In this paper, we propose moving object detection and classification methods for Algorithm Embedded Surveillance Camera with robustness and real-time processing. Until recently, most visual surveillance systems have been collecting visual information by camera which is connected through a network to the main server. This approach can reduce computational complexity as the collected visual information is processed separately on a PC-processor. But using this method increases network bandwidth and excess cost because of main server extension. Algorithm embedded Surveillance Camera is an attractive alternative to this problem. Algorithm embedded Surveillance Camera has benefits over traditional systems since it saves network bandwidth traffic as all computation is carried on board and is also less costly as all its components are built in the embedded system. But being an embedded system, this system has restricted computing power therefore it requires low complexity moving object detection and classification algorithms.

Proposed moving object detection and classification algorithm has trade-offs between performance and computational load. Though Gaussian Mixture Model is widely used for object detection, it is computationally heavy and causes the problem of preserving of information (when a moving object stops (like a car being parked), it is included in the background). On the other hand, Temporal Difference is a simple and fast algorithm which has constraints of hole or ghost problems and is sensitive to noise like waving leaves. These problems make Temporal Difference method inefficient to be used for Algorithm Embedded Surveillance Camera. For this reason, in this paper, we used Modified Temporal Difference to guarantee computational speed and overcame the problems which occur in temporal difference such as Hole, Ghost etc. For good performance in out-door environment, which is constantly varying due to different conditions like illumination changes, wind etc., we have used Simple Background Modeling with Adaptive Threshold. Also for an effective treatment of objects like parking car and overcoming restrictions of our Modified Temporal Difference method, we have used Stationary Pixel Removal for effective processing.

For classification, we have used template matching method which measures similarity between model DB and detected object using edge information extracted from object detection. Other similar methods need many calculations to measure similarity between the model DB and the detected object since they have to process 2-d computation. Whereas our method can perform in real time, as we calculate similarity by Hilbert scan distance using 1-d array, generated using by Hilbert Curve.

This method not only fulfills the real-time processing requirement for a surveillance system but also performs effectively in difficult environments where color or texture information is extracted from low resolution images.

To verify the proposed method’s performance, we test the method; detect salient moving objects and classify into human, human group and car using video which is recorded in indoor and outdoor environments. Experimental results show that it detects only salient moving objects under quick illumination changes and varying background motions, and classification performs well independent to the object size. Moreover, through a flexible and adjustable learning rate and threshold, we can quickly remodel a background and perform detection and classification again in short time in an abnormal condition such as an early background modeling stage and shaking of camera.

* Note: The text above is the abstract of the thesis.

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