

## Tracking Across Multiple Moving Cameras

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**Venue:** 209, Comp. Sci. Bldg

**Time:** Oct 10<sup>th</sup> Friday, 9:30 to 10:30Am

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### Abstract:

The concept of a cooperative multi-camera system, informally a ‘forest’ of sensors, has recently received increasing attention from the research community. These ideas is of great practical relevance, since cameras typically have limited fields of views, but are now available at low costs. Thus, instead of having a high-resolution camera that surveys a large area, far greater flexibility and scalability can be achieved by observing a scene ‘through many eyes’, using a multitude of lower-resolution COTS (commercial off-the-shelf) cameras.

In this talk I will present two approaches for object tracking across multiple moving cameras. In the first approach, objects are to be tracked across several cameras, each mounted on an aerial vehicle, without any telemetry or calibration information. The principal assumption that is made in this work is that the altitude of the camera allows the scene to be modeled well by a plane. First the global motion is compensated in each video sequence and objects are detected and tracked in individual cameras. For solving multiple camera correspondence problem we exploit constraints on the relationship between the motion of each object across cameras, estimating the probability that trajectories in two views originated from the same object, to test multiple correspondence hypotheses (without assuming any calibration information).

In the second approach we consider sequences acquired by hand-held cameras, for which planar scene assumption is not valid. Recently we have proposed a notion of temporal fundamental matrix to capture the epi-polar geometry between the temporal views of independently moving camera pair where the scene is dynamic. The temporal fundamental matrix, which is a 3 by 3 matrix capturing the temporal variation of the geometry. Constraining the rotational and translational motion of cameras to polynomials in time, we have shown that the components of the fundamental matrix are polynomials in time. In order to obtain the correct correspondences across the multiple moving cameras, we perform a maximum bipartite matching of a graph, in which the weights of the edges depend on the properties of the temporal fundamental matrix.