

EMC 2017

Tooling and Infrastructure

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Department of Mechanical Engineering

May 3, 2017

Introducing PICO



- ▶ Telepresence Robot from Aldebaran
 - ▶ Robot type: *Jazz*
- ▶ Sensors:
 - ▶ Laser Range Finder (LRF)
 - ▶ Wheel encoders (odometry)
 - ▶ Asus Xtion Depth sensor
 - ▶ 170° wide-angle camera
 - ▶ Sonar

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Introducing PICO



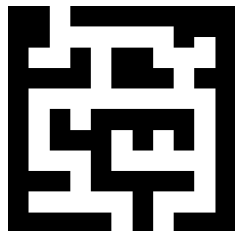
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- ▶ Computer:
 - ▶ Intel I7
 - ▶ Running *Ubuntu 14.04*

The Assignment

- ▶ Let PICO navigate through a maze and find and go to the exit.
- ▶ You have to:
 - ▶ try to be *as fast as possible*
 - ▶ deal with *dynamics* in the environment (a moving door)
- ▶ You can use:
 - ▶ The *Laser Range Finder* to detect walls and doors
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 - ▶ The **encoder** data from the wheels
- ▶ Final Presentations: **June 7**
- ▶ Competition Day: **June 14**



Intermediate Assignment

- ▶ **Corridor Competition:** Let PICO drive through a corridor and take the first exit.
- ▶ You have to:
 - ▶ try to be **as fast as possible**
- ▶ You can use:
 - ▶ The **Laser Range Finder** to detect walls
 - ▶ The **encoder** data from the wheels
- ▶ Competition day: **May 24**



Ubuntu

- ▶ Linux-based operating system
- ▶ Use version **14.04** (not 14.10, 15 or 16!)
- ▶ 32- and 64-bit (**64-bit recommended**)
- ▶ Easy dual boot installation with e.g., Windows
- ▶ Download: www.ubuntu.com
 - ▶ Any problems? → [Check the wiki](#).
 - ▶ No info? → Ask the ICT Servicedesk or contact us.



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- ▶ Instead, we will provide our own 'software layer'
 - ▶ It is simpler to understand, and 'cleaner' to use
- ▶ However, you are still **allowed** to use ROS!

C++

- ▶ We will use C++ as programming language
- ▶ C++ is object-oriented C
 - ▶ “C with Classes”
 - ▶ Encapsulate data and functionality within objects
- ▶ It is a **powerful** but **complex** programming language.
- ▶ However, we provide a **software framework** to get you started

Creating code: Qt Creator

- ▶ Integrated Development Environment
 - ▶ Advanced code editor
- ▶ Many advantages over 'simple editors':
 - ▶ Syntax highlighting
 - ▶ Code completion
 - ▶ Visual compiler feedback
 - ▶ Static code checking
 - ▶ Refactoring tools
 - ▶ Parenthesis matching
 - ▶ ...



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 - ▶ *'Manages files and directories, and the changes made to them, over time'*
- ▶ Used to **store** and maintain your code on the server
 - ▶ (Like Dropbox)

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- ▶ More info on the Wiki

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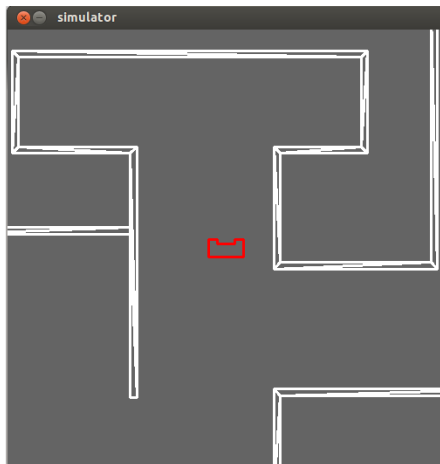
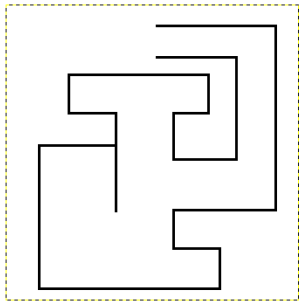
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- ▶ Can easily create test environments using **height maps**
- ▶ **Integrates** well with our provided software
 - ▶ If your software runs in the simulator, it runs on the robot
 - ▶ This does **not** guarantee that it will also work...

You still need to test on the real system!

PICO Simulator



Example

- ▶ [Full Example](#): from requirements, through Task-Skill-Motion to Software Executable.
- ▶ (far) from perfect!
- ▶ Focus on decoupling parts of functionality, explicitly in the code.
- ▶ Will be released this week! Check the [tutorial page](#)!

Wiki

- ▶ EMC Wiki:
 - ▶ http://cstwiki.wtb.tue.nl/index.php?title=Embedded_Motion_Control
 - ▶ Info on practical assignment, installation, getting started
 - ▶ Frequently Asked Questions
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- ▶ Overall use:
 - ▶ Everyone can [edit](#)
 - ▶ If you see a mistake: [correct it](#)
 - ▶ If you had a problem and know how to fix it: [add it](#)

Recap

- ▶ Assignment: solve maze with PICO robot

Recap

- ▶ Assignment: [solve maze](#) with [PICO](#) robot
- ▶ OS: [Ubuntu 14.04](#)
- ▶ Programming language: [C++](#)
- ▶ Code editor: [Qt Creator](#)
- ▶ Version control: [git](#)
- ▶ Simulation: [PICO simulator](#)
- ▶ Documentation: [Wiki](#)

Getting Started

- ▶ Check the wiki:
 - ▶ http://cstwiki.wtb.tue.nl/index.php?title=Embedded_Motion_Control
- ▶ Follow the [tutorials](#) on the wiki:
 - ▶ Ubuntu
 - ▶ C++
 - ▶ Qt Creator
 - ▶ Simulator
 - ▶ Software framework
 - ▶ git

Groups

- ▶ \approx 60 students signed up Canvas!
- ▶ **Aim:** for at most 10 groups of 6 persons each

Group 1:	✓	Group 6:	✓
Group 2:	✓	Group 7:	-6
Group 3:	-4	Group 8:	-6
Group 4:	✓	Group 9:	-3
Group 5:	✓	Group 10:	✓

- ▶ thus \approx 19 students did not sign up for a group yet!

Tutor name will be sent to you
It is *your* responsibility to get in touch with your tutor