Process automation

Introduction: Course Goals & Organization

BS UNI studies, Fall semester 2024/2025

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Outline

- Introduce the course
- Present the course topics
- Learning outcomes
- Course components, policies and grading

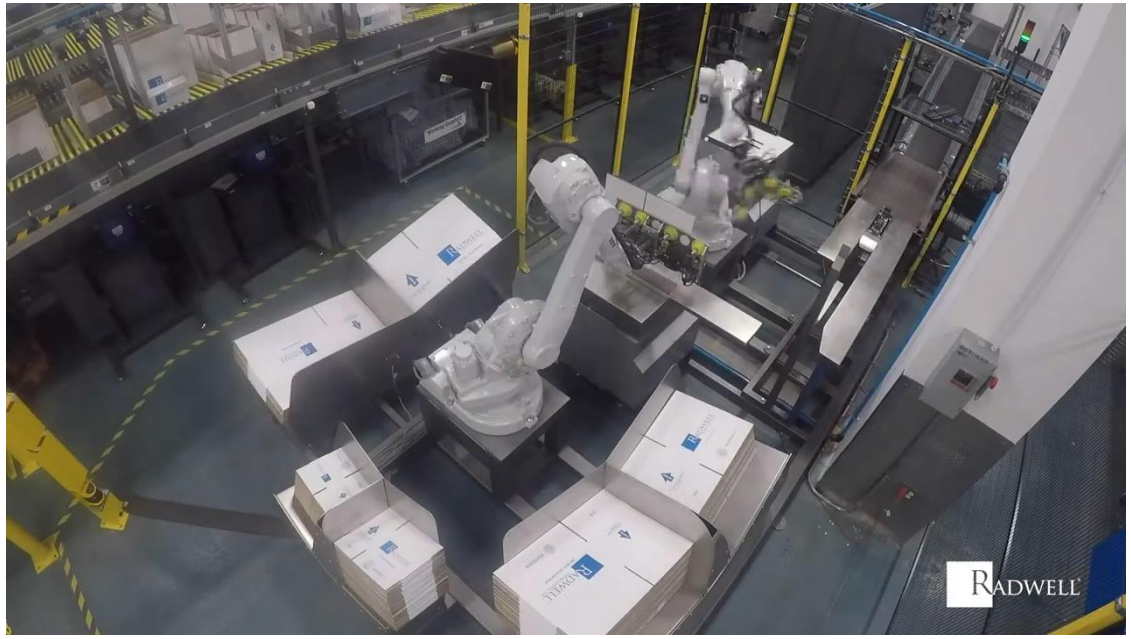
Instructor and Teaching assistant

- Dr Octavian Machidon
  - PhD on reconfigurable computing from Transylvania University of Brașov, Romania (2015)
  - Joined FRI in 2020, currently an Assistant Professor
  - Research expertise in mobile and ubiquitous computing, embedded systems, and intelligent agents
  - Latest research project: UAV computer vision for smart agriculture
    - H2020 Smart4All AgriAdapt: Energy efficient UAV-based agriculture through real-time neural network adaptation
  - octavian.machidon@fri.uni-lj.si ([PA 63737] in the subj.)
  - Office hours: by appointment

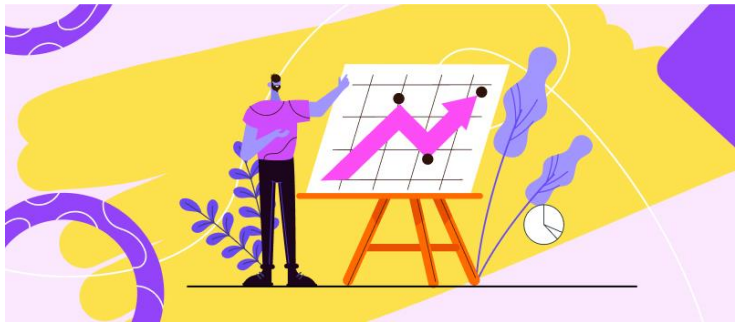
Process automation

What is process automation?

- Using technology to execute recurring tasks or processes in a business where manual effort can be replaced. It is designed to **streamline operations**, **reduce the need for human intervention**, and **increase efficiency**.
- **Key Aspects:**
  - **Control Systems:** Systems used to control processes in industrial settings, like SCADA and PLCs.
  - **Software Automation:** Using software to automate tasks such as data entry, scheduling, or reporting.
  - **Robotics:** Implementing robots to handle repetitive tasks in manufacturing.
  - **AI and Machine Learning:** Utilizing AI to make processes smarter by enabling systems to learn from data and improve over time.



Importance of process automation



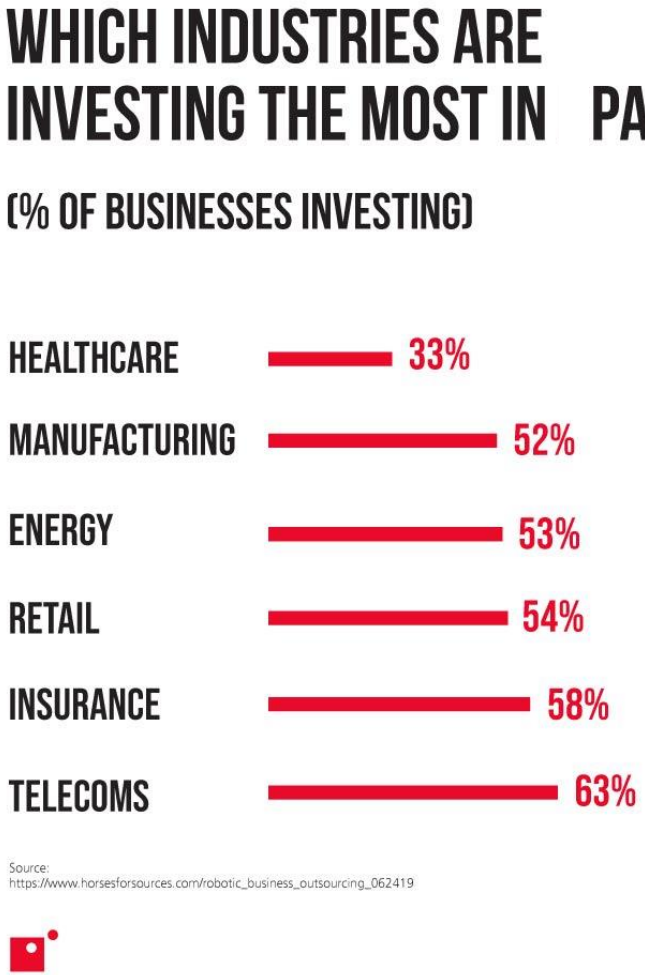
- **Efficiency and Productivity:**
  - Automation speeds up processes, reducing the time taken for tasks and increasing output.
- **Quality Improvement:**
  - Consistent and repeatable processes ensure higher quality and reduce defects.
- **Cost Reduction:**
  - Decreased need for labor, reduced waste, and less downtime lead to cost savings.
- **Safety:**
  - Automation removes the need for humans to be involved in hazardous tasks.
- **Scalability:**
  - Easier to scale operations with automated processes compared to manual ones.

Where do we encounter automation?

- **Daily Life Examples:**
  - **Smart Homes:** Automated lighting, heating, and security systems.
  - **Automated Vehicles:** Autonomous cars that can drive with little to no human intervention.
  - **Retail:** Self-checkout systems in supermarkets.
- **Industrial Examples:**
  - **Manufacturing:** Automated assembly lines.
  - **Energy Production:** Automated monitoring and control of power plants.
  - **Pharmaceuticals:** Automated drug manufacturing and packaging.

Impact across industries

- **Manufacturing:** Automation of assembly lines, reducing human labor and increasing precision.
- **Healthcare:** Use of automation in diagnostics, patient monitoring, and drug dispensing.
- **Logistics:** Automated warehousing, inventory management, and shipping.
- **IT & Software:** Automation in coding, testing, and deployment processes.
- **Food & Beverage:** Automated food processing and packaging lines.



Learning outcomes

Course outcomes

- After successfully completing the course, you will be able to:
  - Gain a comprehensive understanding of the principles and practices of process automation.
  - Acquire the skills necessary to design, program, and manage automated systems in various industrial contexts.
  - Understand the fundamental principles and elements of computer-aided process control.

Course outcomes

- After successfully completing the course, you will be able to:
  - Implement process automation techniques.
  - Comprehend and analyze the connection between theoretical concepts and their practical application in process control.
  - Develop competencies in system integration and aspects of computer-aided manufacturing.

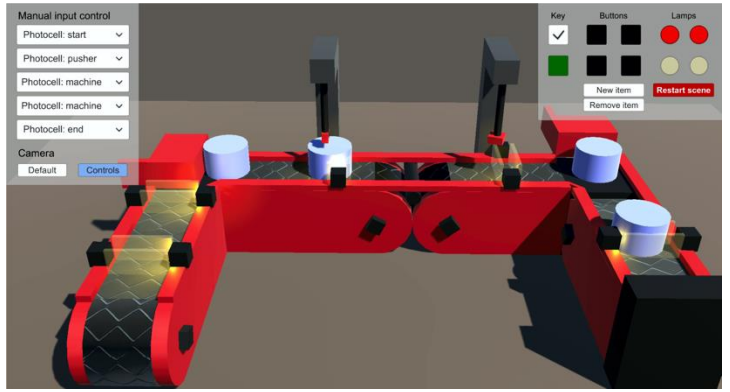
Course components

Lectures

- Tuesdays 12pm – 3pm at PR17
- Help you get a big picture
- Showcase live coding examples
- Allow you to ask for clarifications
- Company visit and guest lecture (2nd half of the semester)
  - Attendance in both events is strongly encouraged!
- There is no comprehensive book for this class!
  - Slides and supplementary readings on Ucilnica

Lab and Project work

- Thursdays 1pm – 3pm at PR17
- Equipment
  - Beckhoff CX7000
  - Fischertechnik teaching models
  - FTsim training model simulator
- Work on a project in pairs
  - manual guidance
  - automatic guidance
  - SCADA control system
  - OPC UA / Beckhoff ADS protocol
- Report
  - project documentation
  - description of the system
  - instructions for use



Final exam

- Oral exam at the end of the semester
- Related to:
  - Lectures
  - Labs
  - Project
- Closed book
- Practice exam questions at the end of the semester
- Conditioned on project grade (at least 50% of the points)!

Policies and grading

Final mark

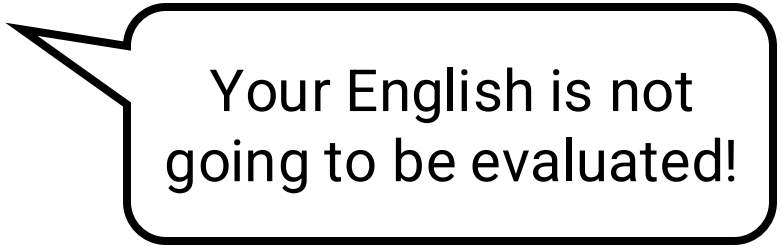
- Coursework 50% (project work and lab exercises)
  - 10% first checkpoint (manual control)
  - 10% second checkpoint (automatic control)
  - 15% final presentation
  - 15% written report
- Final oral exam 50%

Need at least a half of the coursework

Need at least a half of the exam points

Policies

- Read the syllabus
- Subscribe to ucilnica and Slack workspace
- Use English for all course-related communication
- No cheating!
  - Do not copy solutions
  - Do not allow others to access your work
  - Projects are done only in pairs



- Credits to
  - Prof. Uroš Lotrič

and

  - Assist.prof. Nejc Ilc

- Part of the course materials are based on their previous efforts.

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