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# Artificial Intelligence for Robotics - Assignment 03

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For this assignment, you can work in a team of two. Each one in the team should be able to present all submitted material.

1. Does a finite state space always lead to a finite search tree? Can you be more precise about what types of state spaces always lead to finite search trees? (Adapted from Bender, 1996.)
2. In LEA you will find some text files containing a 2D map in ASCII format, which can be interpreted as the following:
  - \* Dirt
  - (Space) free space
  - s is the initial position of the robot
  - Any other character represents an obstacle

Each character in the text file represents a “cell” in the map. Your job is to construct an algorithm that reads the map and uses Breadth-First Search (BFS) and Depth-First Search (DFS) to **plan a path for the robot to explore and find each dirt cell**, imagining what an actual robot (like the Roomba) would do. The rules for the robot are the following:

- The robot can move from one cell to another at each step.
- The robot can only move to the left, right, up or down cells from the current position.
- The robot does not have previous knowledge about the environment, such as dirt positions or obstacles. It has to “explore”.
- The robot cannot move through obstacles and the map is closed.

You should also compare the performance of DFS and BFS. Comment on which search algorithm works better for each map. You should provide data to support your conclusions.