A Practical Semi-automated Vision-based Development Environment for Detection, Classification & Counting of Pedestrians & Bicyclists

The accurate detection and counting of pedestrians and bicyclists on a roadway is a challenging and unsolved problem in computer vision. This is primarily due to the highly unpredictable behavior of pedestrians and bicyclists in contrast to that of motorists. The strategy used so far in Chittenden County has been to record video data of desired roadways in rural, urban and suburban environments and manually watch and tabulate the results.

We propose a simple, practical, GUI-based system with four modules: Pre-Processing, Video Analysis, Training and Classification and Post-Processing. A Bayes classifier is used where the likelihood function is assumed to be multivariate normal. Five types of discriminant functions are available using MATLAB’s function classify. For additional robustness to occlusion, noise and illumination change we adopt a semi-automated approach, wherein human intervention is employed both in the Pre and Post-processing stages.

Our software has automated the counting process for over 122 hours of video in over 11,000 files. Tested at 8 different sites under 2 different camera conditions (tangent and orthogonal) and 3 different environments (rural, suburban, urban) with efficient manual pre- and post processing, estimates of about 80 percent of ground truth were obtained for pedestrian and bicyclist counts. Results improve to about 99 percent with proper camera placement.

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All are welcome