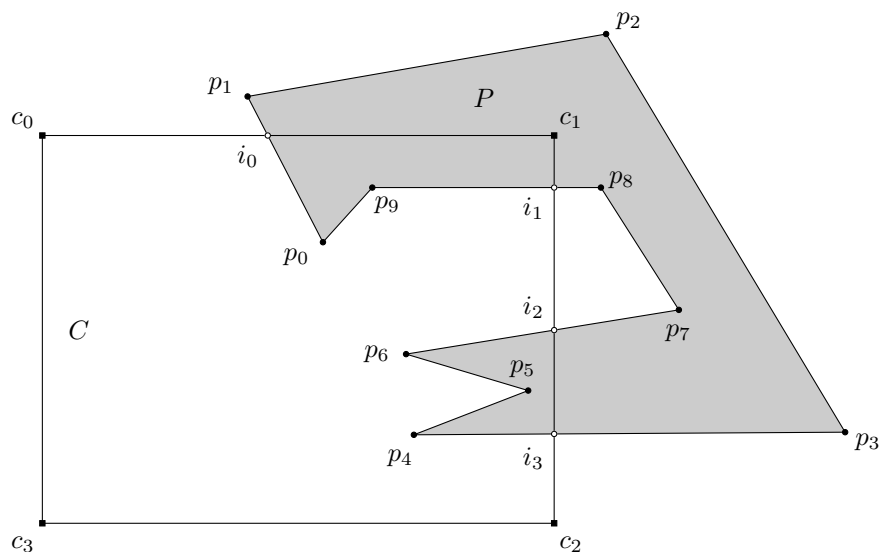


## 2007/2008 Graphics Tutorial 9

**Problem 1** We are clipping the polygon in the image below with the clipping region  $C$  using the Sutherland-Hodgman algorithm. Give the resulting polygon(s) by listing their vertices.



**Problem 2** We are clipping the polygon above again, but this time with the Weiler-Atherton algorithm. (a) Explain how the graph used by this algorithm is constructed. (b) Give the graph for the polygon and clipping region in the image above. (c) Explain how the graph is used to determine the resulting polygons.

**Problem 3** If triangle meshes are subdivided into triangle strips or triangle fans, the number of vertices that has to be transferred to the graphics card can be reduced significantly. What is the gain for a mesh of 666 triangles that can be partitioned into 42 strips?

**Problem 4** The form factor  $F_{ij}$  for source patch  $i$  and receiver patch  $j$  is given by

$$F_{ij} = \frac{1}{A_i} \int_{A_i} \int_{A_j} \frac{\cos \theta_i \cos \theta_j}{\pi r^2} dA_j dA_i$$

- (a) Explain all terms, and indicate why they are in the formula.
- (b) In practice, form factors cannot be computed analytically. How are they computed, and in what sense is the computation an approximation of the analytical solution?
- (c) What is the relation between the radiosity of patch  $i$  and the form factors  $F_{ij}$  for  $i$  and all other patches  $j$ ? Give a formula, and explain it.
- (d) What is progressive refinement?
- (e) What is adaptive subdivision? What are the advantages and disadvantages of adaptive subdivision w.r.t. alternative methods?
- (f) How is the final image rendered when all radiosities have been computed?