Abteilung Algorithmik
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WS 12/13

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Computational Geometry
Homework Set 0, 07. 11. 2012

Solutions to this homework set will not be evaluated, the homework set is treated in the first small tutorial.

Exercise 1 (Guards): For each polygon in Figure 1 find the minimum number of guards necessary to cover it.

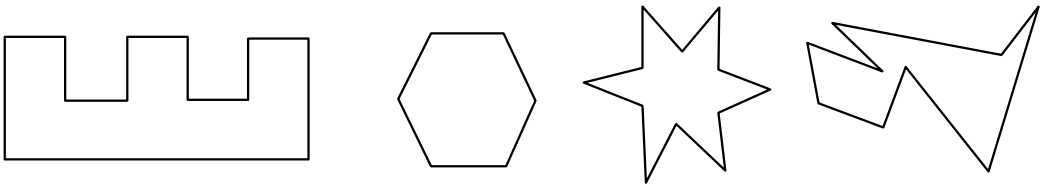

Figure 1: Polygons that need to be guarded.

Exercise 2 (Unique Triangulations): For each $n > 3$, find a polygon with n vertices that has a unique triangulation

Exercise 3 (Blocking Guards): Suppose that guards themselves block visibility so that a line of sight from one guard cannot pass through the position of another. Are there polygons for which the minimum of our more powerful guards needed is strictly less than the minimum needed for these weaker guards?

Exercise 4 (Lower Bound for Polygons with Holes): Prove the following theorem due to Shermer:
$\lfloor \frac{n+h}{3} \rfloor$ guards are sometimes necessary for a polygon of n vertices and h holes.

a) Prove the necessity for $n = 8, h = 1$.

b) Expand your proof from a) to the general case.

Exercise 5 (Triangulation Dual): Is the triangulation dual of a monotone polygon necessarily a path?

Exercise 6 (Diagonals): Prove the following statement:
A diagonal exists between any two nonadjacent vertices of a polygon P if and only if P is a convex polygon.