PEDESTRIAN TRACKING BY LEARNING OF MULTI-VIEW HUMAN COLOR APPEARANCE

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Abstract

Recent years, cameras have been also widely applied in varying folds of life according to low production costs. However, these surveillance systems have not already reached the expected performance yet because of lacking the specialized software. Therefore, in this thesis, we aim to build the pedestrian tracking system which can reliably detect and tracking the unknown number of walkers by using multiple cameras. The system has to keep in track multiple targets even in the urban environments where clutter and occlusion occur frequently. Results from our automated tracking system may provide helpful insights for evacuation planning and for real-time situation awareness during the emergency response to public disturbances.

We start by performing background subtraction independently on every available view. Besides using the blobs tracking from the result of background subtraction, we also use the color appearance. We try to learn the color appearance of pedestrian while they move inside the tracking area. When people are moving closely to another one, or they are occluded for a long time, the identity switching cases will occur easily. However, with color appearance learning, it not only helps to overcome such that problem, but the accuracy of localization is also better than

methods, which use the background subtraction only.

In some previous methods, a person is modeled as the cylinder which is projected by rectangles in each view. However, the rectangle did not enclose the foreground pixels of people very accurately, and the color appearance cues may be affected by ambiguous pixels from the background. In order to improve the result of tracking, we defined the new model which is the cooperation between the rectangle and the ellipse.

We also proposed a detection and tracking in one-step method based on a modified Bayesian model. At each frame, the marginal conditional probability of the state of all people is approximated based on the background subtraction images from all views and the color appearance model. The marginal conditional probability in one frame only depends on one previous frame. This implementation helps to reduce the searching space which is the problems of the original Bayesian model which try to connect all previous frames. The approximation is obtained by sampling the posterior function using Reversible Jump Markov Chain Monte Carlo method. This system is really general, which means that besides the background subtraction and color appearance, other higher features could be applied to improve the accuracy, for example Histogram of Orient (HOG).