Abstract: Face Detection From In-car Video for Continuous Health Monitoring

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Face detection in videos from smart cars or homes is becoming increasingly important in human-computer interaction, emotion recognition, gender and age identification, driving assistance, and vital sign measurements, as heart rate and respiratory rate is derived from the video. However, face detection suffers from variations in illumination, subject motion, different skin colors, or camera distances. In this work [1], we compare three algorithms for in-car application: Haar cascade classifier (HCC), histogram of oriented gradients (HoG), and a deep neural network (DNN). For evaluation, we consider the freely available "driver monitoring dataset" (DMD) multimodal database and self-collected videos recorded in a research car. We analyze run-time, accuracy, and F1-score. HoG has highest computational time as compared to HCC and DNN with 2.99 frames per second (FPS), 7.00 FPS, and 18.25 FPS, respectively. For DMD, the F1-scores are 91.75%, 95.91%, and 99.48% for HCC, HoG, and DNN respectively, and 88.05%, 83.68%, and 99.66% for our dataset, respectively. All in all, DNN is fastest and most accurate. Moreover, we observed that DNN handles occlusions and varying illumination better than the other approaches. In conclusion, DNN can be applied successfully for in-car face detection as a first step towards real-time continuous health monitoring.

References

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