Q1: Pacman's Tour of San Francisco

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Pacman is visiting San Francisco and decides to visit N different landmarks $\{L_1, L_2, \ldots, L_N\}$. Pacman starts at L_1, which can be considered visited, and it takes t_{ij} minutes to travel from L_i to L_j.

Part 1

0.0/3.0 points (graded)

Pacman would like to find a route that visits all landmarks while minimizing the total travel time.

Which of the following is a minimal correct state space representation?

- An integer p corresponding to Pacman's current landmark.
- An integer p corresponding to Pacman's current landmark, plus n corresponding to the number of visited landmarks.
- N boolean variables indicating whether each of the landmarks has been visited.

- (●) An integer p corresponding to Pacman's current landmark, plus N boolean variables indicating whether each of the landmarks has been visited. ✔
- ( ) An integer p corresponding to Pacman's current landmark, plus N boolean variables indicating whether each of the landmarks has been visited, plus t giving the total elapsed time.
- ( ) An integer p corresponding to Pacman's current landmark, plus n corresponding to the number of visited landmarks, plus t corresponding to the total elapsed time.
- ( ) An integer p corresponding to Pacman's current landmark, plus n corresponding to the number of visited landmarks, plus an N by N array containing t_{ij} for any (i, j).
- ( ) This cannot be represented as a search problem.

Explanation
The minimal state representation is Pacman's current location and which landmarks he has visited (boolean indicators or a set or an unordered list) OR the inverse, which landmarks Pacman has not visited.

Submit You have used 0 of 1 attempt

ℹ Answers are displayed within the problem

Part 2

0.0/3.0 points (graded)
Ghosts have invaded San Francisco! If Pacman travels from L_i to L_j, he will encounter g_{ij} ghosts.
Pacman wants to find a route which minimizes total travel time *without encountering more than* G_{max} *ghosts* (while still visiting all landmarks).

Which of the following is a minimal correct state space representation?

- ( ) An integer p corresponding to Pacman's current landmark.

- An integer p corresponding to Pacman's current landmark, plus n corresponding to the number of visited landmarks.
- An integer p corresponding to Pacman's current landmark, plus n corresponding to the number of visited landmarks, plus g corresponding to the number of ghosts encountered so far.
- An integer p corresponding to Pacman's current landmark, plus n corresponding to the number of visited landmarks, plus an N by N booleans indicating whether Pacman has transitioned from L_i to L_j and encountered g_{ij} ghosts.
- An integer p corresponding to Pacman's current landmark, plus N boolean variables indicating whether each of the landmarks is visited, plus g corresponding to the number of ghosts encountered so far. ✔
- An integer p corresponding to Pacman's current landmark, plus n corresponding to the number of visited landmarks, plus g corresponding to the number of ghosts encountered so far, plus t corresponding to the total elapsed time.
- An integer p giving Pacman's current landmark, plus N boolean variables indicating whether each of the landmarks is visited, plus an N by N booleans indicating whether Pacman has transitioned from L_i to L_j and encountered g_{ij} ghosts.
- This cannot be represented as a search problem.

Explanation
The minimal state representation is the visited (or unvisited) landmarks (as above), Pacman's current landmark (as above), and the number of ghosts encountered thus far (or the inverse, the number of ghosts that can be encountered in the future).

Submit You have used 0 of 1 attempt

Answers are displayed within the problem

The ghosts are gone, but now Pacman has brought all of his friends to take pictures of all the landmarks. Pacman would like to find routes for him and each of his $k-1$ friends such that *all landmarks are visited by at least one individual*, while minimizing the **sum of the tour times** of all individuals. You may assume that Pacman and all his friends start at landmark L_1 and each travel independently at the same speed. Formulate this as a search problem and answer the following questions.

Part 3

0.0/3.0 points (graded)

Which of the following is a minimal correct state space representation?

- k integers indicating each Pacman's current landmark, plus n corresponding to the number of landmarks visited by at least one agent.
- **k integers indicating each Pacman's current landmark, plus N boolean variables indicating whether each of the landmarks is visited by at least one agent. ✔**
- k integers indicating each Pacman's current landmark, plus N integers indicating how many agents have visited each of the landmarks.
- N boolean variables indicating whether each of the landmarks is not yet visited by any agent.
- k integers indicating each Pacman's current landmark, plus N integers indicating how many agents have visited each of the landmarks, plus t corresponding to the sum of the tour times of all agents.
- k integers indicating each Pacman's current landmark, plus N boolean variables indicating whether each of the landmarks is visited by at least one agent or is going to be visited by at least one agent in the next move.
- None of the above is correct or minimal.
- This cannot be represented as a search problem.

Explanation
The state representation is the landmarks visited by at least one agent, stored as N boolean indicators, a set, or an unordered list (or the inverse -- the unvisited landmarks) and the current location of each of the k agents.

Submit You have used 0 of 1 attempt

Answers are displayed within the problem

Pacman would now like to find routes for him and each of his $k-1$ friends such that all landmarks are still visited by at least one individual, but now minimizing the **maximum tour time** of any individual. Formulate this as a search problem and answer the following question.

Part 4

0.0/3.0 points (graded)
Which of the following is a minimal correct state space representation?

- k integers indicating each Pacman's current landmark, plus n corresponding to the number of landmarks visited by at least one agent, plus t corresponding to the total elapsed time.
- k integers indicating each Pacman's current landmark, plus n corresponding to the number of landmarks visited by at least one agent, plus t corresponding to the maximum tour time of all agents.
- k integers indicating each Pacman's current landmark, plus N boolean variables indicating whether each of the landmarks is visited by at least one agent, plus t corresponding to the maximum tour time of all agents.
- k integers indicating each Pacman's current landmark, plus n corresponding to the number of landmarks visited by at least one agent, plus k integers indicating the tour time of each agent.

- ◉ k integers indicating each Pacman's current landmark, plus N boolean variables indicating whether each of the landmarks is visited by at least one agent, plus k integers indicating the tour time of each agent. ✔
- ○ None of the above is correct or minimal.
- ○ This cannot be represented as a search problem.

Explanation
The state representation is the landmarks visited and the current location of each agent (both as above), as well as the tour time for each agent.

Submit You have used 0 of 1 attempt

ℹ Answers are displayed within the problem