

CS 6319 - Computational Geometry

Project Proposal

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Prototype of a game where a hand drawn image is turned into the layout of a level, leveraging Computational Geometry and Image Processing/Computer Vision algorithms.

1. Project Description

The idea is to create a game where a hand drawn image is converted into a stage/level. For the prototype, I am planning to add a ship, objects to avoid (lava), the land where the ship can't go and a goal. I will use Contouring to detect the map from the drawing and use Voronoi diagrams to divide the map, so that I can choose partitions to randomly place objects.

2. Known Results

AR/Mixed Reality Games

Advanced AR/Mixed Reality games use real world objects as levels or obstacles in game.

Self-driving cars and robots

They use a system like these to navigate the real world. Advanced AI (Computer Vision) algorithms are integrated with sensors and path finding algorithms to reach the destination autonomously by these cars and robots.

3. Project Plan

- a. Land will be generated from a hand-drawn image using contouring and approximate the shapes of land to a polygon using convex hulls.
- b. The remaining part of the screen would be water, Voronoi diagram will be computed for the part, using randomly placed points in this region.
- c. Some cells of the Voronoi diagrams will be turned into lava.
- d. A cell will be turned into a Goal cell.
- e. A* Path finding Algorithm will be used to check if the goal is valid, otherwise we will reassign the goal and lava objects.

- f. The GJK Algorithm will be used to detect collisions between ships, the land, the goal and the obstacles.
- g. Keyboard will be used as controls
- h. Objective of the game is to reach the goal while avoiding the obstacles.

4. Goal

The Goal of the project is to implement and visualise a system which uses image processing and computational geometry, in a creative way. This kind of system is used in self driving cars/autonomous robots, this project is a small abstraction of that.