Note on the Optimal Intercept Time of Vessels to a Nonzero Range

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NOTE ON THE OPTIMAL INTERCEPT TIME OF VESSELS TO A NONZERO RANGE

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Abstract. There is an even simpler solution to the optimal intercept problem of vessels to a nonzero range.

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In [1] the authors consider the problem of a patrol vessel trying to intercept a target vessel. The goal of the patrol vessel is to get within a specified distance of the target vessel. Both vessels are traveling at constant speed on a plane. What is the minimum time needed for the patrol vessel to get there?

Suppose the target vessel is initially located at $(0, 0)$ and travels with speed $v$ along the $x$-axis, while the patrol vessel is initially located at $(x_0, y_0)$ and travels with speed $u$ to get within the specified distance $R$ of the target vessel. Then think of a circle centered at the location of the target vessel with radius $R$ moving to the right and a growing circle with radius $ut$ centered at the initial location of the patrol vessel $(x_0, y_0)$. The patrol vessel can reach its goal first when the two circles touch, as shown in figure 0.1. Hence the shortest time $t$ to reach this goal is a solution of the quadratic

$$y_0^2 + (vt - x_0)^2 = (ut + R)^2.$$

REFERENCES


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