Artificial and Computational Intelligence

Assignment 1

Radar detection and finding the optimal heuristic path to reach the destination during Drone Warfare

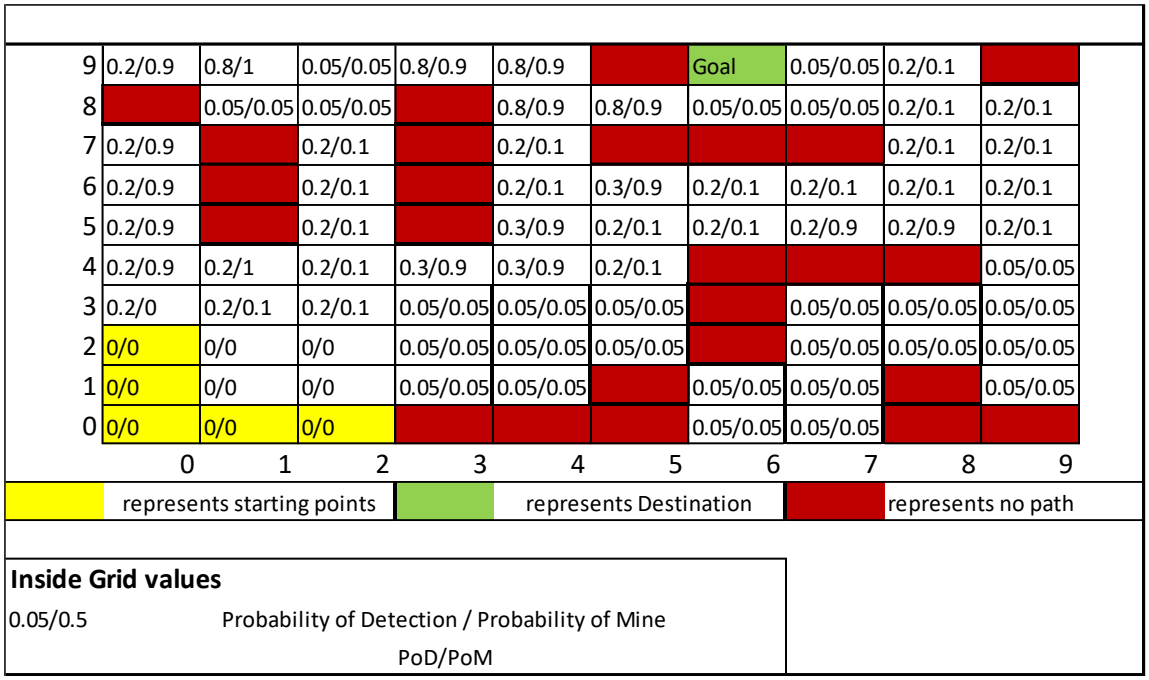
Radar detection during the war is challenging with many uncertainties as detection is still an evolving field. During war, drones are emerging as the technology of choice due to their lower cost and their capability to reach a destination by avoiding enemy radar systems using an optimal path. The challenge is probabilistic and non-deterministic; complete knowledge is unavailable for the location of radar position. This changes drastically when technology is used to find radar locations. As part of Make in India, a company has designed a low-budget Drone that uses customized algorithms to detect radar. However, the accuracy of the system is always at most 80%. The terrain to be traversed can have large shrubs, which can reduce the chances of detection of the portable radar system.

You are approached to build an AI-based decision support system that can take the inputs from the satellite (land terrain – the probability of detection (PoD), drone (probability of radar (PoM)), and from the commander to understand the level of risk he is willing to undertake to reach the destination at the earliest. However, avoiding the radar has the highest priority.

Prove that your technique is correct for the case given as a maze problem when the heuristic to achieve given goal is given by

$$\text{Min}(f(n))=[(1+\text{PoD})(1+\text{PoM})]$$

Apply the Local Beam Search with k=3 parallel beams & Suggest the best solution obtained and optimal cost so the commander can decide the best course of action.



Evaluations will be based on the following:

1. Explain the PEAS (Performance measure, Environment, Actuator, Sensor.) for your agent. (20% marks)

2. Use the above mentioned algorithm and implement in PYTHON. (40% marks)

3. Print the optimal path sequence with costs. (20% marks)

4. For local search interpret the significance of the hyper parameters if any applicable. (20% marks)

Note 2:

- You are provided with the python notebook template which stipulates the structure of code and documentation. Use well intended python code.
- Use a separate MS word document for explaining the theory part. Do not include the theory part in the Python notebook except Python comments.
- The implementation code must be completely original and executable.
- Please keep your work (code, documentation) confidential. If your code is found to be plagiarized, you will be penalized severely. Parties involved in the copy will be considered equal partners and will be penalized severely.