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Optimal Camera Placement

CO3201 Interim Report

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# Aims and Objectives

## Aims

Whilst the Optimal Camera Placement Problem (OCCP) has been studied for decades by this point (J. Zhao, 2011), many studies focus on purely theoretical solutions, that ignore many of the existing real world constrains (Sclaroff, 2004). As such, it is difficult to find algorithms that would be applicable given realistic conditions.

The **primary aim** of this project is to conduct a technical review of the algorithms used for determining optimal camera placement problem and determine ones best suited for the real-world circumstances. One of the important sub aims is to create a visualisation tool so that user can see solutions of different algorithms and compare them to determine the best one for their problem.

## Objectives

1. Conduct a Literature Review
   * Determine a list of algorithms used to solve OCCP
   * Filter out all algorithms which do not follow realistic world constraints, such as unlimited Field of View, infinite Depth of Field or infinite Line of Sight (Sclaroff, 2004)
   * Filter out all algorithms which currently cannot be implemented easily due to their mathematical complexity.
2. Develop a way of comparing algorithmic performance
   * Determine a varied list of starting parameters based on real world situations. These parameters would include values such as Effective Camera Range or Initial Area.
   * Determine a varied list of constraints. Such constraints would consist of cost, maximum number of cameras and similar.
   * Develop an algorithm that given list of parameters and constraints as well as the solution, returns a single **quality score**.
3. Implement a testing environment/visualisation tool for algorithms such as one in (D-Link Corporation, 2014)
   * Determine an optimal technology for the tool (Such as which programming language to use).
   * Create a floor plan generator/handler that either generates the floor plan or imports existing one (Subject to availability and difficulty of implementation).
   * Create a camera object which can handle a range of parameters applicable to most modern cameras (Stahl, 2008) such as field of view between 45 and 360 degrees.
   * Implement each algorithm from Main Objective 1.
4. Compare algorithms
   * Test each algorithm over a range of real-world situations.
   * Determine which algorithm achieved best results in specific situations as well as an algorithm which achieved highest average quality score.

# Planning and Timescales

Below I present a time scale for the project, including started, in progress and completed tasks. Whilst each objective is divided into approximately equivalent tasks, the actual project progression is linear. As such, I have decided to split the project into effectively four stages. At each stage, **Scrum** methodology will be used to complete it. Once enough user stories have been completed within given objective, the project would carry on to the next objective.

Scrum is a subset of Agile consisting of Backlog and Sprints. Backlog is a list of all tasks/functionalities related to the project. In this specific case, each objective will have its own Backlog consisting of related user stories. Sprint is a repeatable time box during which a “Done” product is created (Sutherland, 2017). Duration of the Sprint is usually one to four weeks. I have decided to set the duration to two weeks so that Sprint Review can be conducted together with the main Stakeholder – Project Supervisor.

# Bibliography

J. Zhao, D. H. R. Y. a. S. C., 2011. *Approximate techniques in solving optimal camera placement problems.* Barcelona, IEEE International Conference on Computer Vision Workshops, pp. 1705-1712.

Sclaroff, U. M. E. a. S., 2004. Optimal placement of cameras in floorplans to satisfy task requirements and cost constraints. In: *In Proc. of OMNIVIS Workshop.* s.l.:s.n., pp. 1-12.

Stahl, M. P. a. J., 2008. *The Camera Placement Problem - An art gallery problem variation.* s.l., s.n.