

Online Motion Planning, SS 16  
Exercise sheet 9  
University of Bonn, Inst. for Computer Science, Dpt. I

- *You can hand in your written solutions until Wednesday, 22.06., 14:15, postbox in front of room E.01 LBH.*

**Exercise 25: Simple Street Strategy (4 points)**

Let us assume that for the current vertices  $v_r$  and  $v_l$  the agent use the precise bisecting angle of the opening angle until either  $v_r$  or  $v_l$  changes.

Analyse the Bisecting-Angle-Strategy for a triangle where  $v_r$  and  $v_l$  do not change. Find the worst-case ratio!

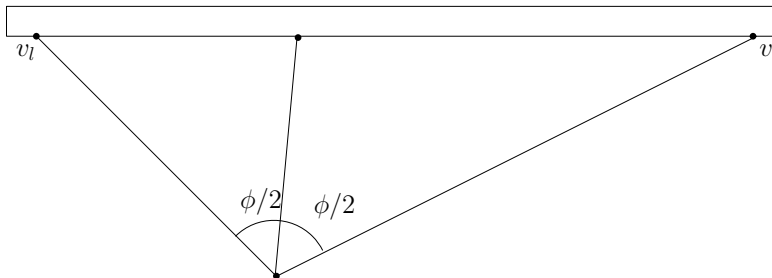


Figure 1: Moving along the bisecting angle!

**Exercise 26: Steet strategy for small angles (4 points)**

In the lecture we presented an optimal path for the street searching problem for opening angles  $0 \leq \varphi_0 \leq \pi/2$  by setting  $\sqrt{2}(\ell_1 - \ell_2) = \sqrt{2}(r_1 - r_2)$ . The reason was that we would like to guarantee  $w \leq \min\{\sqrt{2}(\ell_1 - \ell_2), \sqrt{2}(r_1 - r_2)\}$ .

1. Explain the idea of the above requirement for small angles. Show that the change of reflex vertices is not a problem in the backward analysis of this case.
2. The corresponding curve is a hyperbola, present its parameter form for given starting values  $l$  and  $r$ , similar to the large angle case handled in the lecture.

**Exercise 27: Combine strategy parts (4 points)**

Present a formal argumentation that the application of the WCA-strategy for a sequence of funnel situations achieves a competitive ratio of  $\sqrt{2}$ .