# PROJET TMM

Reconnaissance d'émotions faciales

# Preprocessing
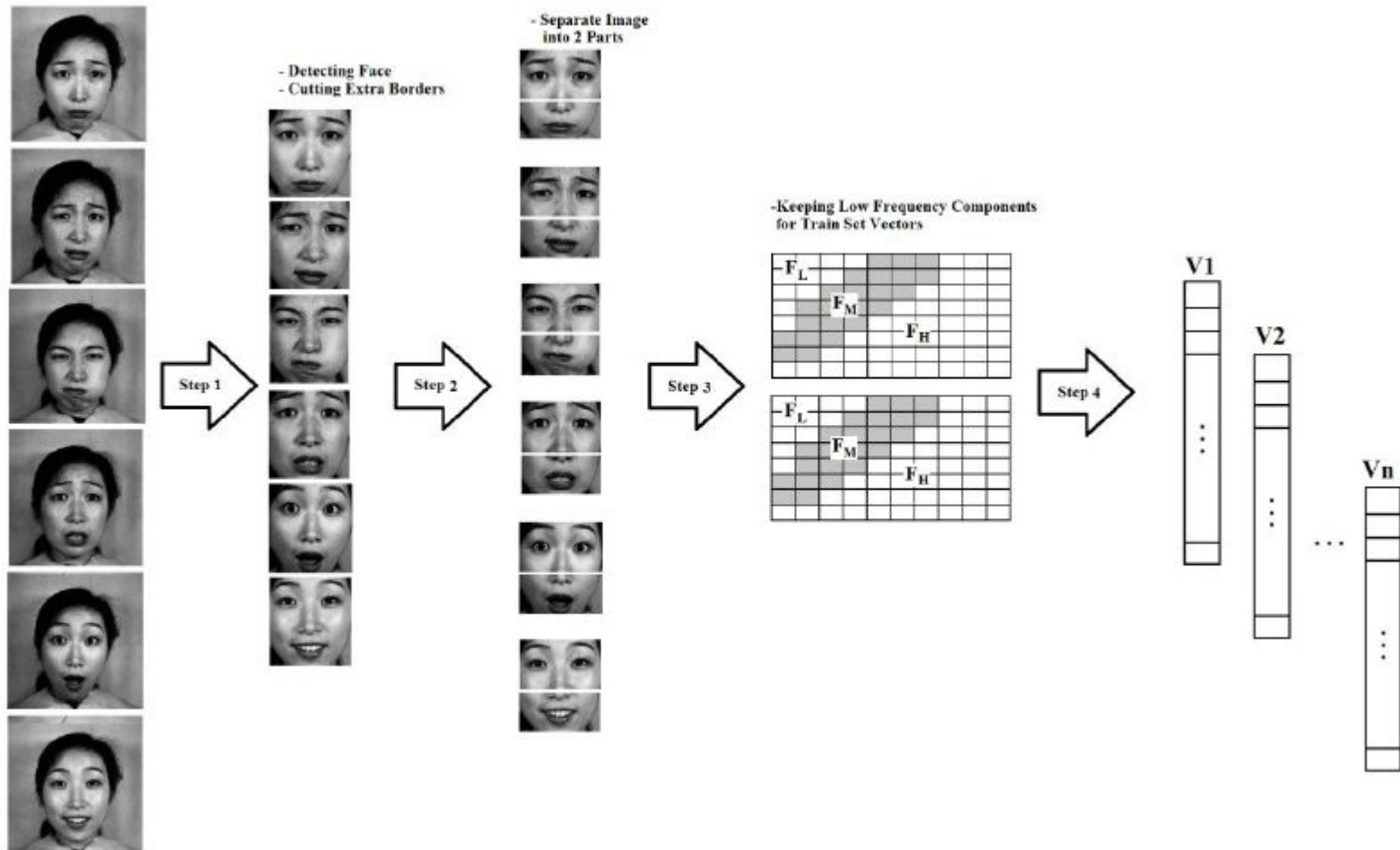


- Detecting Face
- Cutting Extra Borders

- Separate Image into 2 Parts

Step 1    Step 2    Step 3

-Keeping Low Frequency Components for Train Set Vectors

$F_L$    $F_M$    $F_H$

$F_L$    $F_M$    $F_H$

Step 4

V1    V2    ...    Vn

**Figure 8.** Rotation correction on a face from the CK+ database.



**Figure 10.** Results in some faces of the CK+ database using HE.
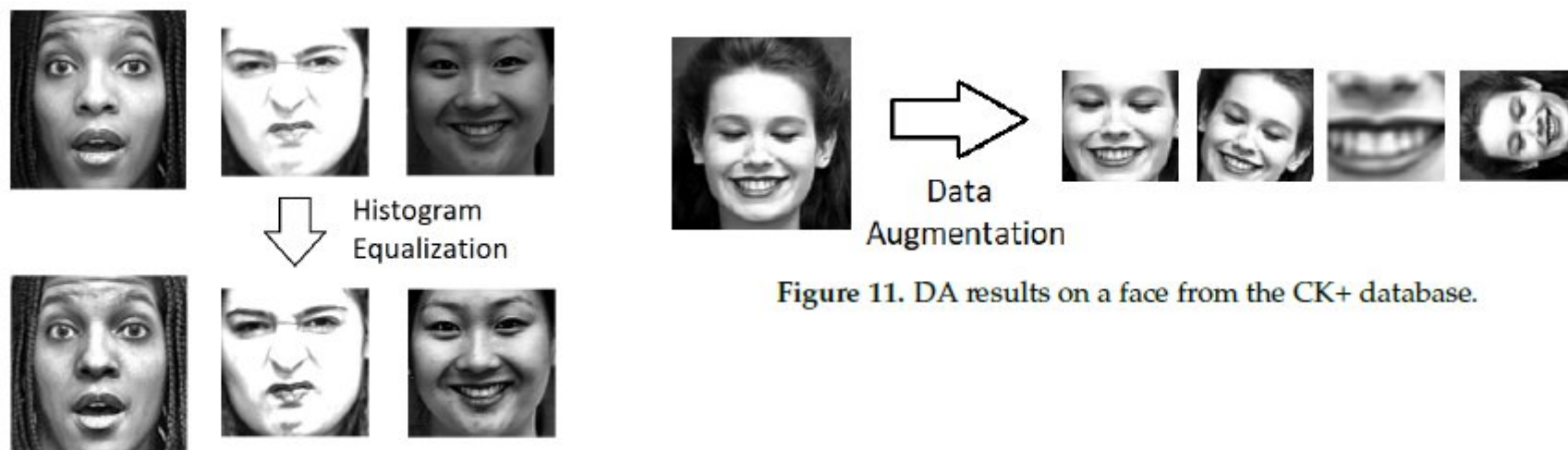


**Figure 11.** DA results on a face from the CK+ database.
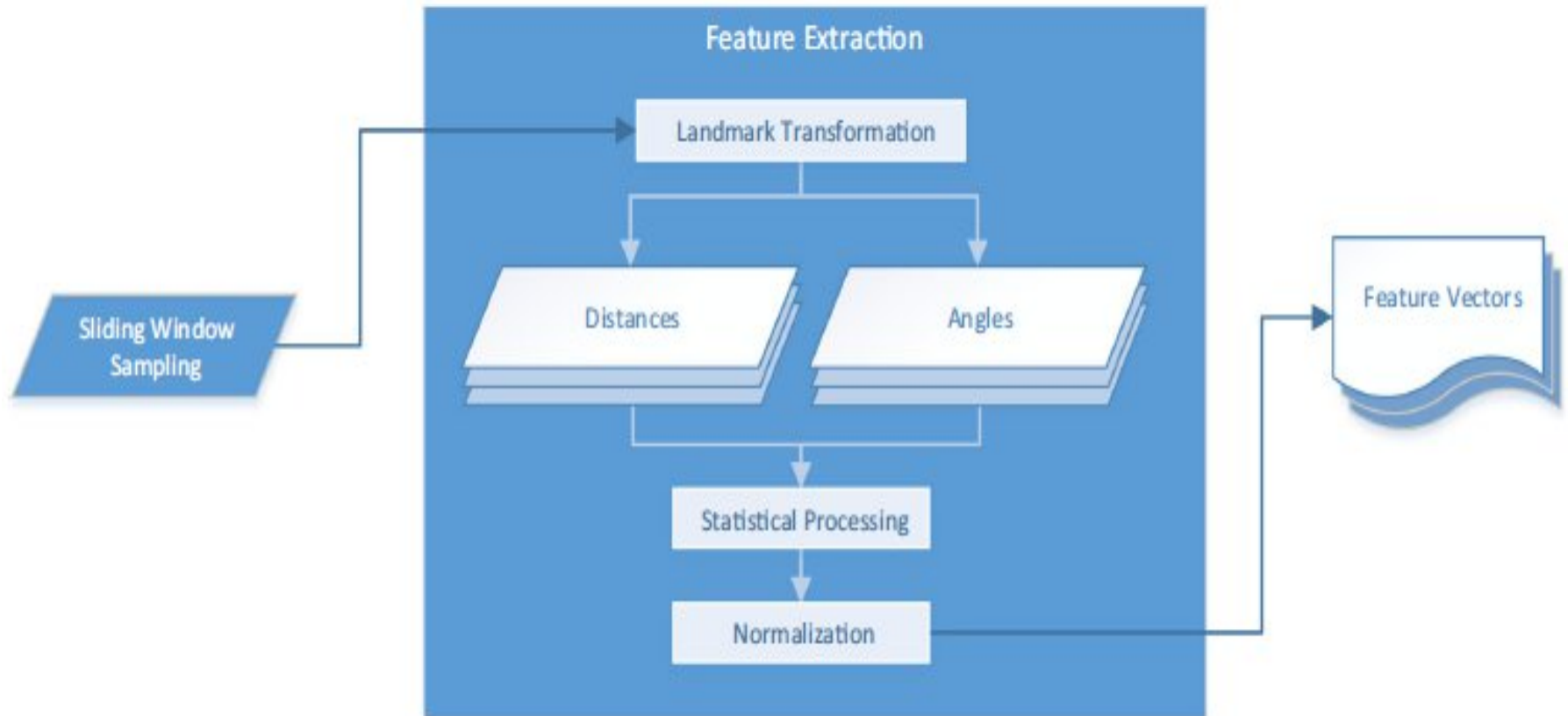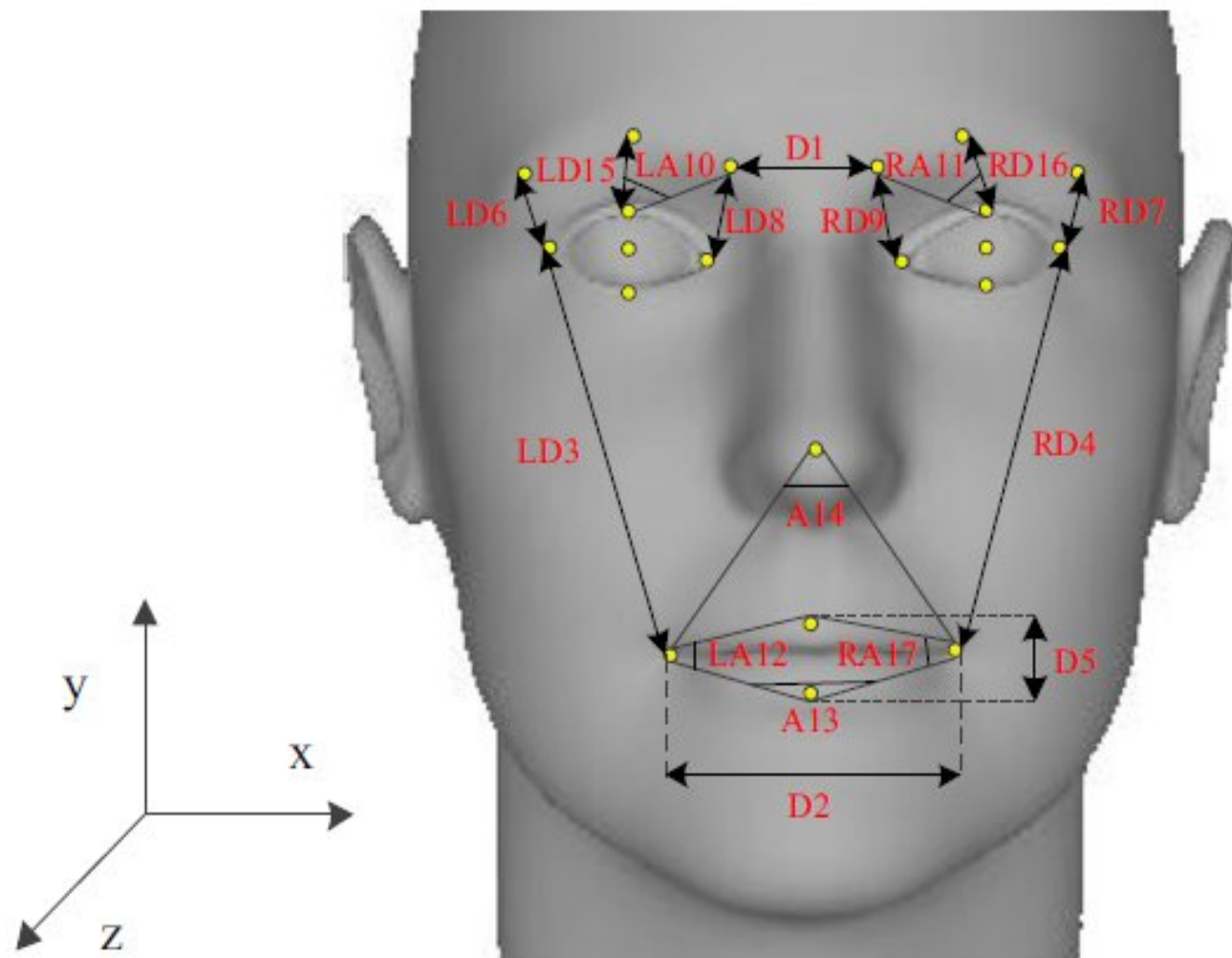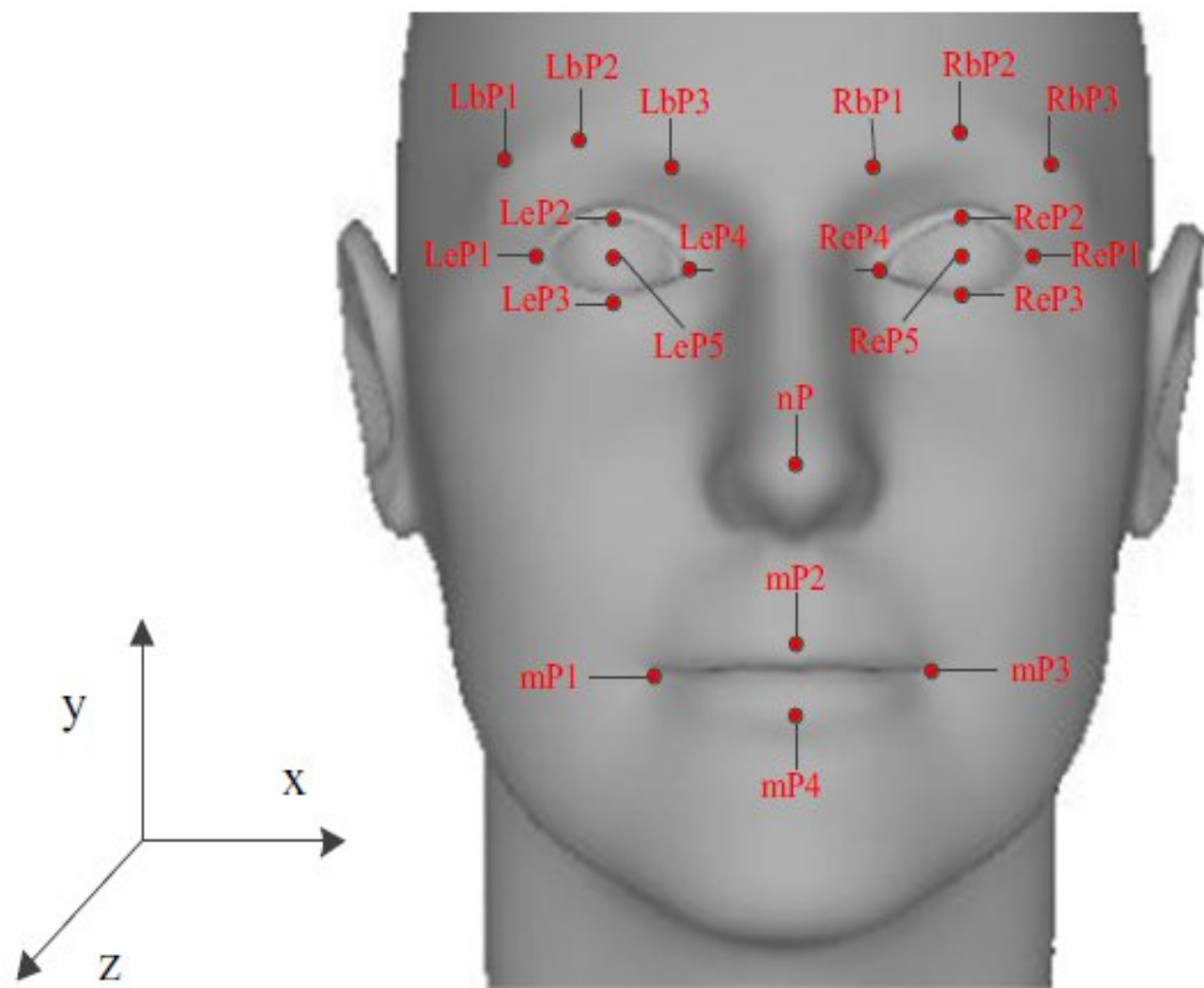
# Feature extraction



Fig. 4 Feature extraction flowchart

**Fig. 5** Facial feature distribution

**Fig. 2** Facial landmark distribution

$$D5 = \sqrt{(mP2x - mP4x)^2 + (mP2y - mP4y)^2} \qquad (1)$$

$$A14 = \cos^{-1} \frac{\overline{(mP1nP)} \cdot \overline{(mP3nP)}}{\overline{|mP1nP|} \cdot \overline{|mP3nP|}} \qquad (2)$$

where

$D5$ height of mouth opening
$A14$ angle of the nose and both side corners of the month
$mP1$ right corner of the mouth

$mP2$ the center point of upper lips
$mP3$ left corner of the mouth
$mP4$ center point of bottom lips
$nP$ nose

### 3.3.2 Statistical Processing

To measure the signal variance of a window, the standard deviation and average of each observation change were calculated for each window. Overall, 34 [(12 distances + 5 angles) × 2 statistical observations] features were generated, and 68 × 21 feature vectors were composed from these features. Figure 6 is an example of feature D5.

### 3.3.3 Normalization

If one feature has a broad range of values, the classifier may be governed by this particular feature. Therefore, the range of all features must be normalized to [0, 1], to ensure that each feature contributes a consistency ratio:

$$x' \frac{x - \text{min}}{\text{max} - \text{min}} \tag{3}$$

where

$x'$ normalized value

$x$ original value of signals

min minimum value of original signals

max maximum value of original signals

# Dataset éléctrique

**Table 1**
Various face emotion datasets.

| Sno | Name of the dataset | Features | Size | Type | Form of collection | Applications in Facial Emotion Recognition |
|---|---|---|---|---|---|---|
| 2.1 | **JAFFE** | 213 posed images of Japanese female in .tiff format labelled with 7 basic expressions + neutral | 1,000 | Images | Wild | Virtual learning environment, facial landmark, EmotionalDAN [6] |
| 2.2 | **FER2013** | Photos represented by pixels are labelled with 0–6 according to the face emotion | 35,887 | Images | Wild | Convolutional Neural Network, Attentional Convolutional Network, Emotion recognition for video clips using CNN |
| 2.3 | **Extended Cohn-Kanade (CK + )** | Diverse images of individuals 18–30 years of age from African-American, Asian and Latin races. | 500 | Images | Laboratory controlled | SVM and NLPCA, Attentional Convolutional Network |
| 2.4 | **CMU-MultiPIE** | Subjects were taken photos under 19 illumination situations. | 750,000 | Images | Laboratory controlled | Raspberry Pi with ASM, Adaboost |
| 2.5 | **AffectNet** | Emphasis on valence and arousal that identifies images in a continuous dimensional model | 1,000,000 | Images | Wild | Context-aware emotion recognition, real-time emotion recognition |
| 2.6 | **IEMOCAP** | Addition of the level of emotion activation according to a situation | 12 h | Videos | Laboratory controlled | Multi-modal emotion recognition |
| 2.7 | **RAF-DB** | 30,000 crowdsourced annotated facial images | 30,000 | Images | Wild | CNN, Neighborhood features |
| 2.8 | **CAER** | Careful selection of video clips to identify emotions | 13,000 | Videos | Wild | Context-aware emotion recognition |
| 2.9 | **iCV-MEFED** | Compound emotion | 31,250 | Images | Laboratory controlled | Dominant and complementary emotion recognition |
| 2.10 | **AFEW** | dynamic temporal facial expressions from movies | | Images | Wild | Video clips |
| 2.11 | **KDEF** | Photos were taken from 5 various angles. | 4900 | Images | Laboratory-controlled | Deep learning |