Garbage Cleaning System

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Project Group 03

Problem Statement

Markov Decision Process (MDP) is a method to formulate problems where agent's actions are non-deterministic. The objective of this project is to learn a policy for an agent that operates in a grid-world environment where it has to clean the cells that contain garbage. Since the environment is modeled using MDPs, the actions are stochastic in nature, such that agent has associative probability of successfully executing every action. Garbage is spread out randomly in the environment.

Motivation

MDPs is one of the hottest topics for research in AI . For most of the real-world scenarios, the state space is infinite and the actions are stochastic in nature. Such problems can be solved by representing the problem as MDP. To incorporate the knowledge we have gained from this course, we propose the idea of this garbage cleaning system.

Approach

We would be building upon the environment provided as part of the course assignment, marking certain cells as dirty to represent garbage in the corresponding cells. Furthermore, in the second iteration of this project we will try to incorporate a few objects as obstacles in the path of the agent. The agent will be operating in the environment with the objective of making it garbage free. The agent's movements are stochastic, i.e., all the actions performed are executed with associated probabilities. To summarize, we would have a static, fully observable, stochastic environment.

We will represent this problem as a Markov Decision Process and use MDP solving strategies to compute an optimal policy that the agent can follow to clean the grid. We will be representing the entire gird as a state and the garbage free grid as the goal state with reward. Solving this MDP would return a policy that would map every state to an action.

Challenging tasks :
   1. The number of states in this case could be very high depending on the grid size.

2. Representation of the grid as a state that is amenable to learning a policy via value iteration.

Task Assignment

Table 1: Tasks Assignment

Name	Tasks Assigned
Tithi Gupta	Environment Creation
Neeraj Varshney	Markov Decision Process
Eshan Gaur	Markov Decision Process
Atta Khan	State Representation