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Event reasoning for transport video surveillance

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The aim of transport video surveillance is to provide robust security camera solutions for mass transit systems, ports, subways, city buses and train stations. As we have known, numerous security threats exist within the transportation sector, including crime, harassment, liability suits and vandalism. Possible solutions have been directed to insulate transportation system from security threats and to make the system safer for passengers. In this talk, I will introduce our solution to deal with the challenges in transports, in particular, city buses. For the benefit of easy understanding, I will structure the talk into the following four sections: (1) The techniques that we developed to automatically extract and select features from face images for robust age recognition, (2) an effective combination of facial and full body measurements for gender classification, (3) human tracking and trajectory clustering approaches to handle challenging circumstances such as occlusions and pose variations, and (4) event reasoning in smart transport video surveillance.

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How does image noise affect viewer's visual attention and scene perception?

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A central research question in natural vision is how to allocate fixation to extract informative cues for scene perception. With high quality images, psychological and computational studies have made significant progress to understand and predict human gaze allocation in scene exploration and understaidng. However, it is unclear whether these findings can be generalised to degraded naturalistic visual inputs. Here, we combined psychophysical, eye-tracking and computational approaches to systematically examine the impact of image resolution and image nosie (Gaussian low-pass filter, circular averaging filter, Additive Gaussian white noise) on observers' gaze allocation and subsequent scene perception when inspecting both man-made and natural scenes. Compared with high quality images, degraded scenes would reduce the perceived image quality and affect the scene categorization, but this deterioration effect was scene content-dependent. Distorted images also attracted fewer numbers of fixations but longer fixation durations, shorter saccade distance and stronger central fixation bias. The impact of image noise manipulation on gaze distribution was mainly determined by noise intensity rather than noise type, and was more pronounced for natural scenes than for man-made scenes. We further compared 4 high performing visual attention models in predicting human gaze allocation in degraded scenes, and found that model performance lacked human-like sensitivity to noise type and intensity, and was considerably worse than human performance measured as inter-observer variance. Our results indicate a crucial role of external noise intensity in determining scene-viewing gaze behaviour and scene understanding, which should be considered in the development of realistic human-vision-inspired attention models.

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