**Problem definition**

I will be tackling the Vacuum Cleaning problem. It consists of several robotic vacuum cleaners (agents) that need to clean up a room filled with dirt which can be detected with the built-in sensors on each robot. The robots are autonomous and act independently of each other, but they share which parts of the room have been cleaned to stop when the whole room is cleaned and to avoid cleaning the same spot repeatedly. The robots can sense if they are next to a wall or next to another robot to not bump into each other.

The final goal of the robots/agents is to clean the room.

**Problem specification**

Firstly, the environment needs to be specified. It is like a grid, with **M** rows and **N** columns. Out of this MxN space, around **P%** of the cells are filled with dirt in random positions.

The next aspect that needs to be specified is the vacuum cleaning agent. At the beginning, it is spawned in a random position and 2 robots can’t occupy the same cell. The robot can tell if there is dirt only in the cell that it is occupying, and it can move in any of at most 8 surrounding cells. A cell is available for a robot to move in if the cell is within the environment borders and the cell is not occupied by another robot.

Choosing the next cell:

* Priorities cells that have yet to be checked by any robot (including the one that is making the decision)
  + If there are several such cells, a random one is chosen
* If there are no undiscovered cells, then:
  + Choose a random available cell that is different from the previously occupied cell
  + If there are no such cells, move to the previously occupied cell
  + Else if the previously occupied cell is also occupied, then the robot is surrounded by other robots and it needs to wait until another robot moves, meaning that it keeps its position

There are **K** robots spawned at the beginning. The only information they share is the positions of each robot and the already checked cells. They also know the size of the room (MxN), but are not aware of the position nor quantity of dirt.

Their goal is to clean the room by checking each cell. Each robot continuously moves independently until the final common goal is reached.