Observation and Control of Collaborative Systems (OCCS)

DFG SPP 1183 Organic Computing

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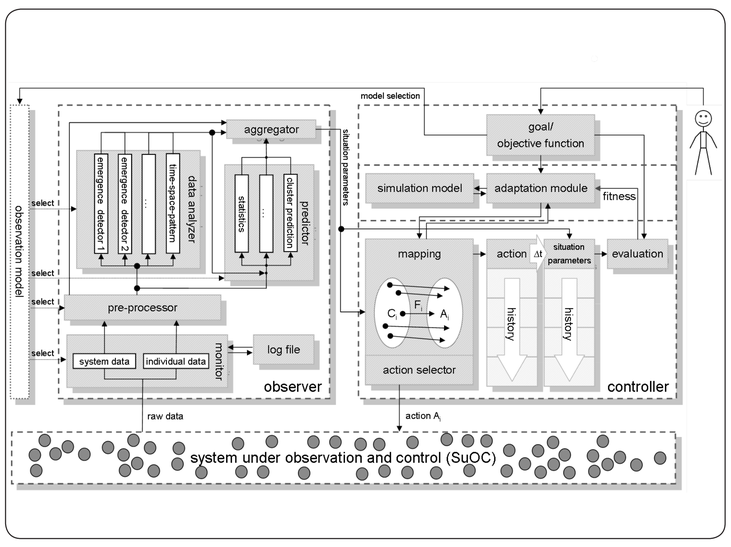
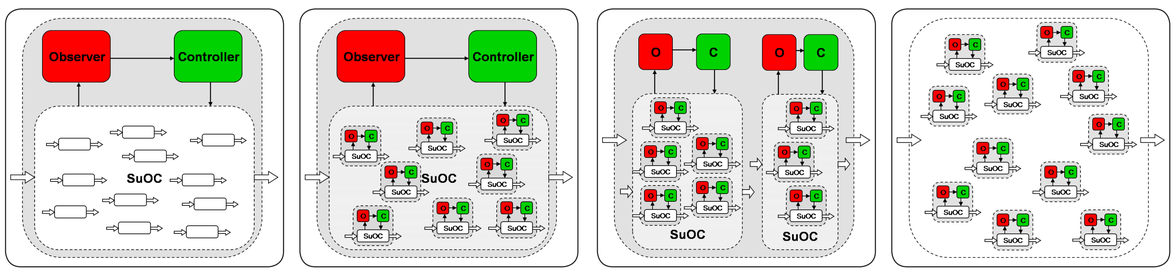
Goals

- From central to distributed o/c architectures
- Focusing on the observation and control of distributed OC systems
- Concentration on distributed and collaborative o/c architectures
- Dealing with collective learning as part of the distributed controllers
- Systematic investigation of collaboration patterns in OC systems

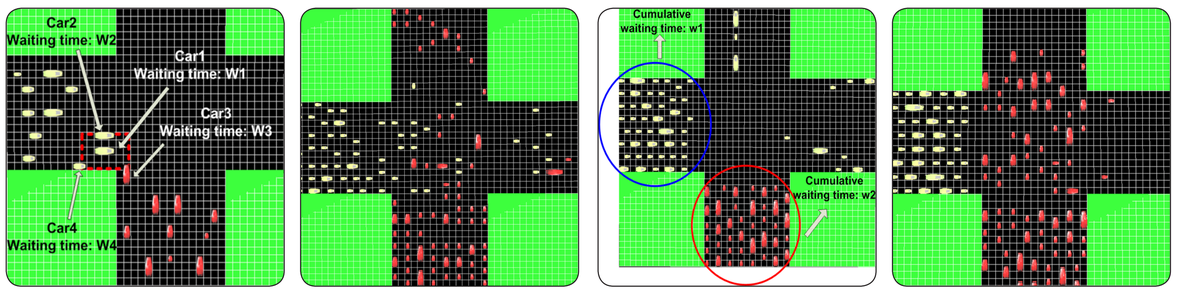
Observer/Controller Architecture



- The system under observation and control (SuOC) consists of a set of interacting intelligent autonomous units.
- The observer measures, analyses, and reports the system behaviour to the controller.
- The controller applies adequate actions to the SuOC to achieve a given goal.



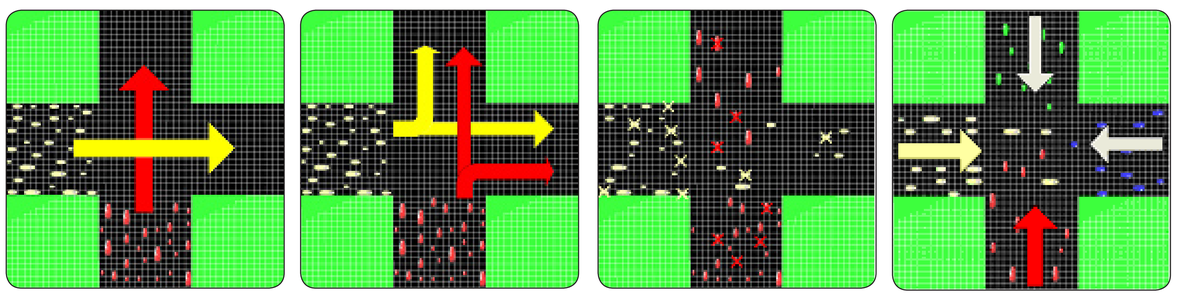
Coordination



System behaviour using the fully distributed observer/controller architecture

System behaviour using the centralised observer/controller architecture

- Comparison of both architectures using different scenarios with increasing conflict levels



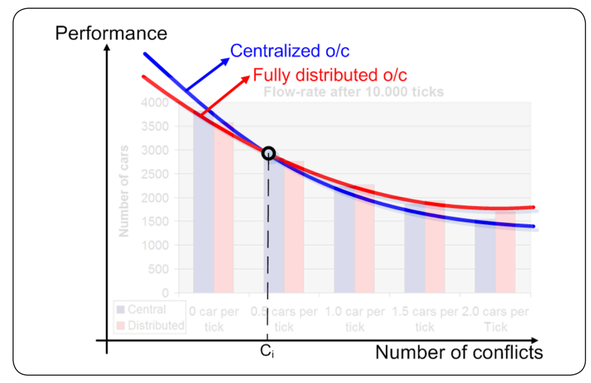
Scenario I: Basic configuration, low conflict level

Scenario II: High conflict level through variable agent behaviour

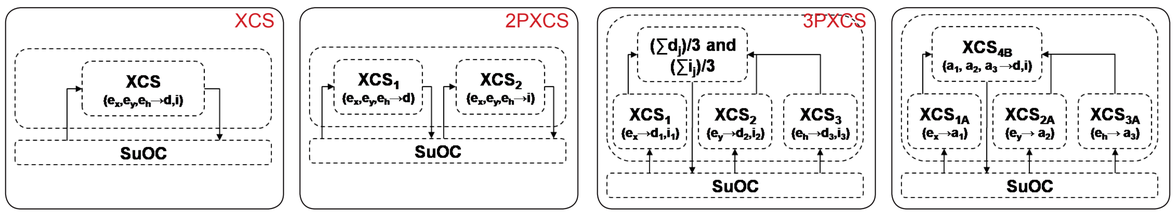
Scenario III: High conflict level through defective cars

Scenario IV: High conflict level through two-way traffic in both directions

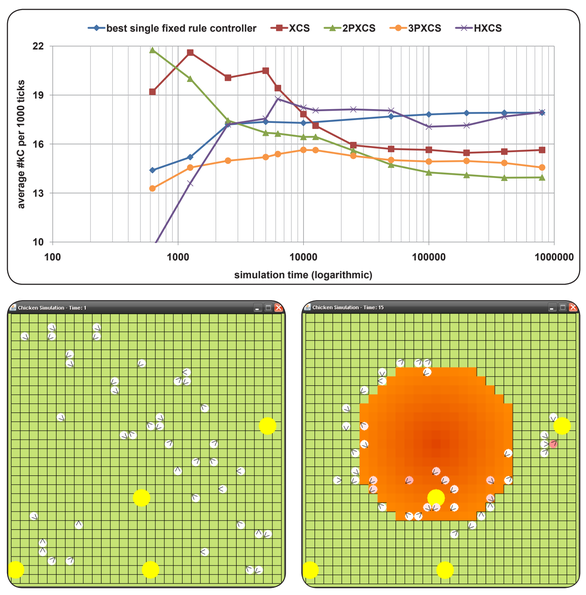
- Better system performance with the centralised o/c architecture only in the low conflict scenario.
- Outlook: Investigation of an adaptive architecture that combines a centralised and a fully distributed architecture and switches between them depending on the conflict level.



On-line learning

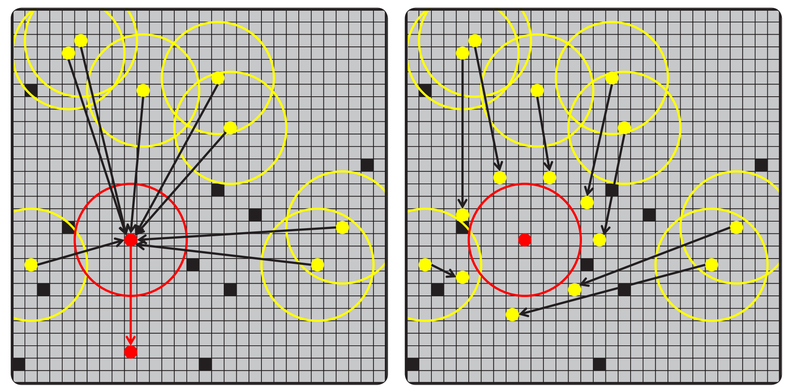


- Evaluating the feasibility of actions by observing their impact and performance on the *real* system.
- Better system performance with the learning controller.
- Improving the global XCS performance by splitting the options of condition-action-mappings into smaller sub-mappings and by solving/ combining them with parallel collaborative LCSs



Collaboration

- Investigation of collaboration patterns in a generic multi-robot scenario
- 2D grid world with obstacles
- Robots have to find and to observe one or more targets



Without collaboration

With collaboration

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