Ex-Jobb Proposal: Estimation of gaze direction

The aim of this project is to estimate the gaze direction of a football player from video footage. The data processed and analyzed will be video obtained from professional football games, specifically from the "Allsvenskan" league.

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`.

The raw data the student will obtain is a sequence of images containing one player. There will then be two distinct objectives. The first will be the construction of a head detector which will be used to localize the player's head in each frame. It is envisaged that this head detector will be based on computer vision techniques which have proven to be successful in similar tasks [1].

Once the head has been localized the next step will be to estimate the direction the head is pointing. One initial approach to try will be that described in [2]. Simply, it involves extracting a feature vector based on counting the number of skin pixels in the head region and comparing this to feature vectors (labelled training data) of the some form which were extracted from images in which the head direction was known. It is then assumed if the newly extracted feature vector is similar to that of one of the labelled training examples then their corresponding gaze directions will also be similar. It is unclear at this stage whether this approach will be sufficient for the problem at hand, but some improvement may be required.

References

[1] N. Dalal and B. Triggs. Histograms of oriented gradients for human detection. In *Conference on Computer Vision and Pattern Recognition*, 2005.

[2] N. Robertson and I. Reid. Estimating gaze direction from low-resolution faces in video. *European Conference on Computer Vision*, 2006.