3 Milestone III – basic smart home

This third milestone focuses on the first real, or rather "realistic", integration of sensors and software for a smart home. You are completely free to choose a combination of relevant sensors to capture data, which could—potentially—serve as input for controlling, actuating, and/or monitoring one or more systems in and around your house. Consequently, this **basic smart home concept** is a starting point for later extensions in milestone 4.

Whereas in the previous milestones a lot of external links and other instructions were provided, the subsequent milestones will only contain brief task descriptions, and limited online resources. *You* will have to figure out:

- how to install and use specific software and libraries
- which online resources and instructions are relevant when solving a particular problem

3.1 Define and implement a first smart-home setup

Some general guidelines:

- Use *at least* three different sensors
- Think about possible extensibility
- Discuss this setup with your teacher
- Test your implementation step-by-step (does it receive the expected data?, ...)

3.2 Write data to CSV file and visualize

After implementing the first basic smart home concept, create a **Python script** that can write the sensor data to a csv file. This involves the following steps:

1. Capture environmental data for *at least* 5 minutes, and accumulate the data, either into a python variable (e.g. in a list or dictionary), or directly to the CSV-file at each sensor reading. For the former, you can write the whole python variable (or object) to a CSV file at once (after reading the sensors).
2. Copy the CSV-file to your local PC (see Section 1.2.5, but make sure to switch input arguments in the secure copy command to copy in the reverse direction). You can transfer the file using any windows’ file transfer applications (do not use FileZilla as it has malware), scp cmd or direct file transfer using Git. Each type of transfer is suitable for some specific situations. Do not forget to discuss the importance of these file transfers in milestone III video.
3. **Visualize** the sensor data by importing this CSV-file into a spreadsheet program (Microsoft/Excel, Google Sheets, LibreOffice, ...). This can be in the form of a line chart, a bar chart, a pie chart, among many other possibilities.

For the Python script, you should be able to find more than enough inspiration in the online tutorials and resources discussed in milestone 1 and milestone 2.

It is generally a good idea to add a timestamp to each data row, i.e., to include a timestamp column in your CSV (or columnar data frame). In Python, you can use the built-in time module.

- https://realpython.com/python-csv/
- https://www.geeksforgeeks.org/saving-a-pandas-dataframe-as-a-csv/
- https://www.w3schools.com/python/ref_list_append.asp