Review of "A Finite-Horizon Approach to Active Level Set Estimation"

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This paper purposes an finite horizon search (FHS) method to estimate the boundary for the one-dimensional step function, and applies the method to sub-Gaussian noisy measurements. Also, this paper applies the purposed noisy FHS to the Gaussian Process level set estimation (GP-LSE) by breaking down the high-dimensional problem into numbers of one-dimensional noisy FHS tasks. The main contribution includes purposing a penalized optimization with optimal search strategy in a closed form and the application to noisy and high-dimensional problems.

Points:

1. Do the experiments on GP-LSE take the cost as a function of sampling time in equation (12)? Note that noisy FHS takes a repeating procedure to deal with the noise while the equation (12) counts only the sampling time for N single sample points. I believe, the cost function (12) should reflect the repeating number R, since T_s represents the time per sample. For example, replacing N by RN. On the other hand, it would be helpful to explain more if it is not proper to include R in the cost of time.

2. Grid search over the number of transects and stopping error is used in the experiments on GP-LSE. Note that the time and computation resource required by gird search are usually not negligible. It would be helpful to report and compare the cost to the grid search with other approaches.

3. The main theorem 1 assumes the change point follow a uniform prior. Is there any intuition for this uniform prior assumption? If we assume other common priors, e.g. Gaussian prior, can we derive the close form of the optimizer, and how sensitive is the performance of the optimizer to the prior?

4. In noisy FHS, the number of repeating R relies on the probability of error δ. What is the choice of δ in simulation and real data analysis?

In general, I think idea in this paper is interesting. Given the above points, I would be hesitant to decide that this paper is suitable for the venue.

References