CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

36723

Project Title

Motion Detection in Video Surveillance

Abstract

Objectives/Goals

Video surveillance cameras are not effective if there is no one to monitor them all the time. Therefore, it would be greatly beneficial if the cameras or computers can automatically detect if there is someone walking by or if there are important motion objects to capture. I wanted to construct an algorithm that most accurately and efficiently improves current methods of separating foreground from background in video frames. My first priority is to create an original algorithm that results in a higher F-measure across all categories. F-measure incorporates both false positive and false negative counts, and is a more complete measure of accuracy of the algorithm.

Methods/Materials

I used IEEE Change Detection Workshop 2012 dataset which includes videos from the following six categories: Baseline, Dynamic Background, Camera Jitter, Intermittent Object Motion, Shadow, and Thermal. The dataset included frame by frame input images of the video and ground truth images that indicated actual motion objects. I implemented my algorithm in MATLAB. My program would detect motion objects in input images based on my algorithm, and generate output images indicating detected motion objects. My program would then compare my output images with the ground truth images to calculate true and false detection rates.

Results

My average F-measure score was 0.7149 over 31 video streams in six categories. This F-measure score was higher than the third place paper among 19 papers submitted to the 2012 IEEE Change Detection Workshop, all using the same dataset.

Conclusions/Discussion

My algorithm has four major components: camera shake detection, block histogram detection, blob cluster filtering, and activity index screening. The combination of these components performed very well with images in the Baseline, Dynamic Background, and Camera Jitter categories. The images in the Intermittent Object Motion category did not perform as well because my current algorithm lacks the function to detect motion objects that stopped moving for a long period of time. All the sets in the Shadow category also did not perform as well because my current algorithm cannot separate actual motion objects from their moving shadows, which should be considered as background. However, the overall performance of my algorithm was very good compared to published algorithms to date.

Summary Statement

I developed an algorithm to detect motion objects in videos with various types of real-world conditions for video surveillance applications.

Help Received

I designed and programmed the algorithm myself after studying prior techniques in the field.

Preliminary