



# Projects

## Write a simulation of a robot vacuum cleaner

1. Create at random a 12m  m room out of many square units, each 20cm x 20cm. This size includes the walls of the room, and there is no open door. The room should be a mixture of empty floor cells and obstacle cells. Obstacles may come in rectangular furniture blocks (of random sizes and shapes, 2-10 units long on a side), walls (straight lines from 1 to 16 units on a side, either up-down or left-right) and individual single cell items sprinkled across the floor. Obstacles should be at random positions and it doesn't matter if they overlap each other.
2. Create a vacuum cleaner vehicle that will move around this room, cleaning the squares as it travels. The robot hardware has two wheels, a 'dirt' sensor that will tell it whether there is dirt on (1) the square in front of it, (2) the square to its right and (3) the square to its left, and an obstruction sensor that tells it if it can move forwards or not. The robot starts on a random dirty square.
3. At each simulation 'step', the  robot may move forwards one step or turn left or right on its current square by 90 degrees
4. Your program should be able to print out the current state of the room: where the objects are, which parts of the floor are clean and dirty, where the robot is and which way it is facing. Obstructions should be '#', dirty squares '.', clean squares spaces, and the robot represented according to its direction by the characters '<', '^', 'V', '>'
5. Your program should keep track of how many clean and dirty unit squares there are in the room, and how many steps the simulation has taken. When the floor is completely clean, the simulation should stop and print out the number of steps.
6. Your program should have at least TWO different types of the robot's brain; it is ok if one of them has a very simple, stupid behaviour, but try to create at least one robot brain that can do an efficient job of cleaning the floor.
7. The user should be able to select which of the two robots to use, how many pieces of furniture, walls and small items are present and also the random number seed used to create the room.
8. Once the user has input these the program should display the initial room and ask for how many simulation 'steps' to run. It should run these steps and then display the new state of the room after them and ask again for how many steps to run next. It should keep on going until the room is completely clean. There is an example of the sort of output I am expecting below

类：



#####

How many simulation steps to run? 1500

#####

```
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#      . . .      #          #####
#          #          #          .#
#          #          #          .#
#          #####
# .#####          #          .#
# .#####          #          .#
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#          .          #          .#
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#####          # #####          #          .#
#          #          #          .#
#          #          #          .#
#          . . . . . . .#
```

#####

How many simulation steps to run? 5000

Floor completely clean at step 2704

#####

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#          #          #####
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#          # #####          #
#####          # #####          #          >#
#          #          #
#          #          #
#          #
```

#####

Simulation complete