CSE 598G: Vision-based Tracking
Schedule number 696382
Instructor: Robert Collins
3 credits

Detecting and tracking moving objects in video data has a rich history in computer vision. Object tracking is intrinsically useful for many applications such as traffic monitoring, motion capture, activity analysis, automated surveillance, and autonomous vehicle navigation. This course will study computer vision approaches and algorithms for tracking objects through video, and methods for performance evaluation of tracking algorithms.

This course will survey this rich literature of vision-based tracking approaches. An initial list of algorithms that we will study includes:

Single Object Tracking

1) mean-shift tracking, based on the seminal paper by Comaniciu, Ramesh and Meer (PAMI 2003)
2) shape-constrained layer tracking, based on published work by Tao, Sawhney and Kumar (PAMI 2002);
3) Lucas-Kanade tracking, based on published work by Matthews and Baker (IJCV 2004).
4) feature selection for classification-based tracking, by Collins, Liu and Leordeanu (PAMI 2005)
5) ensemble tracking via Adaboost, based on published work by S.Avidan (CVPR 2005);
6) particle-filter based tracking, based on published work by Perez and Blake (Proc IEEE 2004);
7) segmentation tracking via graph cuts, based on current work by Tolliver and Collins (WACV 2005)

Multiple Object Tracking

8) JPDAF data association, based on published work by Rasmussen and Hager (PAMI 2001);
9) MHT, based on the seminal work by Reid, as interpreted by Cox and Hingorani (PAMI 1996).
10) MRF-based lattice tracking, based on recent work by Lin and Liu

Students will read and present papers from primary sources (conferences and journals in the field), and will be expected to write weekly critiques comparing and contrasting assigned papers. They will learn how to perform a literature review to understand the history and content of a given tracking method. In addition, each student will be expected to complete a significant term project involving implementation of a state-of-the-art tracking algorithm. These implementations will become part of an evolving, open-source library of tracking algorithms provided by a public tracking evaluation web site (currently located at http://www.vividevaluation.ri.cmu.edu/, but the site will migrate to Penn State in the Spring semester). Grades will be based on class presentations, written critiques, and the term project.