WK04 WRITING ASSIGNMENT

***Write a lab report of any experiment you have conducted based on the following outline, and submit it in a single Word file named “student number + name”, e.g. “1120180000LIMING”.***

Title

* Purpose
* Apparatus (and materials)
* Experimental procedures
* Findings

A Real-time Two-stage Detector for Static Monitor using GMM for Region Proposal

CNN-based object detectors have been widely exploited for vision tasks. Both one-stage method with higher efficiency and two-stage method with higher accuracy have proven their superior performance on huge datasets. To reduce the computation cost for object detection on static monitor while inheriting high accuracy of CNN-based networks, we proposals a method with a two-stage detector using Gaussian mixture model for region proposal which can be embedded into other two-stage detectors.

We remove the region proposal step which is computationally time consuming and unsuitable for static scene because of repeated calculations for video background region. To proposal RoIs effectively, we also reduce the size of CNN and add an extra Gaussian mixture model using a recursive unsupervised method to separate motion foreground from stationary background. We also adopt a light-weight mobilenet as the backbone to further reduce computational complexity and make the model more suitable for embedded devices. All the experiments were done and evaluated on a 1050Ti GPU.

Finally, we test our method on MOT16 datasets. Compared with original models, the Faster-RCNN equipped with Gaussian region proposal achieve a better performance with the mAP increased from 0.45 to 0.61. We also design and train a light-weight detector based on our method. The light-weight model realized the detection speed of 21.7 frames per seconds which is much faster and more suitable for mobile and embedded device with little drop in accuracy (only 0.04 in mAP).

We investigate the effectiveness Gaussian mixture model for region proposal for CNN-based detectors and propose a lightweight detector with faster detection speed. This experiment demonstrates that GMM provides a good priori boxes for a two-stage detector. Therefore, the RPN module can be discarded, and the feature extraction module with less computational consumption can be used to accelerate the detection speed.