SENSORS, MICRO-CONTROLLERS: HOW DO THEY CONNECT

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Students graduating from the Applied Physics department of the Hague University of Applied Sciences are expected to tackle various problems. From understanding the physics behind an experiment to discussing the results with a manager. But also being able to use their time in the R&D lab space effectively. In our second year courses we teach Physical Computing [1] where students learn to combine both hardware and software in order to create something new. We ask them to create their own measurement platform based on a Raspberry Pi-Pico and provide subsets of task in order to guide them through the process. Students are free too use AI tools, but in the end need to answer questions without AI support.

The course has 4 distinct learning outcomes: connecting and using digital multimeters in the lab using Python scripts; choosing the right sensor based on the hardware requirements, focusing on the span of the analogue-to-digital converter (ADC), the word-length of the ADC (number of bits) and the measurement resolution; controlling 2 different available sensors and actuators; and being able to build, test, and use a measurement system combining sensors with input buttons and a small LED-screen. For each learning outcome there is a small assessment where the students show their skills with a 5 performance level rubric to assign their score. The assessment is there to test the student their skills, not the (AI) tools they used in order to complete the task.

In this workshop we will focus on sensor measurements. You will get access to materials and hardware. We will apply the following rubric:

30pt: The student can control different sensors using different interfaces and can store measured data in a meaningful format. The code is well documented and sensors are optimally utilized using supplemental electronic hardware (implemented or worked out on paper).

25pt: The student can control different sensors using different interfaces and can store measured data in a meaningful format. The code is well documented.

20pt: The student can control different sensors and stores measured data in a meaningful format. The code is well documented.

10pt: The student can control different sensors and stores measured data in a meaningful format.

0pt: The student cannot control a sensor.

During the workshop we will guide you through the process of working with the sensors and help you understand the joy of creating something yourself. After the workshop you have the tools to implement a Physical Computing topic and have access to the world of micro-controllers with micropython.

[1] M. Przybylla, R. Romeike (2014). Physical computing in computer science education. ACM Other conferences. https://doi.org/10.1145/2670757.2670782