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An Automatic Large Classroom Attendance Conceptual Model Using Face Counting

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Abstract : large lecture theatres cannot be covered by a single camera but rather by a multicamera setup because of their size, shape, and seating arrangements. Although, classroom capture is achievable through a single camera. Therefore, a design and implementation of a multicamera setup for a large lecture hall were considered. Researchers have shown emphasis on the impact of class attendance taken on the academic performance of students. However, the traditional method of carrying out this exercise is below standard, especially for large lecture theatres, because of the student population, the time required, sophistication, exhaustiveness, and manipulative influence. An automated large classroom attendance system is, therefore, imperative. The common approach in this system is face detection and recognition, where known student faces are captured and stored for recognition purposes. This approach will require constant face database updates due to constant changes in the facial features. Alternatively, face counting can be performed by cropping the localized faces on the video or image into a folder and then count them. This research aims to develop a face localization-based approach to detect student faces in classroom images captured using a multicamera setup. A selected Haar-like feature cascade face detector trained with an asymmetric goal to minimize the False Rejection Rate (FRR) relative to the False Acceptance Rate (FAR) was applied on Raspberry Pi 4B. A relationship between the two factors (FRR and FAR) was established using a constant (λ) as a trade-off between the two factors for automatic adjustment during training. An evaluation of the proposed approach and the conventional AdaBoost on classroom datasets shows an improvement of 8% TPR (output result of low FRR) and 7% minimization of the FRR. The average learning speed of the proposed approach was improved with 1.19s execution time per image compared to 2.38s of the improved AdaBoost. Consequently, the proposed approach achieved 97% TPR with an overhead constraint time of 22.9s compared to 46.7s of the improved Adaboost when evaluated on images obtained from a large lecture hall (DK5) USM.

Keywords : automatic attendance, face detection, haar-like cascade, manual attendance
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