

Ex-Jobb Proposal: Mosaic construction and alignment

The aim of this project is to implement an algorithm that takes a relative short sequence from television footage of a football game where the camera is potentially rotating and zooming and to build a mosaic from the frames in the sequence. This mosaic will then be used to determine which parts of the football pitch were visible during the sequence.

Currently, the *Computer Vision and Perception Lab* (CVAP) here at KTH is in collaboration with the Stockholm based, digital media and sports analysis company *TRACAB*. The latter has a real time player tracking system that estimates each player's position on the football pitch throughout a game. It is employed regularly on "Allsvenskan" and "Champions League" games (buy a copy of *Aftonbladet* or check out <http://zoom.sportbladet.se/> to see their results). The collaboration between *CVAP* and *TRACAB* focuses on building a 3D reconstruction of each player's motion from the tracking and video data. This ex-jobb project would be one element of this whole process, see <http://www.csc.kth.se/~sullivan/actvis>, as it would allow higher resolution television data to be used in conjunction with the *TRACAB* video (a low resolution image of the whole pitch) and tracking data.

The student will obtain several relatively short video clips from tv footage corresponding to complete shots. There will then be three distinct tasks to be completed. The first will be the computation of the homographies between temporally adjacent frames. A homography is a transformation that models the difference between pictures of the same scene taken by cameras whose positions are related by a rotation. This is a common task in computer vision and there are many related ways of estimating this homography, see [1]. Much of this work assumes that there are no moving objects in the scene and this is not the case for football, so some adjustments of standard methods may be required.

Once the inter-frame homographies have been found, the next task is to use these homographies to stitch the frames of the sequence together to form a mosaic. Given this mosaic, you will then have to estimate which part of the football it corresponds to. This will require finding the pitch markings (lines, centre circle etc..) visible in the image, distinguishing the gross position of the camera (ie on the left hand side) and then putting the markings in correspondence a model of the football pitch.

References

- [1] D. Capel and A. Zisserman. Automated mosaicing with super-resolution zoom. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, Santa Barbara*, pages 885–891, June 1998.