Memetic Algorithms for Realizing Graphs with Distance Constraints in 3D

Introduction

- A good description of relationships between objects is essential to the computer vision field. (for scene description or image understanding)
- The problem is to build graph layouts for weighted graphs. When representing a geometric graph layout, geometrical distances between the vertexes should be consistent with the weights of the edges.
- The target is to implement memetic algorithms of genetic algorithms and local search algorithms to find out optimal solutions for realizing graphs with distance constraints.

Algorithms

Two memetic algorithms are used to solve the RGDC problem by combining the genetic algorithm[1-3] and a specific local search operation[4-5](avoid trapping local optimal solutions).

A. Genetic Algorithm + Simulated Annealing Method

B. Genetic Algorithm + Variable Neighborhood Search

Results

Four algorithms have been tested and the errors and the runtime are recorded respectively for comparisons (GA+BFS+M1+M2).

Conclusions

The results demonstrate that the accuracy of the memetic algorithms is much higher than that of the genetic algorithm. The memetic of genetic algorithm and simulated annealing performs best in both accuracy and efficiency.

In future research, we will try to work out whether the genetic algorithm’s performance can be improved by incorporating other local search operations.