

Data-driven Continuous Evolution of Smart Systems

Self-experimentation in Human-Robot Interaction

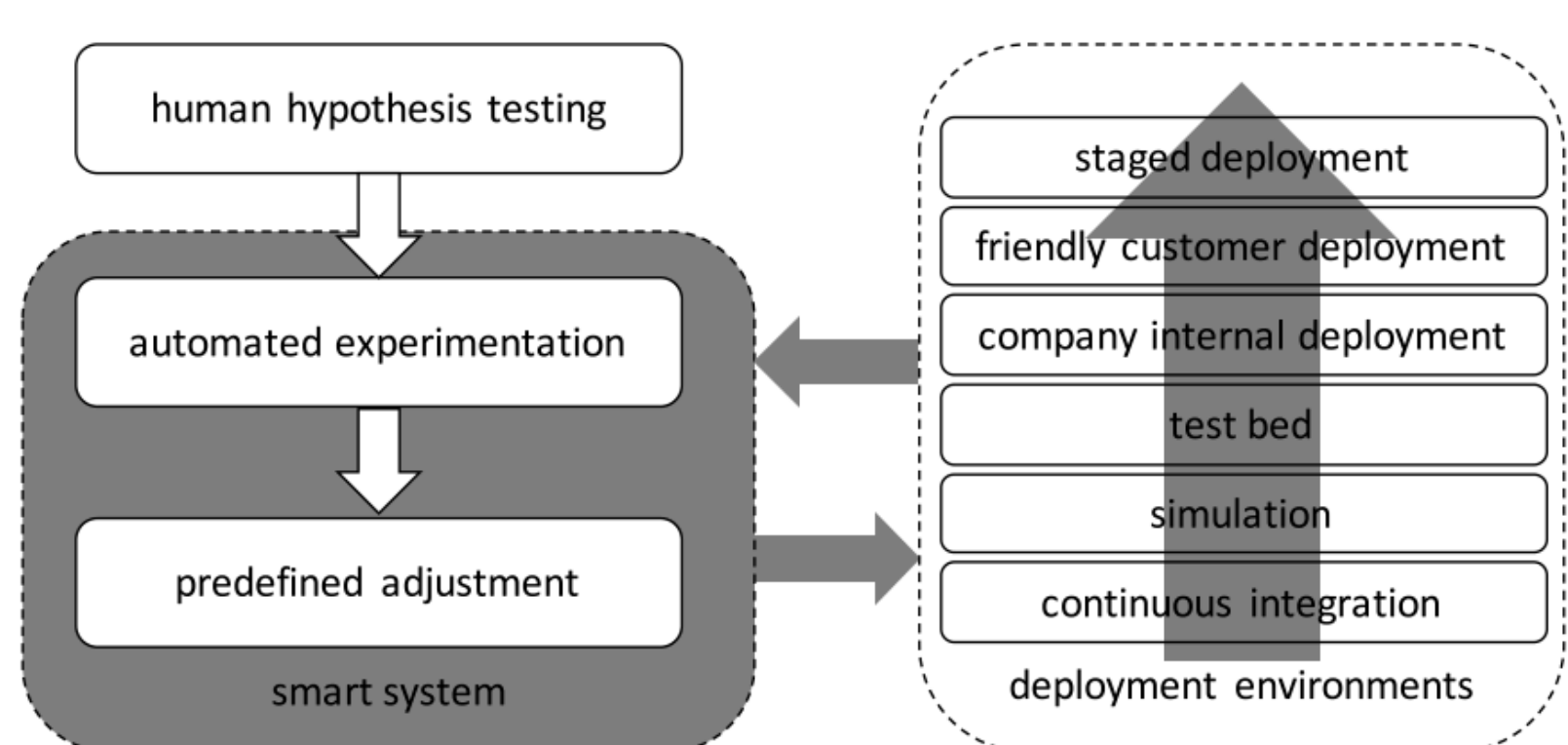
David I. Mattos*, Jan Bosch*, Helena H. Olsson**

*Chalmers University of Technology, **Malmö University

Description:

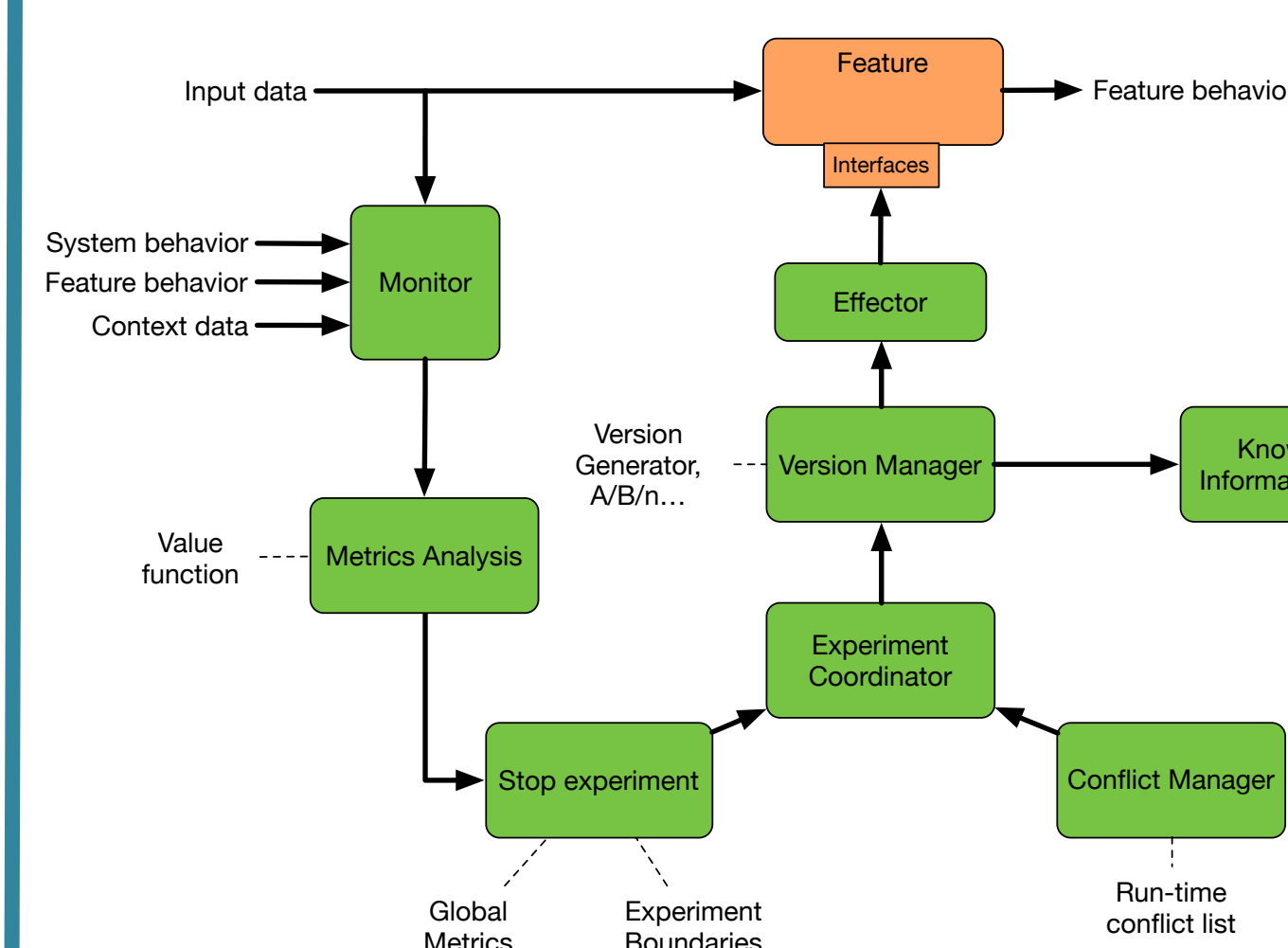
This project is concerned with self-adaptive architectures that inherently support automated experimentation and data-driven behavior. Initially, this project seeks to develop new architecture styles, patterns and solutions for self-adaptive architectures and systems that address the requirements including integral data collection and automated experimentation. The process of a system automatically experimenting a behavior and learning it experimentally is called self-experimentation. Self-experimentation helps bridging manual and automated experimentation. A first architecture for self-experimentation was developed and tested in a robot proxemics distance problem.

Background & Motivation



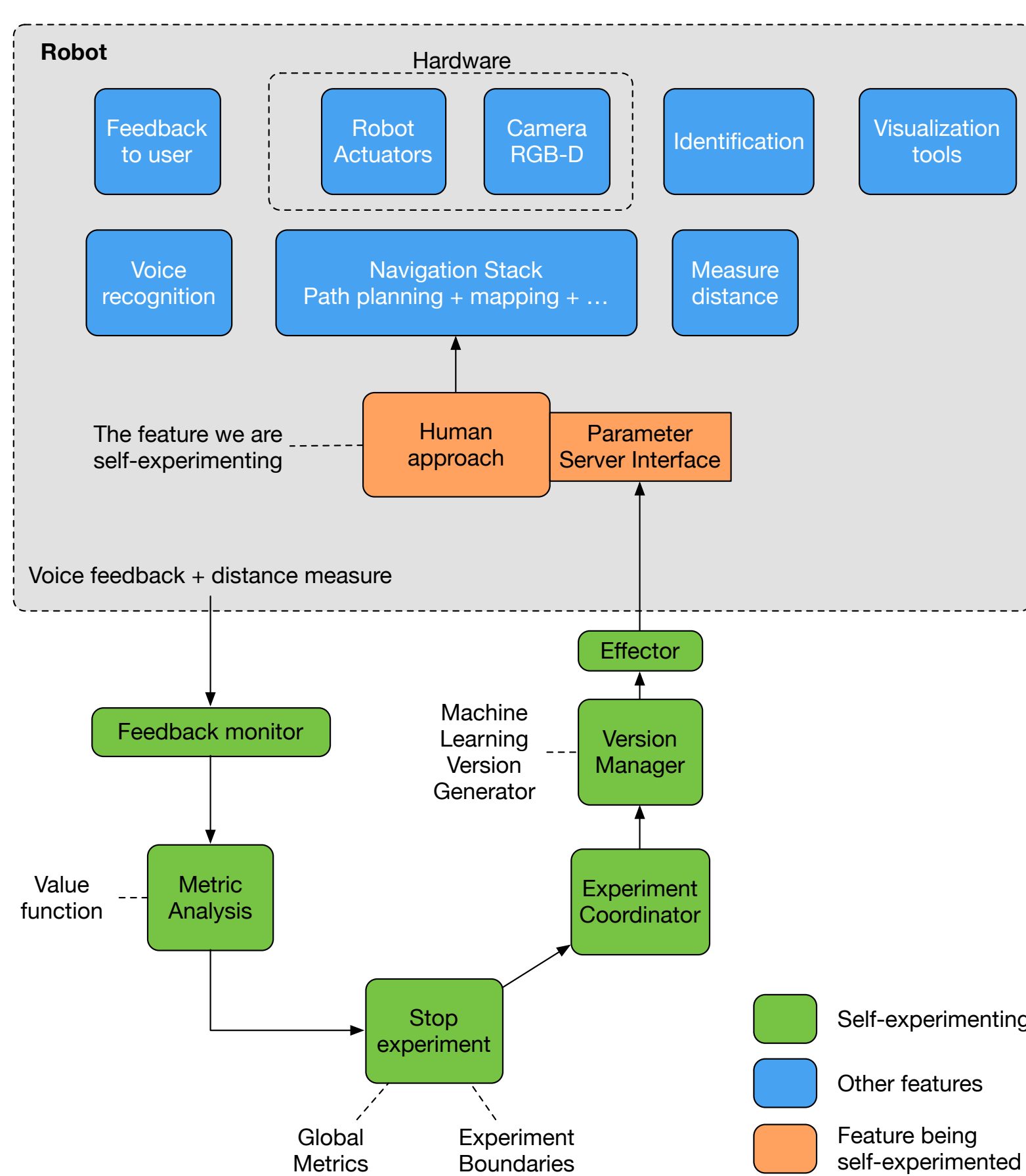
- Challenge to confirm value delivered by the developed features
- We need data to support development decisions
- Customer feedback
- Manual hypotheses experimentation
 - User behavior
- Self-adaptive systems can help bridging from manual to self-experimentation

Research Goal & Questions



- Develop architecture styles, patterns and solutions for self-experimentation
- Development methods and process to support self-experimentation.
- Validation in different domains and industrial context
- First steps:
 - Develop a preliminary architecture
 - Validation in a HRI problem

Methods & Preliminary Results



- Literature review in Self-adaptive systems
- Development of a conceptual architecture
- Implementation of the architecture in a Human-Robot interaction problem
 - Proxemics distance
- Validation:
 - Correctness architecture behavior
 - Indicates a more cost-effective solution for running experiments

Roadmap & Milestones

- Validation in different domains
 - Web
 - Embedded systems
 - Telecommunication
- Industry validation
 - Evolution of the architecture
 - Challenges associated to self-experimentation

References:

1. J. Bosch and H. H. Olsson, "Data-driven continuous evolution of smart systems," in *Proceedings of the 11th International Workshop on Software Engineering for Adaptive and Self-Managing Systems - SEAMS '16*, 2016, pp. 28–34.
2. Mattos, I. D., Bosch, J., and Olsson, H.H. Self-experimentation in Autonomous Systems. (submitted to IEEE Transactions Emerging Topics in Computational Intelligence).
3. Mattos I. D., Bosch, J., and Olsson, H.H. Development of an Architecture to Support Self-Experimentation in Autonomous Systems. (submitted to ICSA 2017).

Evolution of the robot behavior in the proxemics distance problem

