Performance Evaluation of Human Activity Recognition in Video Sequences

Kalawitigoda Gamage Manosha Chathuramali

(138051X)

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University of Moratuwa
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Declaration

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Abstract

In this thesis, we address human behavior recognition, as one of the important topics in computer vision. It finds applications in many areas such as surveillance, military installations, and sports. The problem becomes more challenging, due to the huge intra-class variation, background clutter, occlusions, illumination changes and noise. Human behavior recognition typically requires standard preprocessing steps such as motion compensation, background modeling. The errors of the motion compensation step and background modeling increase the mis-detections. We use JBFM as our background model and optic flow values to compute the motion. We propose two different spatio-temporal feature descriptors, SOF and DTF, which combine both computed motion and appearance based features. We use SVM to recognize human actions, by using different evaluation protocols (test cases). We perform several experiments and compare over a diverse set of challenging videos to address the problem, human behavior recognition by simplifying into three tasks. They are, human action recognition in stationary background, human action recognition in dynamic background, and abnormal activity recognition. Our Experimental results show that the selected framework outperforms state-of-the-art methods in many cases in terms of both recognition rate and computational complexity.

Index terms—Human action recognition, dynamic backgrounds, abnormal activity, silhouette, optic flow, SVM, HOG, HOF, MBH, dense trajecories, BoVW

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List of Abbreviations

Abbreviation	Description
ROI	Region of interest
MEI	Motion energy image
MHI	Motion history image
HOG	Histograms of oriented gradients
HOF	Histograms of optic flow
MBH	Motion boundary histograms
JBFM	Joint background foreground modell
AMM	Approximate mean model
GMM	Gaussian mixture models
FDM	Frame difference model
3DHOG	3D-Histogram of oriented gradients
PCA	Principal component analysis
MRF	Markov random fields
HMM	Hidden markov models
DBN	Dynamic Bayesian networks
SVM	Support vector machines
SOF	Silhouettes and optic flow based features
DTF	Dense trajectory based features
N-cut	Normalized cuts
SIFT	Scale-invariant feature transforms
BoVW	Bag-of-visual-words
NN	Nearest neighbor
LMNN	Large margin nearest neighbors
RBF	Radial basis function
LOO	Leave-one-out
L1AO	Leave one actor out
L1AAO	Leave one actor-action out

L1SO	Leave one sequence out
RR	Recognition rates
FE	Few examples