

Enhanced Navigation Method for Source Term Estimation Algorithms

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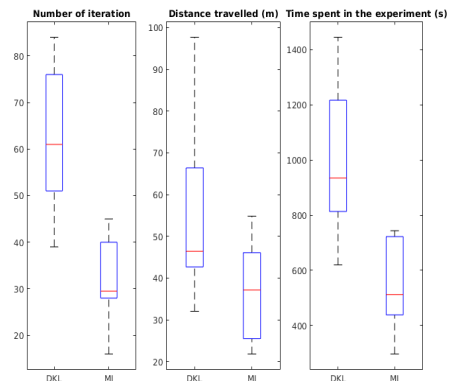
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Odor source localization is a challenging problem in robotics whose goal is to find as fast as possible the source of a leakage releasing. It exists many way to tackle this problem but the one explored here relies on Source Term Estimation. Our goal was to implement a new strategy for the navigation of the robot in order to hopefully improve some aspects of the STE implemented in Rahbar's work (total distance made by the robot, number of iterations to end the algorithm etc.). For this purpose we modified the objective function used for the navigation strategy already implemented by using, instead of the Kullback-Leibler divergence, the Mutual Information (MI). The implementation of the Mutual Information needed to develop a discretized estimate of the MI that could be run on a real robot without affecting too much the performance of this solution.

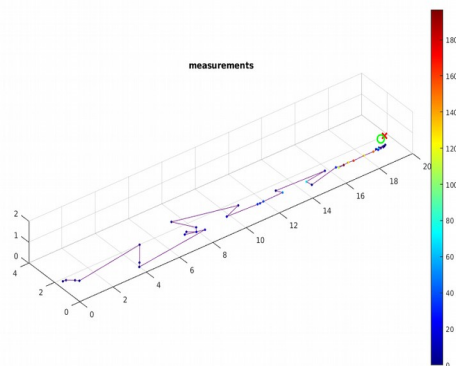
In the first place, we tested our navigation strategy in Webots on a single Khepera IV robots which showed the validity of this solution.

We also assessed the performances of the Mutual

several improvements but at the cost of more computational requirements.



Performance comparisons between DKL and MI



Example of trajectory of a robot starting on left and with green odor source on the right

Information navigation strategy regarding several metrics and compared them to the Kullback-Leibler divergence navigation. Mutual Information showed

In the second place, we tested the Mutual Information navigation in a distributed way on three Khepera IV robots using collaborative and cooperative communication. In the same way we have compared its performance regarding both scenarios and how it compared to Kullback-Leibler divergence.

In the end, we successfully implemented a new navigation strategy with the Mutual Information that showed promising results on a single robot and in a distributed way. However further investigations should be done to decrease the computational cost of this solution in order to make it more viable on a real set up.