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Contents

Investigating State Covariance Properties during Finite Escape Time in H∞ Filter SLAM

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Abstract. This paper deals with the investigation of finite escape time problem in H∞ Filter based localization and mapping. Finite escape time in H∞ Filter has restricted the technique to be applied as the mobile robot cannot determine its location effectively due to inconsistent information. Therefore, an analysis to improved the current H∞ Filter Three main factors are being considered in this research namely the initial state covariance, the γ values and the type of noises. This paper also proposed a modified H∞ Filter to reduce the finite escape time problem in the estimation. The analysis and simulation results determine that the modified H∞ Filter has better performance compared to the normal H∞ Filter as well as to Kalman Filter for different γ, initial state covariance and works well in non-gaussian noise environment.

Keywords: H∞ Filter, Finite Escape Time, Estimation.

1   Introduction

Mobile robot has been one of the technologies to make human life comfortable and safe. Its applications covers various industries, explorations, mining and military to achieve a particular task. Even now, the job of cleaning the house can be performed by an autonomous mobile robot as a vacuum cleaner or lawn mower. These technologies requires a study of mobile robot kinematics, dynamical system, behavioural based decisions and some other aspects to be considered prior to the mobile robot design and applications.

To operate a mobile robot in a remote area with less human monitoring system is a challenging task which includes various factors to be considered. To list a few of it are such as the environment conditions, sensory devices, communications system, intelligent system and a suitable mobile robot design. Generally, these issues requires a truly autonomous mobile robot to perform the operations which is capable to identify its location and any related decisions respectively to the surroundings. This condition is known as localization and mapping where mobile robot needs to localize itself concurrently with the construction of environment. The problem is also alternatively