Course outline: PEP 398 – SKIL IV

Suggested subtitle: Sensors and individual project

Course Description:

Continuation and extension of SKIL III to more complex projects. Projects may include research participation in well-defined research projects.

Prerequisite: PEP 397

Scope:

This course has two scopes: In the lab part you should continue working on the projects you started last term or start a new project. If you continue a project – then the outcomes and deliverables should be significant different from last term. If you want to start a new project - there are this time no limits on the project group size – hence you can choose an individual project that you work together with a faculty / lab group as a topic. However: the project goals (deliverables, etc.) should be defined so they can be delivered within the class term.

In the lecture part we will talk about different sensors that are being used to make measurements. Each week will discuss a different quantity to be measured. Focus is thereby to understand the way how the sensor works – i.e., through which physical effects the quantity to be measured (like for example force) is converted to a number / gauge reading / easily measurable value (like electric potential difference). In this context we will discuss the properties (range, resolution, response time, hysteresis, …) as well as limitations that each sensor has. We will discuss commonly used sensors as well as novel or more exotic sensors.

Meetings:
Lecture: Tuesdays 9:30AM-10:45AM per Zoom links, Lab: Thursdays 9:00AM-10:50AM also per Zoom links.

Grading:

10%: Attendance / Course participation

45%: Lecture assignments

45%: Lab assignments: A possible distribution may be the following:

     7.5%: Proposal (due end of third week)

     7.5%: Midterm| (due end of 8th week)

     15%: Final Poster (due after 1st final week)

     15%: Final Report (due after 1st final week)

Late submission will not be accepted. Poor attendance will have a negative effect on your grade.

SPAD-Questions:

- You are able to communicate challenges and problems that arises during a project to the advisor / other student and to identify next steps to overcome these problems.
- You are able to classify and distinguish between different sensors and identify the one best suited for a specific measurement.
- You know several different sensor and sensor configurations used to make common measurement (for example temperature, intensity, etc.).

Weekly topic and assignments: Lectures

Week	Lecture Topic	Lecture HW
1	Course Introduction / Sensor template	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
2	Position and velocity sensor	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
3	Acceleration sensors (including gravitation)	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
4	Force sensors (including mass)	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
5	Pressure sensors (including vacuum gauges, and microphones)	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
6	Temperature sensors	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
7	Time and Frequency sensors	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
8	Electric field sensors (including potential and current)	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
9	Magnetic field sensors	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
10	Intensity sensors (including CMOS / CCD camera sensors)	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
11	Ionizing and non-ionizing particle sensors (including Neutrinos)	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
12	Spectrum sensors	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
13	Chemical and medical sensors (includes presence, concentration, radiation or electrical based measurements)	Submit description for 3 commonly used and one uncommon / exotic sensor for next week topic.
14	Sensor topic tbd or developing elevator speech	

Weekly topics and assignments Lab:

Week	Lab Topic	Lab HW
1	What is a good project idea	Submit a project idea that you want to work
2	Present project idea / formation of groups	Submit an extended project description
3	Elements of a proposal	Submit project proposal
4	Proposal presentation	
5	Group work on project / individual meetings	
6	Elements of a progress report	Prepare progress report
7	Progress report presentation	
8	Elements of a midterm report	Prepare Midterm report
9	Group work on project / individual meetings	
10	Group work on project / individual meetings	Prepare progress report
11	Present progress report	
12	Group work on project / individual meetings	
13	Elements of a final report / presentation	Prepare powerpoint / poster presentation
14	Present final project powerpoint / poster	Prepare final report – What have you learned?