Group 20:
Project specification on
DD2380 - Artificial Intelligence

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Multi-agent based guarding and covering as a variation of the classical "Art Gallery Problem"

Motivation

The description of the problem Nowadays, coverage and coordination problems have been a pole of interest in a broad application domain from military surveillance to automatic vacuum cleaners. Thus, we decided that it would be very interesting to carrying out a project on this topic. The description of our problem is practically a variation of the Art Gallery Problem (AGP). The original AGP corresponds to a real-world problem of guarding an art-gallery, using the minimum possible guards in optimal spaces who combined can observe the whole gallery. In our version, the room with obstacles, a set of points of interest, the number of guards and their sensor range is given and we want to find the paths which make the guarding optimal in the sense of all points been seen at least once in minimal time.

Concepts that we plan to study and use to address the problem

- Find computational feasible and well performing algorithm (preferable optimal)
- Experimenting on different algorithms that may solve the problem and compare them
- Dive as deep as time allow as to the best performing algorithm
- Experimenting on different parametrization of the problem e.g. different number of guards, range, number of items that need to be seen, and landscape.

The starting point of the literature

- Church, R. and Velle, C.R., 1974. The maximal covering location problem. Papers in regional science, 32(1), pp.101-118.
- Laporte, G., 1992. The vehicle routing problem: An overview of exact and approximate algorithms. European journal of operational research, 59(3), pp.345-358.
- Glover, F., 1989. Tabu Search âĂŤ part I. ORSA Journal on computing, 1(3), pp.190-206.

The combination of evaluation we aim for Technical depth (Dp) = 2ph ,Technical breadth (Br) = 2ph ,Implementation (Im)= 3ph ,Anaysis and Discussion (An) = 4ph

Division of work and the time-line As this being a group project all of us will have to know and get involved with each part of the project. Nevertheless, our different backgrounds give us the opportunity to divide the workload in a much efficient way, in terms of time consumption and optimality on the results. Therefore, we decided to divide the workload in the following way:

- Literature study, understanding and explaining to others the theoretical aspects of the problem: George Zervakis and Christos Matsoukas
- Implementation of the main algorithms: François Chastel, Alexandros Ferles and Quentin Vecchio
- Experimenting and inference George Zervakis and Christos Matsoukas
- Combining all together in order to construct a solid outcome: The whole group

Of course all members will spent time on the coding part and the theoretical one but the ones with better understanding on maths will help the others on the critical points and vice versa. Having that in mind, we propose the following timetable:

- Day 1-3: Deep comprehension of the theoretical background i.e. the difficulty of the problem and the proposed solution.
- Day 2-3: Start building the environment of the problem (Note that our plan is to use Python)
- Day 4-7: Implementation of the main algorithms(Up to this point it should be the 50% of the project)
- Day 7-9: Run different experiments as the formulation of the problem will vary
- Day 9-11: Run the same experiments with different algorithms to compare them
- Day 11-presentation day: Combining everything together and prepare the final form of the report and the presentation.

Please note that our plan is to write the report in parallel with each of the parts mentioned before.