World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Toward Indoor and Outdoor Surveillance using an Improved Fast Background Subtraction Algorithm

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Abstract : The detection of moving objects from a video image sequences is very important for object tracking, activity recognition, and behavior understanding in video surveillance. The most used approach for moving objects detection / tracking is background subtraction algorithms. Many approaches have been suggested for background subtraction. But, these are illumination change sensitive and the solutions proposed to bypass this problem are time consuming. In this paper, we propose a robust yet computationally efficient background subtraction approach and, mainly, focus on the ability to detect moving objects on dynamic scenes, for possible applications in complex and restricted access areas monitoring, where moving and motionless persons must be reliably detected. It consists of three main phases, establishing illumination changes in variance, background/foreground modeling and morphological analysis for noise removing. We handle illumination changes using Contrast Limited Histogram Equalization (CLAHE), which limits the intensity of each pixel to user determined maximum. Thus, it mitigates the degradation due to scene illumination changes and improves the visibility of the video signal. Initially, the background and foreground images are extracted from the video sequence. Then, the background and foreground images are separately enhanced by applying CLAHE. In order to form multi-modal backgrounds we model each channel of a pixel as a mixture of K Gaussians (K=5) using Gaussian Mixture Model (GMM). Finally, we post process the resulting binary foreground mask using morphological erosion and dilation transformations to remove possible noise. For experimental test, we used a standard dataset to challenge the efficiency and accuracy of the proposed method on a diverse set of dynamic scenes.

Keywords : video surveillance, background subtraction, contrast limited histogram equalization, illumination invariance, object tracking, object detection, behavior understanding, dynamic scenes
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020