Real-Time Tracking with EM Algorithms

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Brief description of the demos

Because of the simple demo requirements, it is proposed that a single demo stand be used for two trackers developed in Copenhagen. The trackers that will be demonstrated are the Cluster Tracker and the FFC (feature-free contour) Iris Tracker.

Cluster Tracker

The Cluster Tracker can track any object appearing in the field of view of a fixed camera. The tracker is based on image differencing and the EM clustering algorithm, and is fully described elsewhere [4]. The number of tracked objects is dynamically updated at each frame. Real-time tracking for indefinite lengths of time has been demonstrated with a PC and a webcam. The method is robust to changes of illumination and background, needing less than one minute to adapt to radical changes in the reference image.

The tracker has been applied to outdoors tracking of pedestrians and motor vehicles [4, 2], as well as indoor tracking of pedestrians [3] (see Fig. 1). The tracker includes very few parameters; the live prototype shows that these parameters can be kept constant independently of camera, scene, and illumination. Commercial applications in people counting are being explored.

Iris Tracker

The FFC Iris Tracker is an active-contour tracker that fits an ellipse to the eye iris. It has been developed for eye typing by disabled people. The underlying image model has been described elsewhere [5]. The tracker works by a combination of particle filtering and the EM contour algorithm [5].

The iris tracker will be presented at the satellite workshop on Analysis and Modelling of Faces and Gestures [1]. The tracker works in real time and can be set up very easily for a demo with any volunteer.

Demo requirements

The laptops and webcams required for the trackers, as well as a poster describing the trackers, will be provided by the authors. The only requirements are 3 chairs (one for each author, plus one for a volunteer to try the iris tracker), a table for the laptops and cameras and a poster stand.

The demo of the Cluster Tracker would become easier if a few meters of space without traffic were available, either between table and poster stand or between table and a nearby wall. However, this is not a requirement, as the tracker can work with moderate traffic, or can be demonstrated by waving a hand in front of the camera.

References

[1] D. W. Hansen and A. E. C. Pece. Iris tracking with feature free contours. In *Proc. Workshop on Analysis and Modelling of Faces and Gestures: AMFG 2003*. IEEE Computer Society, October 2003.

[2] A. E. C. Pece. Tracking of non-gaussian clusters in the pets2001 image sequences. In *Proc. 2nd workshop on Performance Evaluation in Tracking and Surveillance: PETS 2001*. IEEE Press, 2001.

[3] A. E. C. Pece. From cluster tracking to people counting. In *Proc. 3rd Workshop on Performance Evaluation in Tracking and Surveillance: PETS 2002*, pages 9–15. IEEE Computer Society, June 2002.

[4] A. E. C. Pece. Generative-model-based tracking by cluster analysis of image differences. *Robotics and Auton. Syst.*, 39(3–4):181–194, 2002.

[5] A. E. C. Pece and A. D. Worrall. Tracking with the EM contour algorithm. In *Proc. ECCV 2002*, LNCS 2350, pages 3–17. Springer, 2002.

Figure 1: Application of the Cluster Tracker to test sequences from PETS 2001 (parking lot) and PETS 2002 (shopping mall).

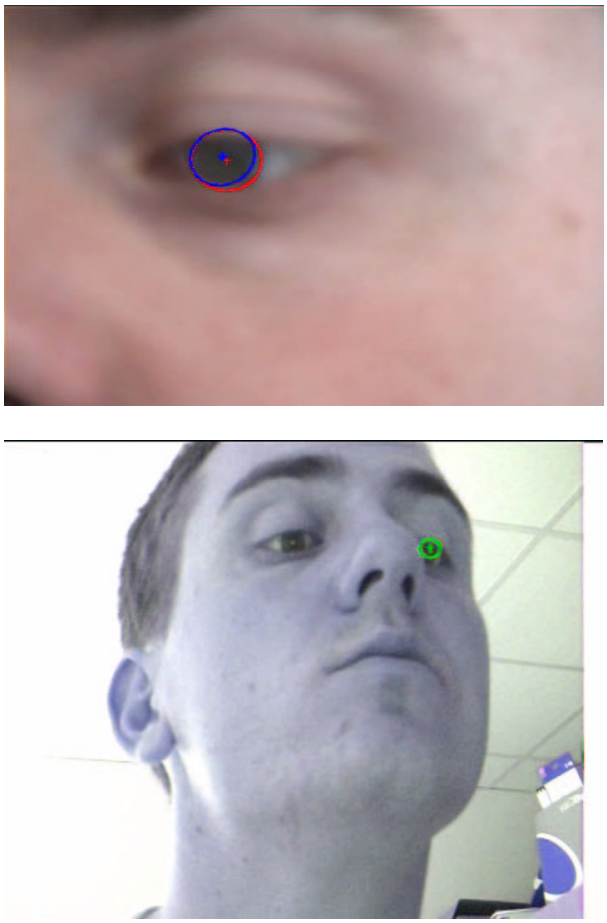

Figure 2: Application of the Cluster Tracker to test sequences from PETS 2001 (parking lot) and PETS 2002 (shopping mall).