to drive on a different path because it has got two light sensors which makes him dynamic.

Wall-e

Program flowcharts:

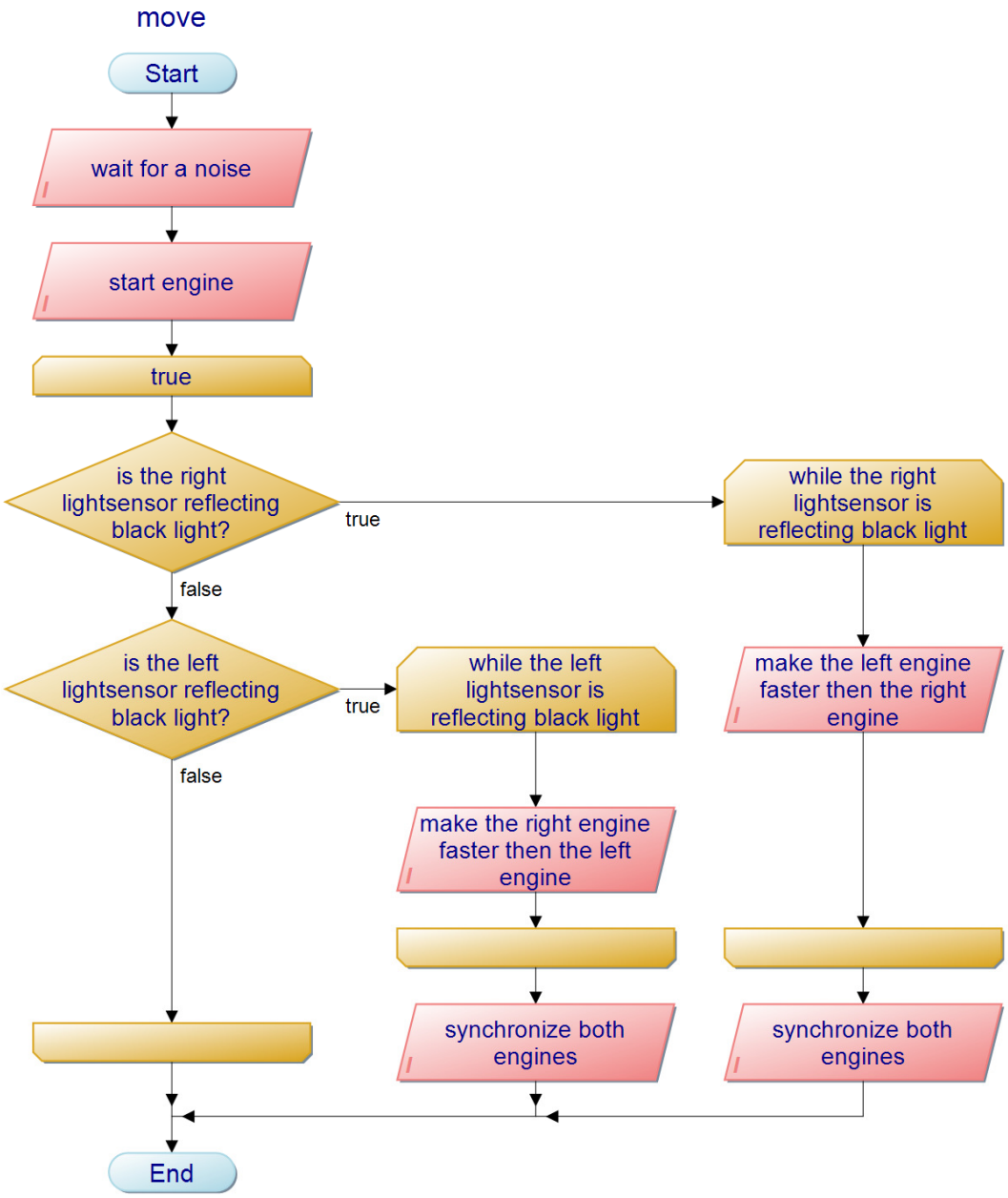



```
task main()
{
  PlayFileEx("WALLe.rso",4,FALSE);
  Wait(1500);
  Precedes(move_square, check_sensors);
  SetSensorLight(IN_1, SENSOR_LIGHT);
  SetSensorLight(IN_2, SENSOR_LIGHT);
  SetSensorSound(IN_4);
  SetSensorLowspeed(IN_3);
}
```




```
task check_sensors()
{
  while (true)
  {
   if (SensorUS(IN_3)<15)
   {
     while(SensorUS(IN_3)<15)
     {
     Acquire(moveMutex);
     OnRev(OUT_BC, 0);
Wait(500); until
(SensorUS(IN_3)>15);

PlayToneEx(262,400,5,FALSE);
Wait(500);
     Release(moveMutex);
}
   }
  }
}
```




```
  Acquire(moveMutex);
  OnFwd(OUT_BC, 95);
  Release(moveMutex);
  }
  if(SENSOR_2<=60)
  {
  while(SENSOR_2<=59)
  {
       Acquire(moveMutex);
       OnFwd(OUT_B, 90);
       OnFwd(OUT_C, 40);
       Release(moveMutex);
  }
   Acquire(moveMutex);
   OnFwd(OUT_BC, 95);
   Release(moveMutex);
  }
}
}
```

```
mutex moveMutex;
task move_square()
{
until (SENSOR_4>=100); Wait(330);
OnFwd(OUT_BC, 95);
 while(1)
 {
 if(SENSOR_1<=72)
   {
   while(SENSOR_1<=66)
   {
     Acquire(moveMutex);
     OnFwd(OUT_C, 90);
     OnFwd(OUT_B, 40);
     Release(moveMutex);
   }
```

Conclusion

We succeeded in building the robot, we got it to move along with the black line, and when something is in the way it stops, and it is not starting before one of us claps in or hands, so we are really happy for or result, because the robot lived up to our expectations.
If we look at the project, we think it's have been a nice project, it have been funny to build the robot, but it is hard to do the project like a group , because there is only one who can build the robot, and one who can make the programming.

Annex