We say that a staircase path from p to q goes southwest if, in traversing it from p to q, we go west on all the horizontal segments and south on all vertical segments. Thus, staircase paths between p and q can be of four possible orientations: northeast, northwest, southeast, southwest.

We now define a star polygon.

Definition 1. A *star polygon (SP)* P' is an OP such that $\exists\ p \in P'$ with the property that $\forall\ q \in P', p \equiv q$.

A *maximal SP* in P is an SP contained in P, but not contained in any other SP contained in P. The *visibility polygon*, $v(p)$, of $p \in P$ is the set of all points $q \in P$, such that $p \equiv q$.

Lemma 1. The boundary between $v(p)$ and any connected component of $P - v(p)$ is a single line segment (horizontal or vertical).

Proof: The proof is in two parts. We first show that the boundary between $v(p)$ and any connected component Q of $P - v(p)$ is connected. Assume to the contrary that the boundary is disconnected. Then, there is a region S that is bounded by $[v(p) \cup Q]$, and disjoint from $[v(p) \cup Q]$. Since P is simple, S is contained in P. For the same reason, the boundary of S with $v(p)$ or Q cannot use a polygon edge. By definition no point of S is in $v(p)$. Then, $S \cup Q$ is connected and $[S \cup Q] \in P - v(p)$, implying that Q is not a connected component of $P - v(p)$, a contradiction.

We now show that the boundary between $v(p)$ and Q is a single line segment. Assume to the contrary that the boundary contains adjacent line segments ab, that is horizontal, and bc, that is vertical. Assume without loss of generality, that $v(p)$ lies to the south of ab. If p lies to the south of ab, then the staircase paths from p to any point on ab goes northeast or northwest. Such a staircase path can be extended vertically upwards to see points in Q, implying that ab is not part of the boundary. Thus, p lies to the north of ab.

If c lies to the north of b then Q is to the west of bc (see Figure 3). By an argument similar to the one for ab, this implies that p is to the west of bc. Now, the staircase paths from p to a and c, together with ab and bc form an OCP, which must have a non-empty intersection with Q. This implies, by Observation 1, that p sees points in Q, a contradiction.