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Multi-modal Approach to Ionizing Radiation Source Localization by an Unmanned Aerial Vehicle

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Unmanned aerial vehicles (UAV, drones), equipped with compact radiation detectors, are becoming an essential tool in environment monitoring. Most of the commercially available platforms enable simple pre-planned trajectories to be followed without the need for a dedicated pilot. However, systematic mapping of large areas requires a lot of time, making it an inefficient strategy for localization of radiation sources concentrated in compact hotspots. We propose an efficient radiation source localization method, which employs a single UAV equipped with a miniaturized Compton-effect camera based on the Timepix3 sensor [1]. By processing the measurements directly onboard a UAV, the position of the radiation source can be estimated on-the-fly [2]. Since Compton scattering only constitutes a small fraction of the observed ionizing events (less than 1%), we propose a data fusion method, which combines the Compton measurements with an integrating dosimetry approach. Over the course of the mission, the flight trajectory is continuously updated to maximize the information gained by the Compton camera.

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