Framework for mathematics-based localization*

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Abstract

The problem, hereby, ([1, 2, 3, 4]) is how to provide information related to a precept object's position and movement on the basis of the information given by the presence sensor. By presence sensor we mean a sensor which detects the presence of a certain object and transmit it binary (presented, or not).

We consider the position of the sensors and the likelihood-function of perception and non perception (i.e. that in case of a possible position of the given object what is the probability of the presence sensor to sign positively, negatively) as known and try to use these to locate.

We examine two different methods. First is the maximum likelihood estimation concerning the position of the object ([1, 2]) secondly we use the Bayesian probability to calculate the probability of the object being in a given set. ([5]).

In general we introduce the use of the two methods with the likelihood function of only one perception given by a single sensor. Then, we investigate the joint likelihood function of independent observations carried out simultaneously. Furthermore we examine the likelihood function of multiple sensors' observations which are time dependant and have been carried out in

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different time. It can be used to locate moving objects. Finally we examine how we can use the sequence of observations made by a sensor within short time limits.

Besides introducing this mathematical problem we also present possible fields of applying these theses. We review the mathematically based framework which can be used to prove if the solution to the problem is correct with the help of actual devices like RFID-antennas and RFID-tools.

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