Introduction to Robotic Group Project 2016

Dr Hongbin Liu

Course Outline

‣ Seven tutorials for two semesters

‣ Friday 10-11am, Lab:SW41

Autumn term

    ‣ 1. General introduction to robotics and the group project

    ‣ 2. Kinematics modelling for a wheeled robot

    ‣ 3. Feed forward control and feedback control

Spring term

    ‣ 4. Probability foundations in robotics

    ‣ 5. Robotic localisation- recursive Bayesian filter

    ‣ 6.Introduction to Kalman filter for speed estimation

    ‣ 7. Path planning for navigation

Course Outline

▸ **No text book needed**

Recommend reading:

Probabilistic Robotics, Sebastian Thrun, Wolfram Burgard, Dieter Fox

Lab sessions!

Starts from week6 , Wednesday 9-12pm, Lab:SW41

Assessment

Term - 1

Practical Exam25%

15% individual coding practice +10% group robot building test

Term - 2

Group Presentation 25%

Group robot demonstration +presentation

Individual report 20%

Robot design, implementation and evaluation

Group management minutes 5%

Overall group evaluation 10%, individual member evaluation 5%

Peer evaluation 10%

Assessment

January

Written Exam 15%

- Added a written exam on software systems development, to ensure students demonstrate an understanding of the relevant learning outcome beyond what they can demonstrate in the practical work.

Group and Meeting Minutes

▸ Form groups, each group has 2-3 members

▸ Weekly meeting minutes –(progress, problem, plan)

▸ Each group member take meeting minutes per week

Robot you will use

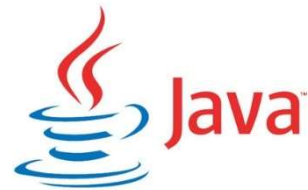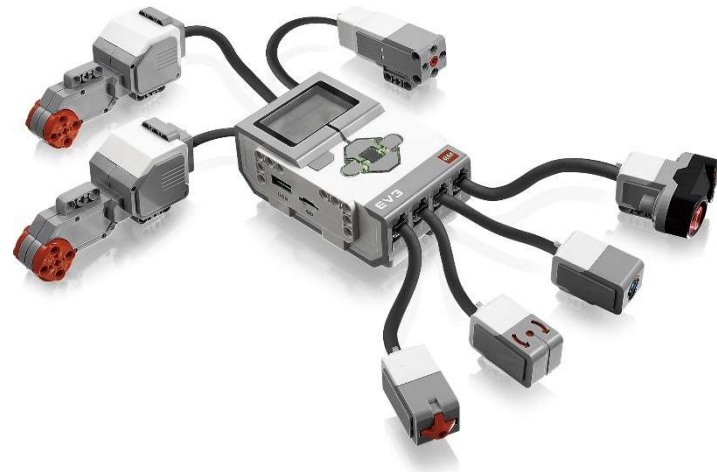LEGO Mindstorms EV3

Sensors and actuators

Three DC motors

Sensors

- ▸ Touch sensor
- ▸ Light sensor
- ▸ Sound sensor
- ▸ Ultrasound range sensor
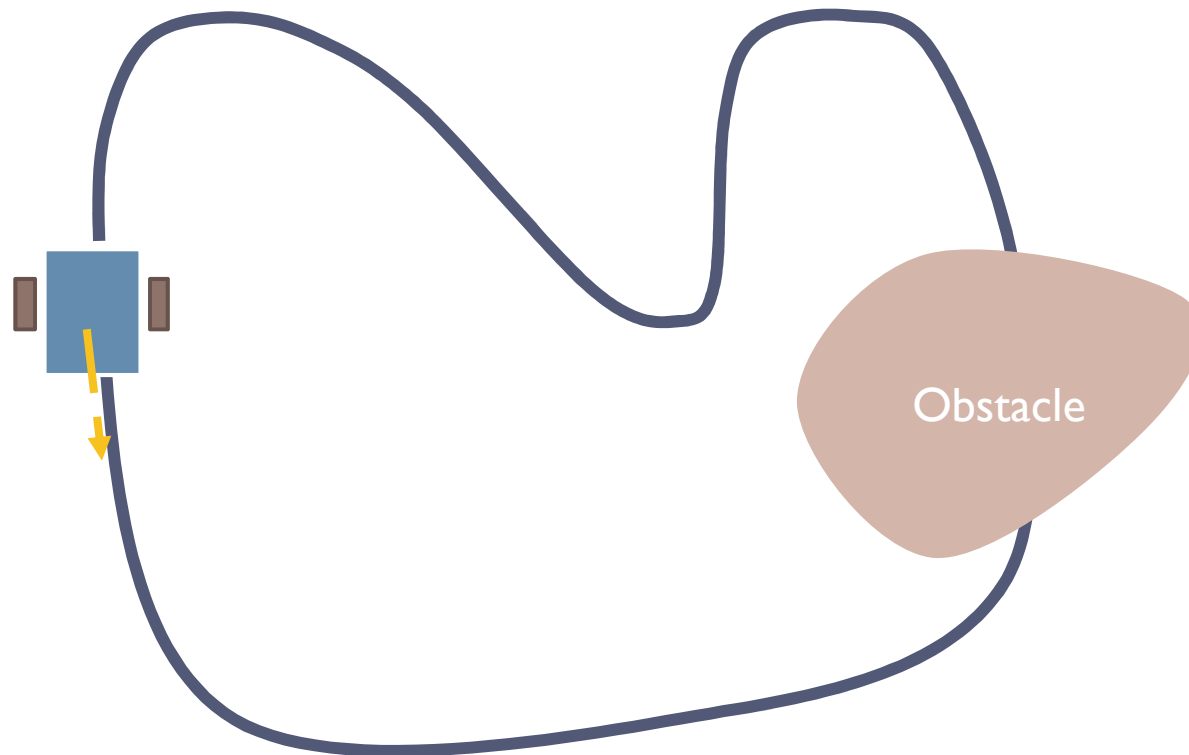- ▸ Compass sensor
- ▸ Color sensor

Programming

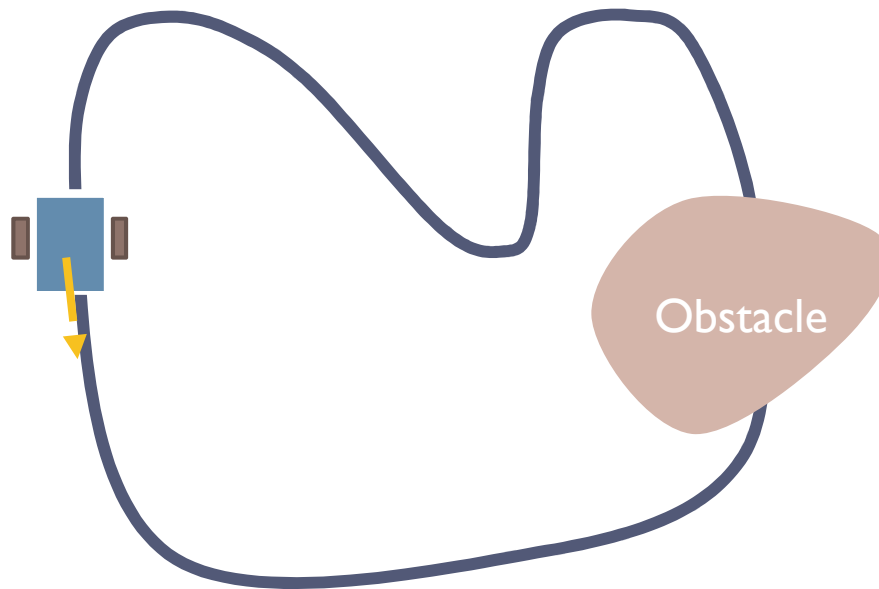EV3 runs Linux with Java
Runtime Environment (JRE7)

Term 1   Line following + obstacle avoidance

Obstacle

NXC line follow PID 1.avi
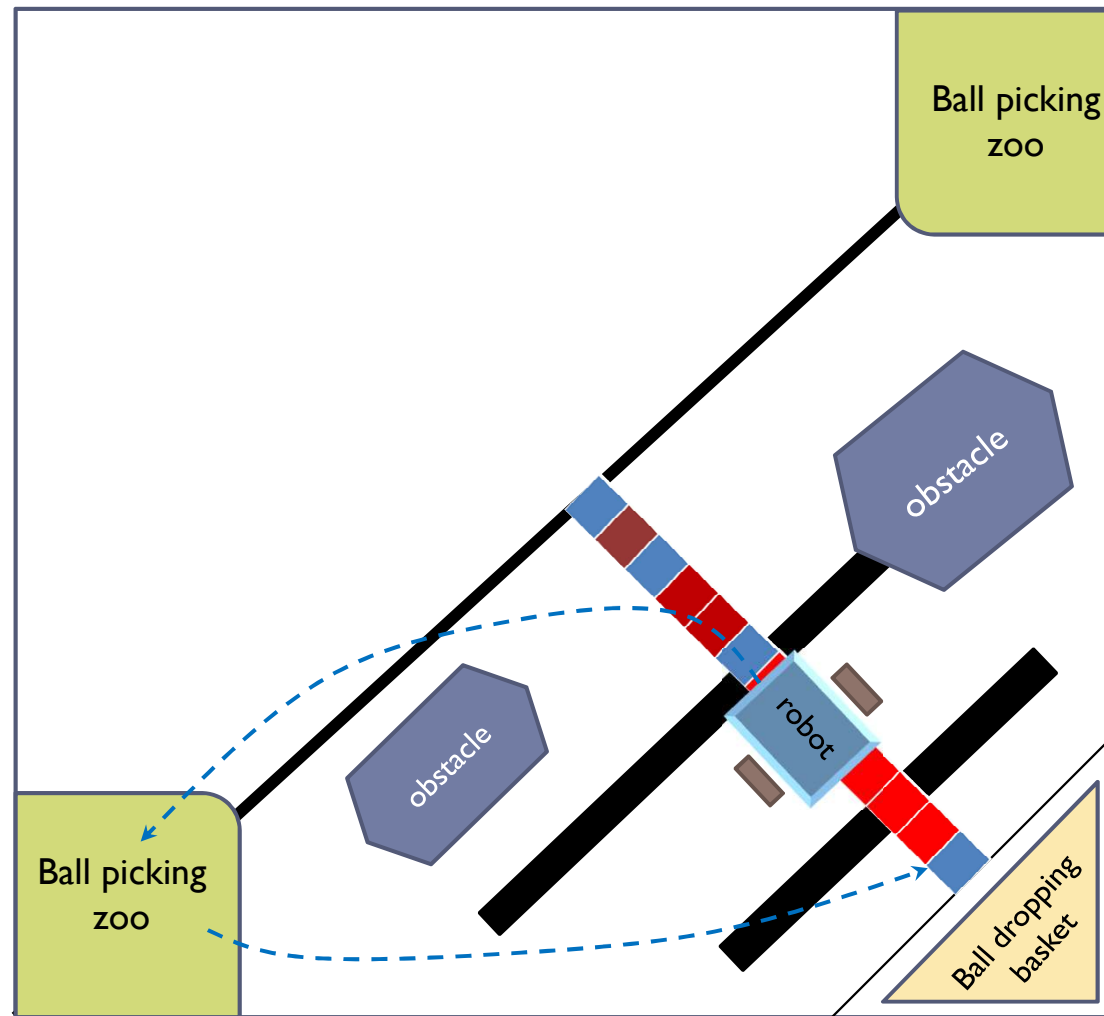
Video from previous RGP students

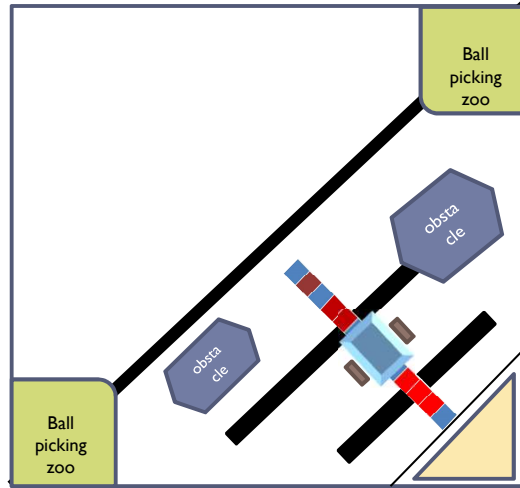# Term 1: Line following obstacle avoidance

Obstacle

You will learn in tutorial sessions

- Kinematic modelling of mobile robot

- Open loop implementation

- Feed-back control
  - -bang-bang control
  - -PID control

- Obstacle avoidance and following

Term 2 Ball Picking Dropping Challenge

Term 2 Ball Picking Dropping Challenge

You will learn in tutorial sessions

- Probabilistic method for robot navigation

- Self localisation-Bayesian filtering

- A star planning

- Kalman filtering

Your action

▶ Form your group

▶ Report to Teaching Assistant by Week 7

▶ Students not in a group after Week 7 will be randomly assigned