Online Motion Planning
Problem Set 6
Universität Bonn, Institut für Informatik I

To be solved until the 6th of December

Problem 1:

Let P be a simple polygon and $s \in P$. Let for every vertex v of P and every exploration tour π starting in s $f_\pi(v)$ denote the first point on π from which v is visible. Prove or disprove:

a) If v is a reflex vertex, then v is unexplored at point $f_\pi(v)$ for every exploration tour π starting in s.

b) If v unexplored at point $f_\pi(v)$ for some exploration tour π starting in s, then v is unexplored at $f_\pi(v)$ for every exploration tour π starting in s.

c) If v is a right vertex for every exploration tour π starting in s then v is a right vertex for every exploration tour π starting in any other point s'.

Problem 2:

Let for a polygon P in the free plane $A(P)$ denote the length of the boundary of its angle hull, $B(P)$ denote the length of its boundary, and $C(P)$ length of the boundary of its convex hull.

a) Give an example of a polygon P with $A(P) = \frac{\pi}{2} B(P)$.

b) Give an example of a polygon P with $A(P) \leq \frac{101}{100} B(P)$.

c) Show that for every $x \in \mathbb{R}$ there is a P such that $B(P) \geq x A(P)$.

Problem 3:

Consider the case of online polygon exploration where we need not come back to our starting point.

Show that there can be no strategy that explores a simple rectilinear polygon with a competitive factor $C < \sqrt{2}$.