CS271 Computer Graphics II

Fall 2025

Problem Set 1

Due: 23:59, Oct. 24, 2025

1. Submit your **PDF** solution to the course **Gradescope**. **[Code: 8XV4G8]**

2. Submit your **Source Code and PDF as a zip file** to the **ShanghaiTech EPAN**: `https://epan.shanghaitech.edu.cn/l/RF2KH8`. [**Filename:** `name_2025xx(your id)_hw1.zip`]

3. There are no restrictions on programming languages.

4. You are required to follow ShanghaiTech's academic honesty policies. You are allowed to discuss problems with other students, but you must write up your solutions by yourselves. You are not allowed to copy materials from other students or from online or published resources. Violating academic honesty can result in serious penalties.

Problem 1: Melkman's Algorithm for Simple Polygon Convex Hull

Implement Melkman's algorithm to compute the convex hull of a simple polygon in $\mathcal{O}(n)$ time complexity.

Reference: Lecture 2, page 71
Requirements:

1. **Input:** A simple polygon represented as an ordered sequence of n vertices.

2. **Output:** The convex hull vertices in counterclockwise order.

3. Complexity analysis explaining why the algorithm achieves $\mathcal{O}(n)$ time.

4. Test cases with at least three different polygons.

Problem 2: General Voronoi

Study general Voronoi diagrams and implement one variant of your choice.

Reference: Slides of General Voronoi.
Requirements:

1. Explain which variant you chose and why.

2. Implement the algorithm with proper data structures.

3. Visualize the result (2D plot showing sites and Voronoi regions).

4. Analyze the time and space complexity.

5. Test cases with at least three different point configurations.