

IAPM: Intelligent Attendance and Participation Monitoring

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Use Case

- Computer vision based attendance and participation system
- System will detect when students/leave the classroom
- System will keep track of participation by detecting when students raise their hands and speak.

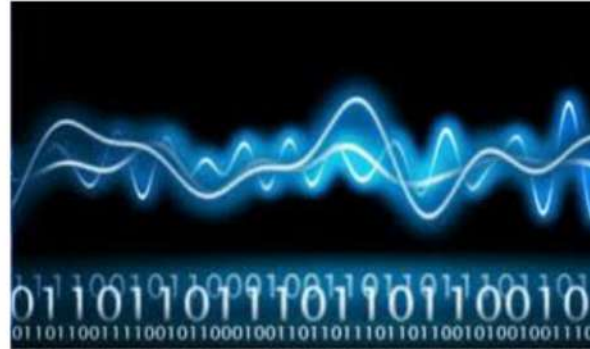


Ece Areas



Software Systems

- Computer Vision
- Application Development



Signals and Systems

- Machine Learning
- Signal Processing

Requirements

User application displaying attendance and participation records for each student.

Attendance:

- Record attendance with accuracy of 70% or above.

Participation:

- Detect in real-time with an accuracy of 75% when students raise their hands.
- Detect mouth movement to indicate speaking. (Reach Goal)

Challenges

- Dealing with students who do not look directly at camera
 - sleeping, students who are leaning down
- Students wearing apparel (hats, scarves)
- Discerning between a stretch and a hand raise
- Discerning between a yawn and speaking
- Latency in handling more than 5 students
- Placement of camera
 - Needs to not disrupt teachers movement
 - Needs to be easy to set up
 - Teacher should not block view



Solution

- Face Recognition
 - Facial recognition algorithms based on machine learning
 - PCA + Eigenfaces.
- Raised hand detection
 - Computer vision based algorithms to detect when students raise their hands.
- Mouth movement detection
 - Lip detection and tracking algorithms to determine if a student is speaking or not.



Minimum
Viable Product

Solution



Hand is cue to watch mouth for movement

Components

Hardware

- High resolution camera w/ USB port
- Laptop
 - Application runs on the laptop

Software

- Python, C/C++, OpenCV



Testing and Verification: Individual Components

Face Recognition

- Test facial recognition algorithm using an image dataset.

Hand Raise Detection

- Manual testing

Mouth Movement Detection

- Manual testing

Testing and Verification: Integrated System

- Manual testing
 - Test in a small room with group sizes between 5 and 10
 - Test each group for 3-5 minutes, measuring ground truth for the time period

- Metrics:
 - Accuracy of attendance recording
 - Accuracy of hand-raising detection and speaking

Tasks and Division of Labor:

Facial Recognition algorithm - Neeraj and Omar

Raised hand recognition algorithm - Kevan

Prototype mouth detection - Kevan

Final mouth detector - All

Integration of Facial Recognition with Participation system - All

Schedule

