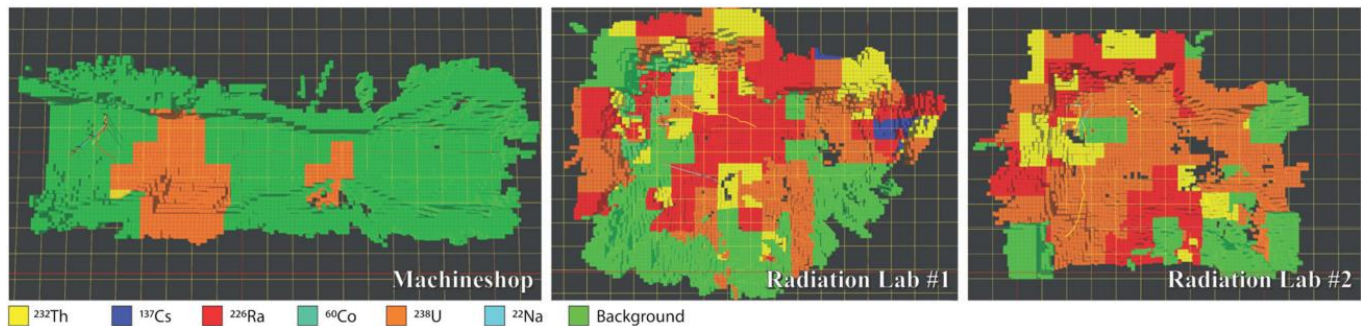# Radiation Mapping for the Autonomous Characterization of Nuclear Sites

Abstract: Robotic systems can be utilized for the purposes of radiation mapping and spectroscopic characterization of nuclear sites. Such deployments can prove critical during emergency response (i.e., when a nuclear accident takes place) or for a host of other activities including nuclear decommissioning. Motivated by the above, in this project you are tasked to develop a miniaturized sensing unit involving a scintillator system such that an autonomous flying robot can enter nuclearized environments and return with a dense map estimate of distributed radiation fields further characterized for the spectroscopic characteristics (i.e., what material) within each region.

Results from prior work on automomous radiation mapping and spectroscopic characterization [1].

Tasks:

- Study of literature in order to understand the problem.
- Develop a sensing solution for the task of radiation mapping and spectroscopic characterization.
- Develop a method for distributed gamma radiation mapping and spectroscopic characterization of environments presenting distributed nuclear sources.

Literature (indicative):

[1]   Mascarich, F., Kulkarni, M., De Petris, P., Wilson, T. and Alexis, K., 2023. Autonomous mapping and spectroscopic analysis of distributed radiation fields using aerial robots. Autonomous Robots, 47(2), pp.139-160.

[2]   Mascarich, F., De Petris, P., Nguyen, H., Khedekar, N. and Alexis, K., 2021, May. Autonomous distributed 3d radiation field estimation for nuclear environment characterization. In 2021 IEEE international conference on robotics and automation (ICRA) (pp. 2163-2169). IEEE.

[3]   Zhu, S., Zhuang, S., Fang, S., Dong, X., Li, W., Zhang, L., Liu, X., Li, R., Liu, X. and Cao, J., 2022. 3-D gamma radiation field reconstruction method using limited measurements for multiple radioactive sources. Annals of Nuclear Energy, 175, p.109247.

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