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A Multifocal Master's Program in Automation

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Technical Background

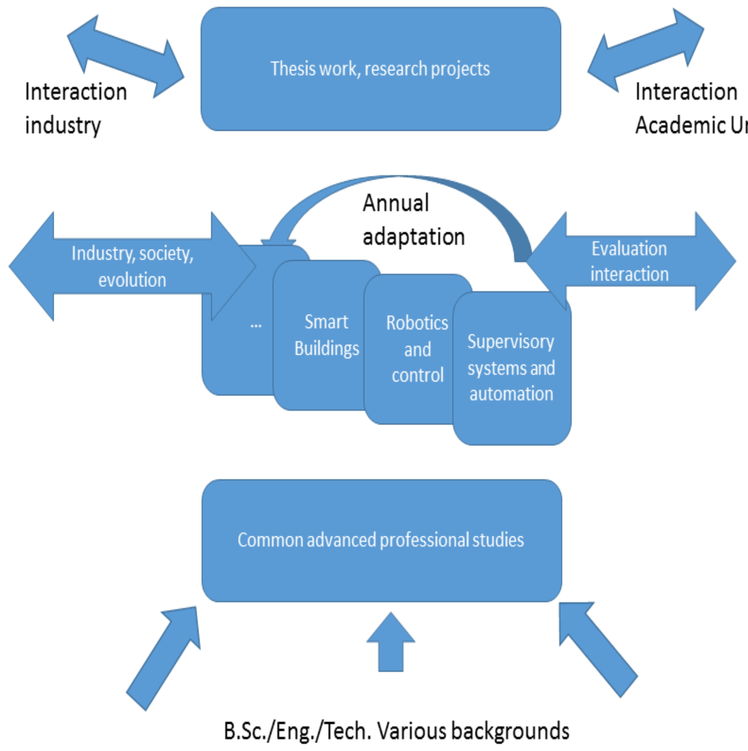
The fields of control and automation are going through a turmoil as these traditional engineering fields are taking influences from and adopting methodologies of various fields of science. For example; system identification, robust control, fault-tolerance and actuator-measurement choices are established methods in technical feedback control, but still under development in other non-technical fields. Also, the methods of feedback control are being adapted to new fields, enabling new achievements and new insight and presenting the community with unsolved problems. E.g. [1], [2], [3]

The multitude of evolving topics and fields of automation and control thus offers a perhaps unique challenge in engineering education.

Proposed Master's Program

The Master's programs being developed in Universities of Applied Sciences (UAS) in Finland at the moment are intended to complement the traditional masters programs at the academic Universities. At the UAS, the focus should be stronger on the applications, whereas the academia more focus on long-term research, usually through doctoral students and programs. The program consists of 60 ECTS, out of which 30 ECTS is a Master's thesis. The studies contain common advanced professional studies (10 ECTS) and degree specific advanced professional studies (20 ECTS). The studies consist of virtual parts and intensive course days mainly at Campus Vaasa.

The thesis work is realized as a research and development project related to working life.



Pedagogical approach

Education in Automation and Control thus faces the challenge of being able to treat advanced, quickly changing topics in a application-oriented manner. In this program, a static curricula fixed over several years is replaced by a dynamic curricula on a rotational schedule and the contents are adapted as the curricula rotates.

The studies will focus on a problem- and project-based learning, where theoretical insight is complemented by practical work in a dynamic and innovative manner. The learning process is characterized by a strong integration of real working life problems and development projects. The studies of the program involve practical ways of learning, laboratory assignments and hands-on exercises, in innovative learning environments. See e.g. [4],[5].

The common advanced professional studies give the fundament of the learning process, whereas the degree specific advanced professional studies emphasize the (annually rotating) field of focus.

In the Master's thesis phase the student plans and implements a development project in and/or for real working life applying case specific research and/or development approaches. Alternatives for the thesis are, for example contributing to research work in the university community at the campus, development projects for the laboratory research equipment or work regarding solving industrial control and automation tasks with the industry or working life.

References

[1] Ahmad Haidar (2016),*The Artificial Pancreas: How closed-loop control is revolutionizing diabetes,* IEEE Control Systems, 36 (5), pp. 28-47.

[2] Oussama Khatib et al. (2016) *Ocean One: A Robotic Avatar for Oceanic Discovery*, IEEE Robotics and Automation, 23 (4), pp 20-29.

[3] Nisar Ahmed, Jorge Cortes and Sonia Martínez (2016), *Distributed Control and Estimation of Robotic Vehicle Networks,* IEEE Control Systems, 36 (2), pp 36-40.

[4] James N. Warnock and M. Jean Mohammadi-Aragh (2016), *Case study: use of problem-based learning to develop students technical and professional skills, European Journal of Engineering Education*, 41 (2), pp 142-153.

[5] Edward F. Crawley et al. (2014), *Rethinking Engineering Education: The CDIO Approach. 2nd Ed., Springer.*

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