* Components (2)+(3) project 2
  + Component (2)
    - comments about the solution (problem analysis) and conceptual modeling of the problem using agents (PAGE, PEAS, properties of the environment) (doc);
  + Component (3)  
    - a design documentation (doc) for the MAS system containing
      * the agents role within the MAS
      * a class diagram
      * the communication and interaction model between the agents.

**Problem analysis**

Each agent runs on its own simulation. The simulations are each started on their own threads and share the common environment which has a state that takes care of the synchronization on the thread level. The state is composed of a grid-like map.

**Conceptual modelling of the problem using agents**

**PEAS**:

* Performance measure: number of cleaned cells
* Environment: grid, with dirty cells
* Actuators: vacuum cleaner
* Sensors: dirt sensor

**PAGES**:

Agent:

* robot

State:

* a configuration of the map

Environment:

* grid world
* set of possible states

Actions:

* movement action
* clean dirt action
* shut down action
* spawn action

Perception:

* is the cell dirty

Goal:

* search and remove dirt within the room

**Properties of the environment**:

* accessible
* deterministic
* episodic
* static
* discrete
* non-markovian (agent tries to avoid visited cells)

**Design documentation**

**Agents role withing MAS:**

All agents have the same role. They have to explore the whole grid environment and clean the dirty cells. After all cells have been visited, their execution stops.

**Class diagram:**

**A screenshot of a computer

Description automatically generated with medium confidence**

**The communication and interaction model between the agents:**

The agents communicate through a blackboard system. The blackboard is a shared object between the agents, whose fields are synchronized. In our particular case, the blackboard contains the visited cells. When an agent visits a new cell, it is added to the blackboard in order for all agents to see it and adjust their behavior by choosing cells that are not visited by any agent. This helps also with the ending condition. Essentially, each agent terminates when all cells have been visited and cleaned.