Computer Graphics 1

Project 4

Subject: Filling and clipping

The goal of this project is to extend the application from previous project with the functionality of clipping polygons and filling them with a solid colour or with a colour from an image.

Requirements

- extending the application from the previous project,
- all the previously implemented functions should still work,
- implementation of one assigned clipping algorithm and one assigned filling algorithm,
- drawing rectangles:
  - drawing rectangles with a mouse by selecting position of two opposite corners of a rectangle,
  - editing existing rectangles with a mouse (moving its vertices and edges which change its size),
  - moving entire rectangle,
  - deleting existing rectangles,
- clipping selected polygons to selected rectangles or polygons, depending on the assigned algorithm:
  - for Sutherland-Hodgman algorithm — creating as a result of clipping new editable polygons that behave as normal polygons created by the user,
  - for all others, drawing with different colour fragments of edges of the clipped polygon that fit inside the clipping polygon or rectangle. This highlight should update with any changes to both source polygons,
- ensuring the selected polygons are valid for a given clipping algorithm — if not, that option should be disabled,

- option to fill selected polygons with a solid colour selected by the user,
- loading images and using them instead of a solid colour to fill selected polygons,
- loading different images for each shape,
- loading and saving all the shapes on the screen to a file in a vector form with all the additional information like fill colour and fill images.

Remarks

All the drawing must be done using only single pixel operations

Interaction with the application may be handled mainly by the graphical user interface. All actions performed with keyboard shortcuts should be possible to do using application GUI.

All the listed clipping algorithms are described on the 6th and 7th lecture slides. The lecture and slide number are given in the parenthesis next to each algorithm.

Clipping algorithms [6 points]

- Cohen-Sutherland (l.6, s.5-9) - clipping polygons to a rectangle,
- Cyrus-Beck (l.6 s.10-15) - clipping polygons to a convex polygon,
- Liang-Barsky (l.6 s.16-18) - clipping polygons to a rectangle,
- Sutherland-Hodgman (l.6 s.19-21) - clipping polygons to a convex polygon,

Filling algorithms [9 points]

Filling using Scan-Line algorithm with Active Edge Table (l.7 s.3-5) with one of the Active Edge Table update method:

- Edge Table (l.7 s.6-8),
- Vertex Sorting (l.7 s.9-10).