

# 1 Exercise 1

## 1.1 Computing task

Grid is  $10 \times 10$ , that means we have 100 fields.

2 - for these many times we can choose status for the field (dirty or clean). We have 100 fields, so we have to apply this rule to 100 fields:

$2^{100}$  - this is number of all combinations of board's settings.

$100^5$  - we have 5 robots. Each of them we can put on a board in 100 ways.

$20^5$  - each robot has 20 charge levels.

Number of all states is a multiplication of values mentioned above:  $S = 2^{100} \cdot 100^5 \cdot 20^5$

$T = S \cdot 10^{-6} s = 2^{100} \cdot 100^5 \cdot 20^5 \cdot 10^{-6} s = 2^{100} \cdot 10^4 \cdot 20^5 s$

## 1.2 Questions

1. In the start it says that Planning works when "Your problem is subject to frequent change", but heuristics by its nature enforce a rigidity in description of the problem. Is this an intended trade-off or if it is an open research problem?
2. What was so special about LM-cut heuristic that it caused a major boost in optimal planning in the last years?