Advanced Robot Control
Introduction to laboratory

Wojciech Domski

Chair of Cybernetics and Robotics,
Wrocław University of Science and Technology

Wrocław University
of Science and Technology

Outline

Wrocław University
of Science and Technology

OSH training

1. be aware of electric current,
2. do not try to repair the equipment on your own,
3. do not eat and drink during classes,
4. do not swing on the chair,
5. emergency exit,
6. first aid kit.

Wrocław University
of Science and Technology

Credit rules (1/2)

1. Exercises graded in class for execution, Q&A, and preparation (scope defined).
2. Reports due on ePortal within two weeks post-class. Additional tasks adjust grade -20% or +10%.
3. Entry tests may be required for lab access.
4. Lab grades aggregate preparation, execution, Q&A, and submissions (report and homework).
5. Final grade is the arithmetic mean of all component scores.

Wrocław University
of Science and Technology

Credit rules (2/2)

6. One absence permitted; work must be submitted later. Extra absences reviewed case-by-case.

7. Plagiarism or non-independent work yields 2.0 lab grade; gross violations may fail course. Anti-plagiarism checks apply.

8. All tasks mandatory on ePortal; failure to upload results in failed exercise.

Wrocław University
of Science and Technology

Report (1/2)

- After each laboratory class a report should be prepared. The report should include following in order to ensure maximum mark:
- short description of the exercise at hand,
- configuration of the MCU (applicable for hardware related exercises; if it was the scope of the exercise),
- essential code fragments which show how the exercise was solved,
- plots and graphs for conducted simulations (if applicable),
- visualisation of the achieved results from RemoteLab (both the serial console and the plot),

Wrocław University
of Science and Technology

Report (2/2)

- solution of the homework (essential code, visualisation, simulation results),
- missing homework will result with penalty points for the report,
- late submission will result in penalty points for the report.

If laboratory class included 3 exercises for each exercise above description must be provided.

Wrocław University
of Science and Technology

Grading scale

- 2.0 for less than 50% of points,
- 3.0 for [50%, 60%) of points,
- 3.5 for [60%, 70%) of points,
- 4.0 for [70%, 80%) of points,
- 4.5 for [80%, 90%) of points,
- 5.0 for 90% or more of points.

Wrocław University
of Science and Technology

Website

Additional information about this course is available at
`edu.domski.pl` (available in English).
You have to go to *Courses->Advanced Robot Control* tab and
select *lecture* or *laboratory classes*

Wrocław University
of Science and Technology

Office hours

Office hours are available via USOS system.
The office hours are held in room 209A, building C3.

Wrocław University
of Science and Technology

Course outline

The course covers following subjects:

- input–output decoupling for 3R rigid manipulator in Matlab,
- static linearisation for (2,0)-class mobile platform,
- model predictive control for (2,0)-class mobile platform,
- task synchronization mechanisms and PID control in FreeRTOS with STM32.

Wrocław University
of Science and Technology

RemoteLab

Wrocław University
of Science and Technology

Literature

- Siciliano, B. and Khatib, O., *Handbook of Robotics*, 2007, Springer,
- Ben-Ari, M. and Mondada, F., *Elements of Robotics*, 2018, Springer,
- Åström, K. J. and Hägglund, T., *PID Controllers: Theory, Design, and Tuning*, 1995, Instrument Society of America,
- Real Time Engineers ltd., *The FreeRTOS™Reference Manual*, 2016,
- Bräunl, T., *Embedded Robotics*, 2008, Springer,
- Wescott, T., *Applied Control Theory for Embedded Systems*, 2006, Elsevier,
- Ławrynczuk, M., *Nonlinear Predictive Control Using Wiener Models*, 2022, Springer Cham,
- C. C. de Wit, B. Siciliano, and G. Bastin., *Theory of Robot Control*, 1996, Springer-Verlag London,
- lecture notes,
- manufacture manuals.

Wrocław University
of Science and Technology