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**Abstract**

The ability to identify, delineate and track threats such as an illicit radioactive source in an urban environment is critical in national security applications. We present three problems to address these issues, formulated as "monotone integer programs" which were shown [H2002] to imply combinatorial and efficient network flow algorithms.

In one scenario radiation detectors/sensors are mounted on moving vehicles. The detectors' positions are available at all times from GPS data. The level of detected risk is continuously reported from each detector at each position. The problem is to determine the presence of a potentially dangerous source(s) and its approximate location by delineating a small area that has an elevated concentration of reported risk. This problem of using spatially deployed mobile detector networks to identify and locate risks is modeled and formulated here. The problem is shown to be solvable in polynomial time and with a combinatorial network flow algorithm. The efficiency of the algorithm enables its use in real time, and in areas containing a large number of deployed detectors.

In a second scenario we apply a clustering algorithm for optimizing a variant of the normalized cut problem for tracking a specific object in a video sequence.

A third algorithm for solving the "co-segmentation" problem is shown to work efficiently for detecting abnormalities in scenarios for which a "normal" baseline is available. This has been shown useful in medical imaging applications, and is expected to be used when scanning an urban environment for nuclear threats and identifying the existence of a source which is pathological as compared to a normal-background scene.