

Automatic Configuration of ROS Applications for Near-Optimal Performance

Summary

ROS system

- Node parameters
- Computation devices
- Allocation nodes-devices

Combine

Configuration1, Configuration2, ..., ConfigurationN

Performance1, Performance2, ..., PerformanceN

- ROS apps may be distributed, whose performance is a function of their individual nodes, which can be affected by parameters.
- We solve two problems: max performance, min. HW resources.
- Predicted performance is within 2.5% of empirically measured values.

Problem and solution

ROS App

- Node1 Params1
- Node2 Params2
- ...
- NodeN ParamsN

Computation devices

- Laptop
- Server rack
- Robot (KUKA)

Max Performance or Min HW resources

Allocation

Constraints

Greedy Algorithms

Case Study: Multi-agent navigation system



Case Study: Baseline system

Server domain

- Tracker (10-25Hz)
- Tracker ... (10-25Hz)
- Experiment

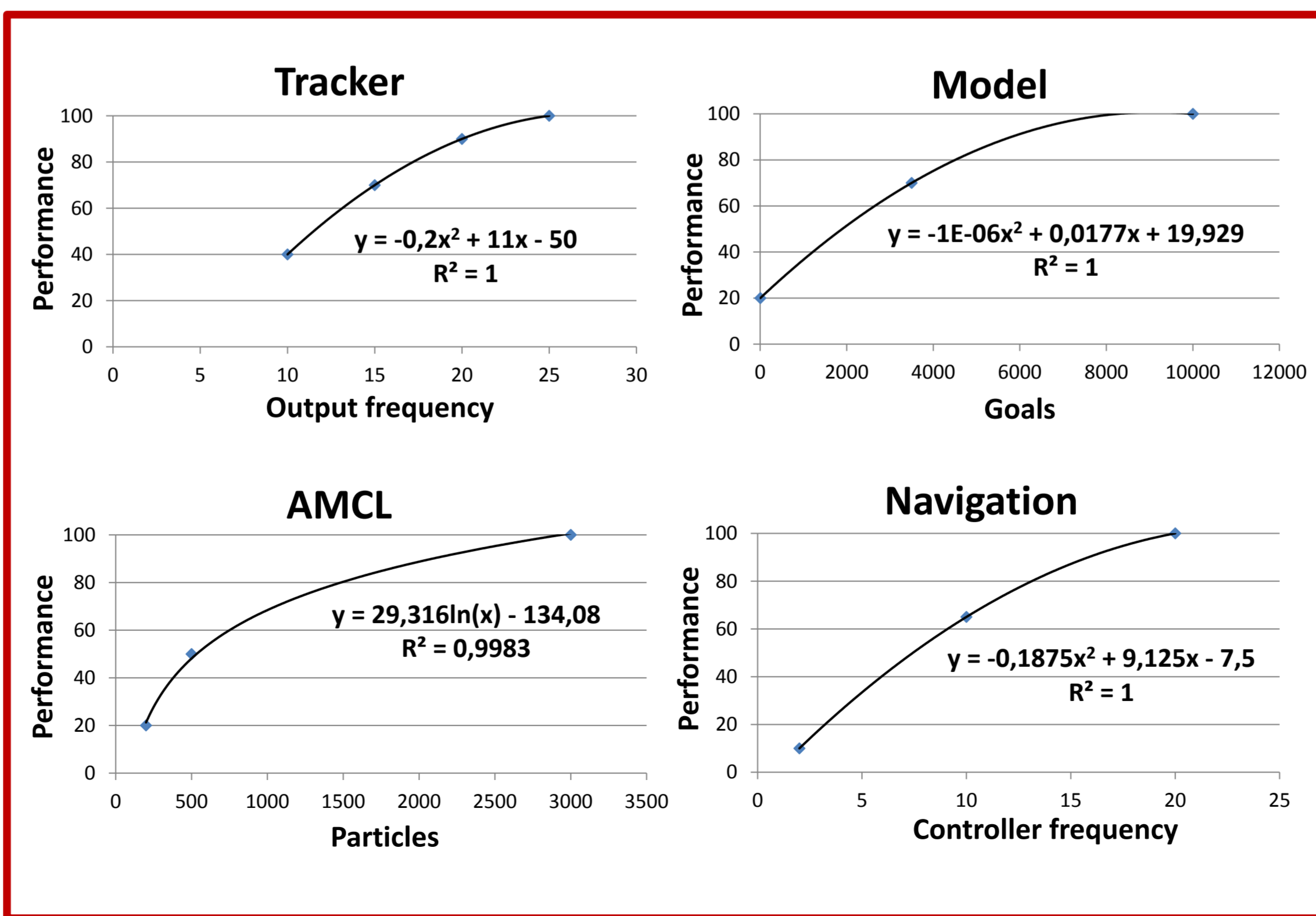
Robot Domain

- Environment (10Hz)
- Planner (10Hz)
- Navigation (10Hz)
- AMCL (1-3Hz)
- YouBot Core (50Hz)
- Model (10Hz)

- ROS Node
- Robot domain
- Server domain
- Other instances
- Parameterised
- Topic (asynch)
- Services (synch)

- Tracker:** Output frequency [10, 25] Hz
- Model:** Number of goals [4, 10000]
- Navigation:** Controller frequency [2, 20] Hz
- AMCL:** Particles [200, 3000]

Regression analysis: parameter values vs performance



Evaluation

