Homework assignment no. 2

1. Draw a polygon $P$ and place guards in it, such that the guards cover the boundary of $P$, but there exists a point in the interior of $P$ that is not seen by any of the guards.

2. A rectilinear polygon is a simple polygon whose edges are either horizontal or vertical. Let $P$ be a rectilinear polygon with $n$ vertices. Prove that $\lceil n/4 \rceil$ guards are always sufficient and sometimes necessary to guard $P$.

3. Let $P$ be a simple polygon with $n$ vertices, and let $p$ be a point in $P$. Define $vis(p) = \{q \in P \mid q \text{ is visible from } p\}$. Show that $vis(p)$ is a simple polygon, and describe an efficient algorithm for computing $vis(p)$. $vis(p)$ is called the visibility polygon of $p$.

4. The stabbing number of a triangulated simple polygon $P$ is the maximum number of diagonals intersected by any line segment contained in the interior of $P$. Describe an algorithm that computes a triangulation for a convex polygon that has stabbing number $O(\log n)$.

5. Let $S = \{s_1, \ldots, s_n\}$ be a set of $n$ axis-parallel squares in the plane, and put $U = \bigcup_{i=1}^{n} s_i$. Prove that the combinatorial complexity of the boundary of $U$ is $O(n)$.

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