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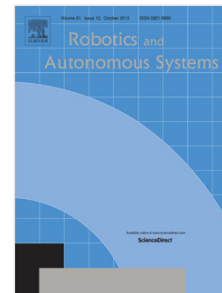
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Conditions for Target Tracking with Range-only Information

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Abstract

This paper addresses the problem of guiding a mobile robot towards a target using only range sensors. The bearing information is not available. The target can be stationary or moving. It can be the source of some gas leakage or nuclear radiation or it can be some landmark or beacon or any manoeuvring vehicle. The mobile robot can be a ground vehicle or an aerial vehicle flying at a fixed altitude. In literature, many different strategies are proposed which use the range only measurement but they involve estimation of different parameters or have switching control strategy which make them difficult to implement. We propose two sets of conditions, one for stationary target and another for both stationary and moving target. Any control strategy, that will satisfy these conditions, can bring the robot arbitrarily closed to the target. There are no restrictions on the initial conditions. Estimation of any parameter is not required. Some candidate controllers are presented that included continuous controllers and switching controllers. Simulations are carried out with these controllers to validate our result with and without measurement noise. Experimental results with ground mobile robot are presented.

Keywords: Target tracking, range only measurement, mobile sensors, pursuit, localization

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