Reliable AMR localization in dynamic industrial environments

- An overview of the planned PhD Project

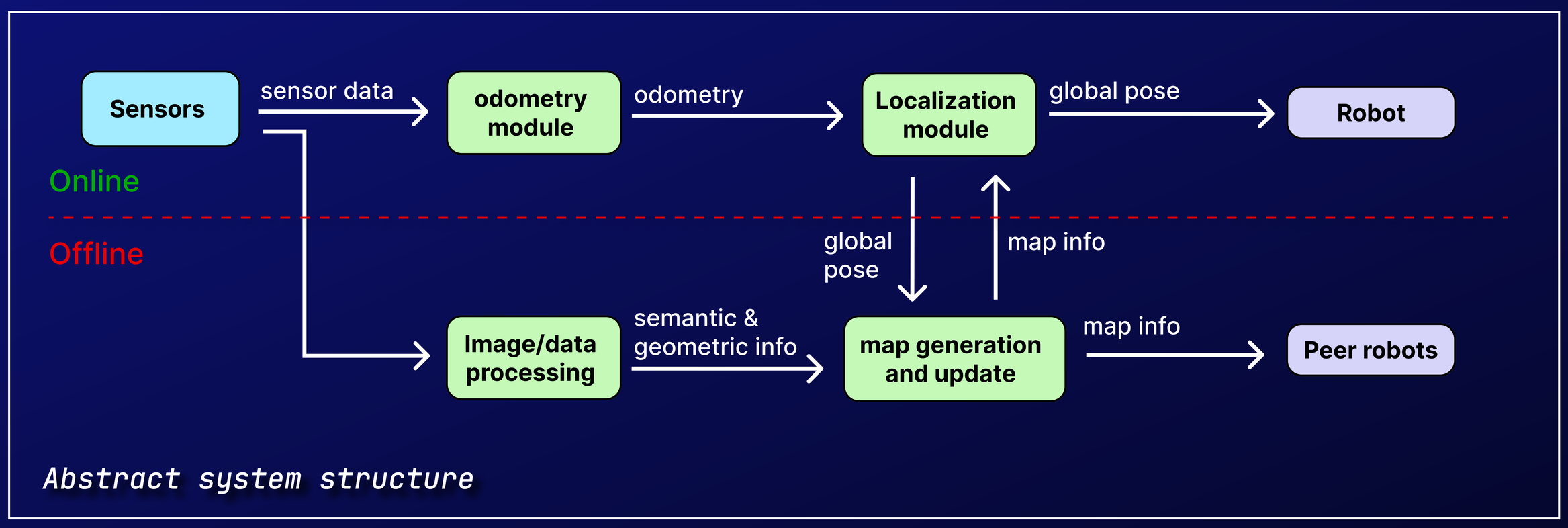
What? Enabling MiR AMRs to perform reliable localization in rapidly changing environments such as large warehouses and distribution centers.

Why? It will expand the potential market size to also include sites that are currently problematic to operate in.

How? By developing a novel localization method that uses cameras & AI to continually update a multi-layered shared representation of the temporary environment.

Temporary objects will be segmented and projected onto a static map of the building layout that the robot cannot alter. Dynamic objects in motion will be excluded. This combination will provide a reliable and updated reference for the robot to use for localization.

The static layer will ensure long-term operational reliability and allow the robot to exploit the spatial information to obtain accurate pose estimations, while the temporary layer allows the robot to maintain it, even when no static features are visible. The temporary layer is shared with peer robots to better utilize the combined observations of the entire fleet.



Abstract system structure

Example environment

Hypothesis: A multi-layered, shared localization system enhanced with metric-semantic information will enable MiR AMRs to operate in rapidly changing industrial environments.

Research question 1:
What is a possible system design for an indoor global localization system that is robust to continuous rapid changes in the physical environment, while also ensuring correct representation of static objects?

Research question 2:
How can AI tools be used to reliably differentiate between static, temporary and dynamic features in previously unseen environments?

Research question 3:
What is a scalable method to store, update and share a collective representation of the robot's common environment?

SDU MiR