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*Terrain coverage algorithms for single  
and multiple robots.*

Many human tasks involve routine actions which are boring for people to do. Robots are good candidates to perform many of these tasks. The class of algorithms we are studying in this project is called "terrain coverage." These are algorithms where one or more robots travel in different directions on a terrain in order to cover the whole area completely. A good example of where such algorithms are useful is in vacuum cleaning. The Roomba robot, for instance, uses a terrain coverage algorithm to vacuum clean the room where it is placed. Terrain coverage algorithms are useful in many other tasks, such as mine sweeping, surface inspection, contamination cleanup, lawn mowing, and crop plowing. In this project we make the following assumptions: (1) the robots have a small rectangular shape, can translate and rotate, and have a laser range-finder to measure distance to obstacles in a 180 degrees cone in front of them, (2) obstacles are convex objects (rectangles, circles,...) and (3) the robots move in a closed rectangular room. The final goal is to develop algorithms to cover the room completely in the shortest time possible using one or more robots. The algorithms we have studied so far are based on simple line movements, spiral movements, and wandering. We have also tried a grid based movement, in which the robot keeps track in its memory of the locations it has visited. This last algorithm is harder for the robots, since robots accumulate odometry errors as they move and need to estimate these errors to avoid missing parts of the room. The last step in this project is to implement a mix of these algorithms on a real robot, such as the Pioneer robot.



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