Public Abstract

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Title: Biologically Inspired Optical Flow System for Motion Detection and Object Recognition

Optical flow is possibly the best known method for motion segmentation. However its application is usually restricted to off line processing as it requires extensive computational resources and time. This thesis explores an optical flow method derived from observation on the vision system of dipterous insect. The proposed method, Biological Optical Flow (BioOF), was implemented using a series of first order filters, and, therefore, is much faster than any existing machine-coded optical flow algorithm besides being hardware implantable.

Like other optical flow methods, the output of the proposed BioOF has two components: horizontal optical flow and vertical optical flow; both of them can be combined in order to get a better final result in terms of motion segmentation. Unfortunately, this combined output of the BioOF can be heavily coupled with noise. So, in order to remove the noise, intensive image processing had to be performed. The result was an algorithm that can provide a good contour of the segmented object in the image.

Finally the object contour is converted to a Fourier feature space leading to a representation that is rotational and translational invariant. Over this Fourier feature space various classification algorithms including SVM; feature subset forward selection; scatter matrix and a simple linear classifier using principal component analysis and Mahalanobis distance were investigated.