Intermittent Measurement and Finite Escape Time Correlations Study in H_∞ Filter in Navigation

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Abstract This paper introduces the analysis of finite escape time and intermittent measurement study in H_∞ Filter in mobile robot navigation. The study aims to analyze the H_∞ Filter performances for mobile robot navigation when finite escape time and measurements data are sometimes missing during observation. In our case, a mobile robot is arbitrarily placed in an unknown environment and then it must construct a map and concurrently localize itself in the built map by using H_∞ Filter. Both Finite escape time and missing measurement data issues are observed to see their correlations and effects to the estimation. This paper shows that, even if a measurement data is missing or there are some uncertainties exist during observations, information is still available for the robot to estimate its location and landmarks effectively. Through simulations, if both problems occurred frequently, then the mobile robot lost its estimation. Based on the experimental results, it was found that, even if finite escape time happens and measurements are sometimes missing during mobile robot observations, the filter is still capable of providing reliable information on the estimation.

Keywords H_∞ filter · Navigation · Mobile robot · State covariance · Intermittent measurement

1 Mobile Robot Navigation

Concurrent Mapping and Localization (CML) or Simultaneous Localization and mapping (SLAM) is one of the essential issues to be solved in navigation. This problem must be solved to guarantee that any navigation system is capable of providing sufficient information on the environment with reliable accuracy and efficiency. In fact, most of the navigation systems applied today is mainly for autonomous

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