Beyond Uncertainty Minimization: Variability and Outlier Informed Active Sensing

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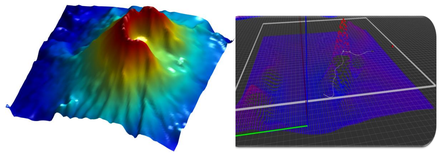
https://vail.sice.indiana.edu/pages/research-pages/research-sampling.html

Problem: existing work on active sensing makes strong assumptions of the probabilistic model

- **Stationarity**: different locations have the same degree of variability
- Gaussian observational noise without outlier assumption

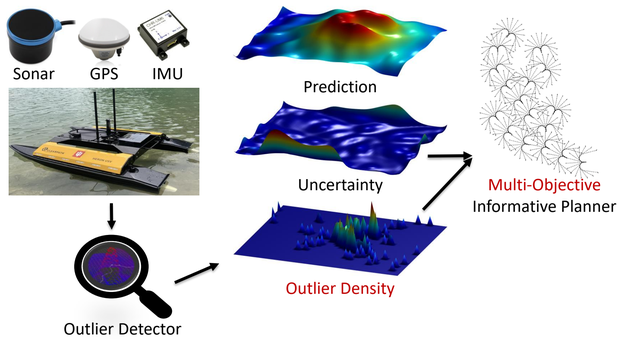


Nonstationary Environment

Sensing Outliers

Solution:

- Propose to revisit the locations where outliers are sampled using our multi-objective planner to distinguish informative samples and outliers

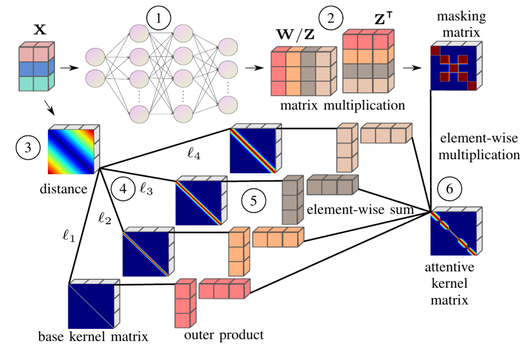


The contributions of this project can generalize to many other research fields/applications, e.g., mobile sensor networks, in dealing with nonstationary environments and sensing outliers

- Attentive Kernels are generic and can improve spatial mapping
- The outlier filtering and revisiting framework can be applied to other scenarios that involves mobile sensors

Solution:

- Propose a new family of nonstationary kernels, named Attentive Kernels, which is simple, robust, and compatible with any existing kernels



This project develops methodologies for autonomous systems and enhances their intelligence in environmental monitoring, search and rescue, surveillance and security, the applications of which can improve our living quality as well as saving lives and reducing financial losses.

Through partnerships with the Louis Stokes Alliances for Minority Participation (LSAMP), the effort of recruiting and mentoring students from minority and other under-represented groups to the PI's undergraduate and research programs has been and will be continuing.

During the 1st year, the project has

- Been supporting 2 PhD students
- Been supporting 1 undergrad
- Published 1 paper “Informative Planning in the Presence of Outliers” in ICRA22.

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