

Grid-based Template Matching for People Counting

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Abstract. This paper presents a novel template matching method to detect and track pedestrians for counting people in real-time. Template matching is a time-consuming technique and performs weakly in matching targets if their appearances change larger. The result of unstable matching will increase lots of false detection and missing rates in people counting. To improve the effectiveness of this technique, a novel grid structure is then proposed for tackling the problem of pedestrian appearance changes. Since the technique is time-consuming, a novel ring structure with integral image is furthermore proposed for quickly filtering out impossible candidates and thus each pedestrian can be counted in real time. Different from training approaches which should train several classifiers and thus need several scanning processes to detect different pedestrians, this approach uses only one scanning process to detect each desired pedestrian from videos. In this system, a GMM (Gaussian Mixture model)-based subtraction technique is first used to detect different moving objects from videos. Then, a shadow elimination method is used for reducing shadow effects into a minimum. After that, the novel grid-based verification approach is then proposed for verifying and counting each moving pedestrian more robustly and accurately. To speed up the verification efficiency, a novel ring structure with integral images is then proposed to count people in real time. Finally, a tracking method is applied to tracking each moving pedestrian so that the real number of passing people per direction can be more accurately counted. Experimental results prove that the proposed method is a robust, accurate, and powerful tool in people counting.

Keywords: People counting, template matching, object tracking, background modeling

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