# Task Variant Allocation in Distributed Robotics

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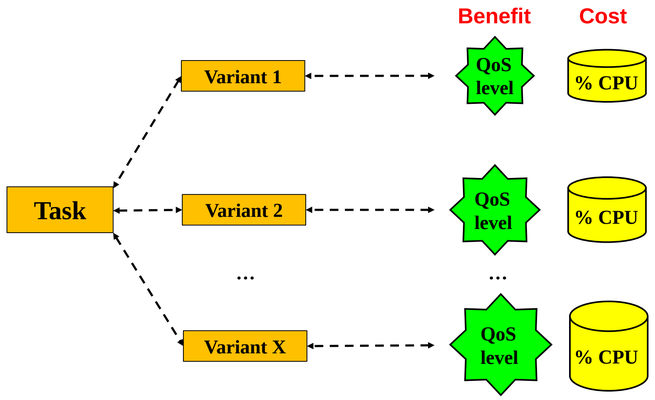
## Summary

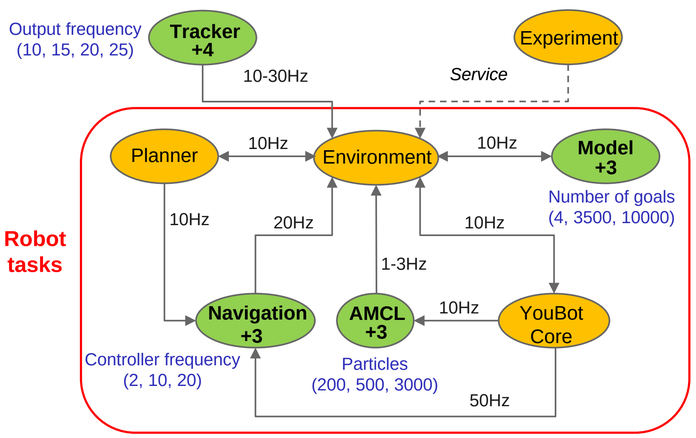

- We consider the ***problem*** of assigning software processes (or tasks) to hardware processors in distributed robotics environments.
- We introduce the notion of a ***task variant***, which supports the adaptation of software to specific hardware configurations.
- We formalise the problem of assigning task variants to processors as a ***mathematical model***.
- We propose ***three solution methods*** to the problem: Constraint Programming, a Greedy Heuristic and a Local Search Metaheuristic.
- We demonstrate the use of task variants with a ***case study***, where constraint programming improves the local search metaheuristic and the greedy heuristic by an average of ***16%*** and ***41%*** respectively.


## Case Study: Multi-agent navigation system


## Task Variants

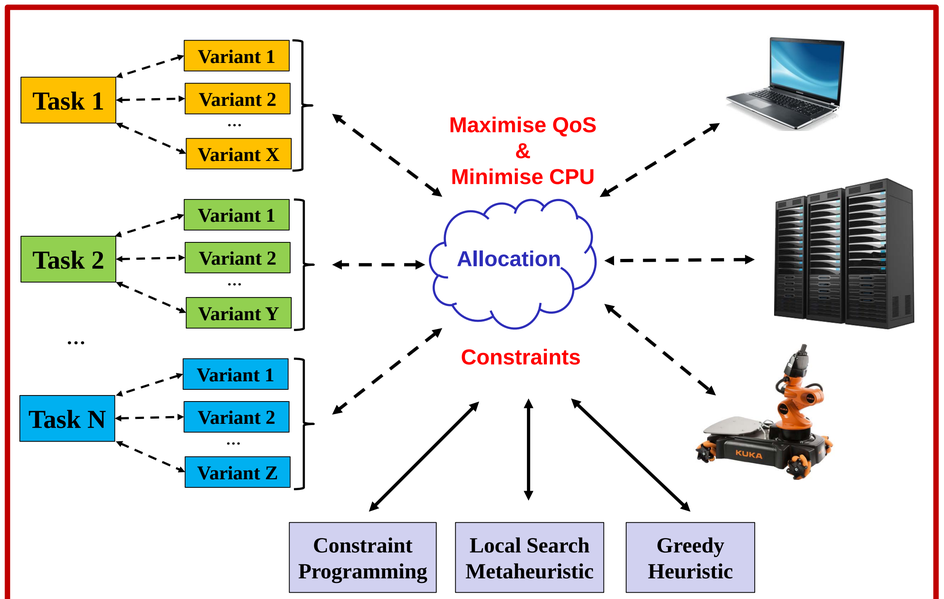



## Case Study: Baseline system and instances

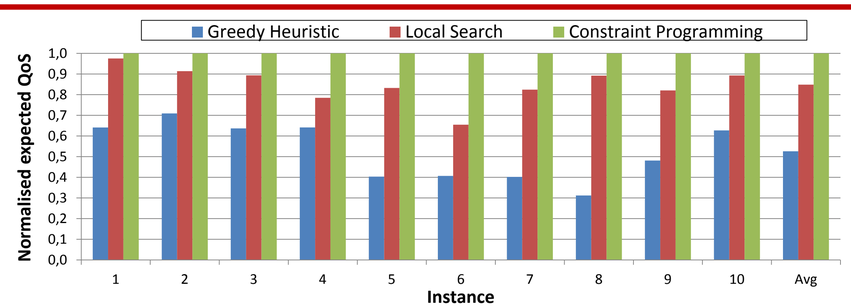


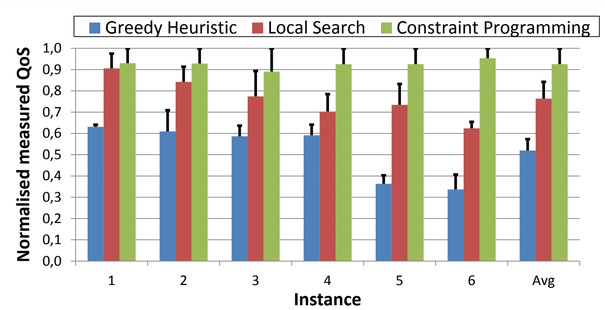

| INSTANCE | Processors | Robots | Cameras | Tasks | Variants |
|---|---|---|---|---|---|
| **1** | 2 | 1 | 1 | 8 | 17 |
| **2** | 2 | 1 | 2 | 9 | 21 |
| **3** | 2 | 1 | 3 | 10 | 25 |
| **4** | 3 | 2 | 1 | 14 | 29 |
| **5** | 3 | 2 | 2 | 15 | 33 |
| **6** | 3 | 2 | 3 | 16 | 37 |
| **7** | 4 | 3 | 1 | 20 | 41 |
| **8** | 4 | 3 | 2 | 21 | 45 |
| **9** | 4 | 3 | 3 | 22 | 49 |
| **10** | 4 | 3 | 4 | 23 | 53 |

## Problem and solution methods




## Evaluation

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