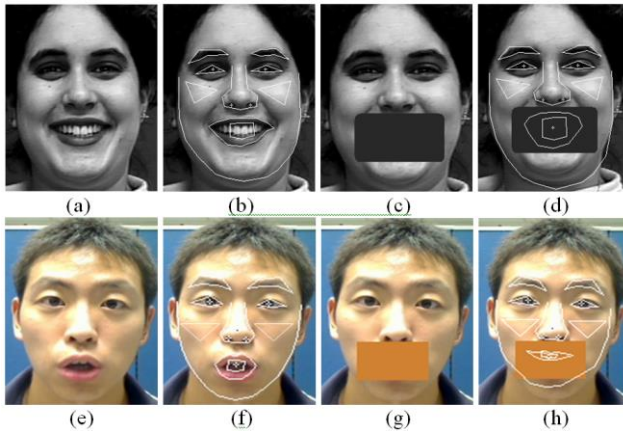


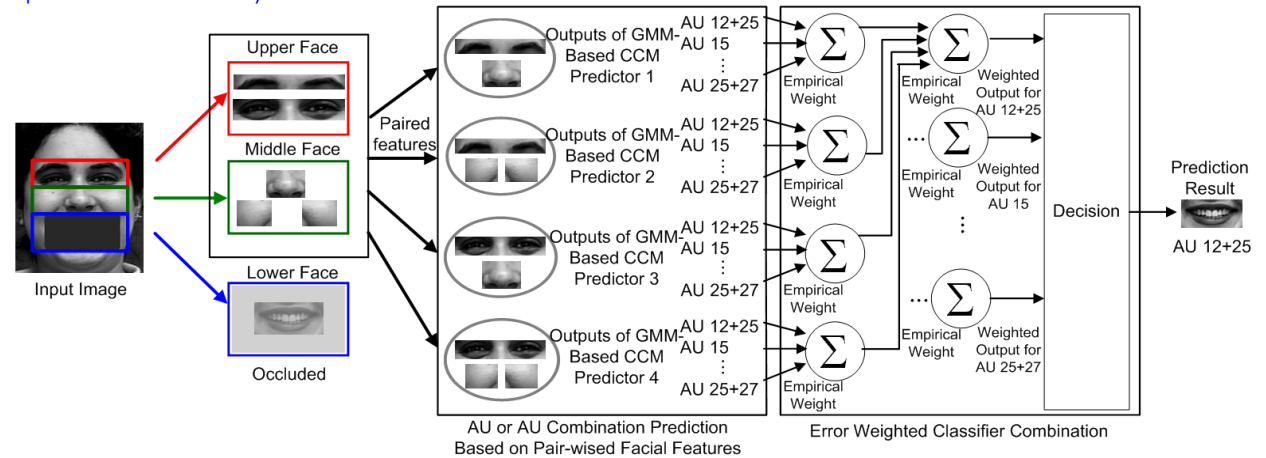
## Introduction

- With partial occlusion, some facial information will be lost and may lead to inaccurate estimate of the facial features
- An example shows a striking effect of partial occlusion on the performance of Active Appearance Model (AAM)-based emotion recognition.



## Main contribution

- An Error Weighted Cross-Correlation Model (EWCCM) is proposed to predict the AU or AU combination in the occluded facial region for providing the correct facial information to expression recognition.
  - models the statistical dependency among features from paired non-occluded facial regions through the GMM-based CCMs
  - explores the contributions of the GMM-based CCMs using the Bayesian classifier weighting scheme to enhance the prediction accuracy



$$P(w | x^m, x^n) \approx \sum_{i=1}^C \sum_{j=1}^D \left\{ \underbrace{\sum_{k=1}^K P(w | \tilde{w}_k, \lambda_i^m, \lambda_j^n)}_{\text{Empirical Weight}} \underbrace{\left[ P(x_i^m | \lambda_i^m, \tilde{w}_k) \prod_{p=1}^P \prod_{q=1}^Q P(\alpha_{j,p}^n | \beta_{i,q}^m, \lambda_i^m, \tilde{w}_k) P(\beta_{i,q}^m | \alpha_{j,p}^n, \lambda_j^n, \tilde{w}_k) P(x_j^n | \lambda_j^n, \tilde{w}_k) \right]}_{\text{GMM-Based CCM}} \underbrace{P(\tilde{w}_k | \lambda_i^m, \lambda_j^n)}_{\text{Empirical Weights}} \right\} P(\lambda_i^m, \lambda_j^n | x_i^m, x_j^n)$$

## Related Work

- Data fusion strategies or classifiers were applied to emotion recognition under partial facial occlusion.
  - Incorrect features extracted from the occluded region will deteriorate the recognition performance.

## Idea

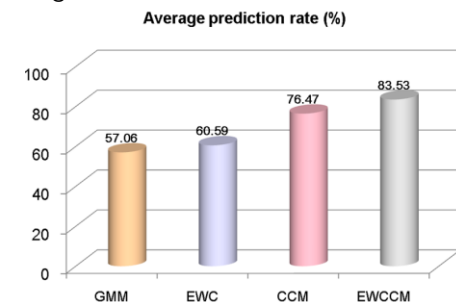
- For missing or incorrect features extracted from the occluded region, we turn our attention in particular to the problems of **predicting the facial action units (AUs)** in the occluded region.

## Experimental Results

- A total of **176** images were selected from **90** subjects in the CK database.
- The experiments were performed based on **leave-one-subject-out cross validation**.
- Five types of AUs related to the lower facial region were considered.

The average occlusive facial feature detection rate achieved 96.59% through the GMM-based color model.

	AU 12+25	AU 15	AU 20+25	AU 23+24	AU 25+27
Test Images	61	13	16	22	64
Correct Detected	59	13	16	21	61
Detection Rate	96.72%	100%	100%	95.45%	95.31%



## Conclusion

- The experimental results demonstrate the effectiveness of the proposed EWCCM for AU prediction.
- The EWCCM is highly flexible and can be easily applied to other computer vision and multimodal classification problems.