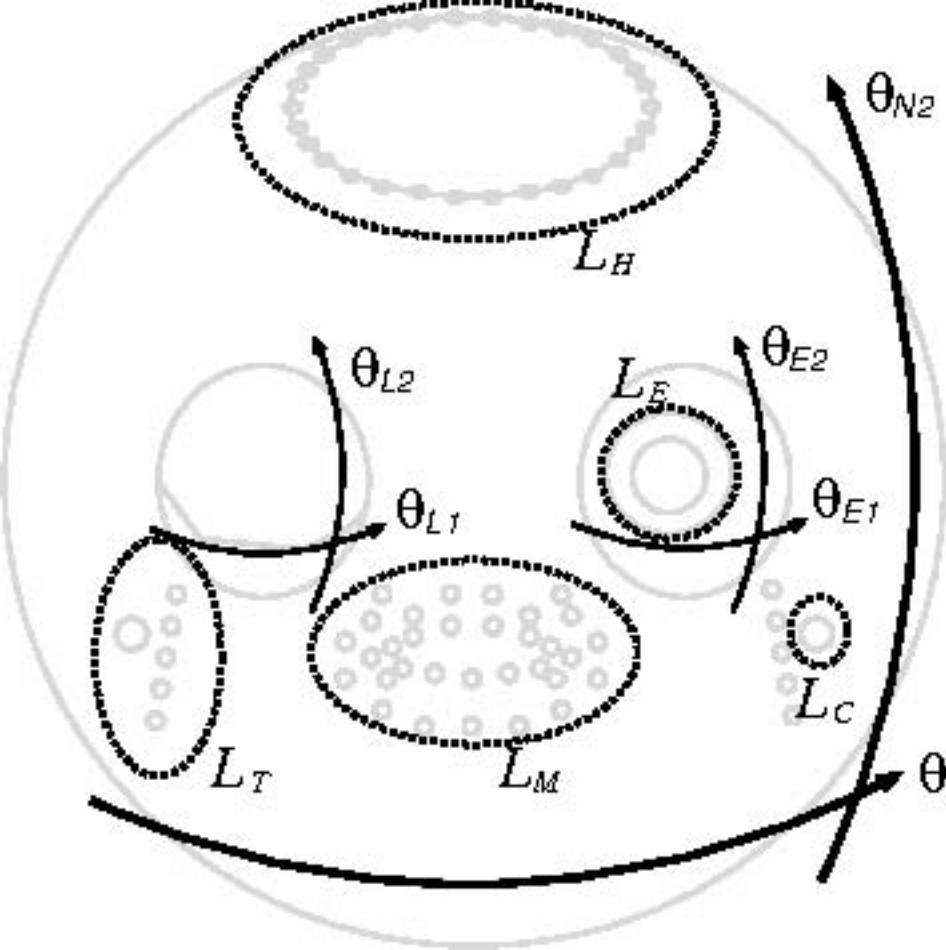


Motor:

neck = θ_{N1} θ_{N2}

eyes = $\theta_{E1}^{(L)}$ $\theta_{E2}^{(L)}$ $\theta_{E1}^{(R)}$ $\theta_{E2}^{(R)}$

eyelids = $\theta_{L1}^{(L)}$ $\theta_{L2}^{(L)}$ $\theta_{L1}^{(R)}$ $\theta_{L2}^{(R)}$

LED:

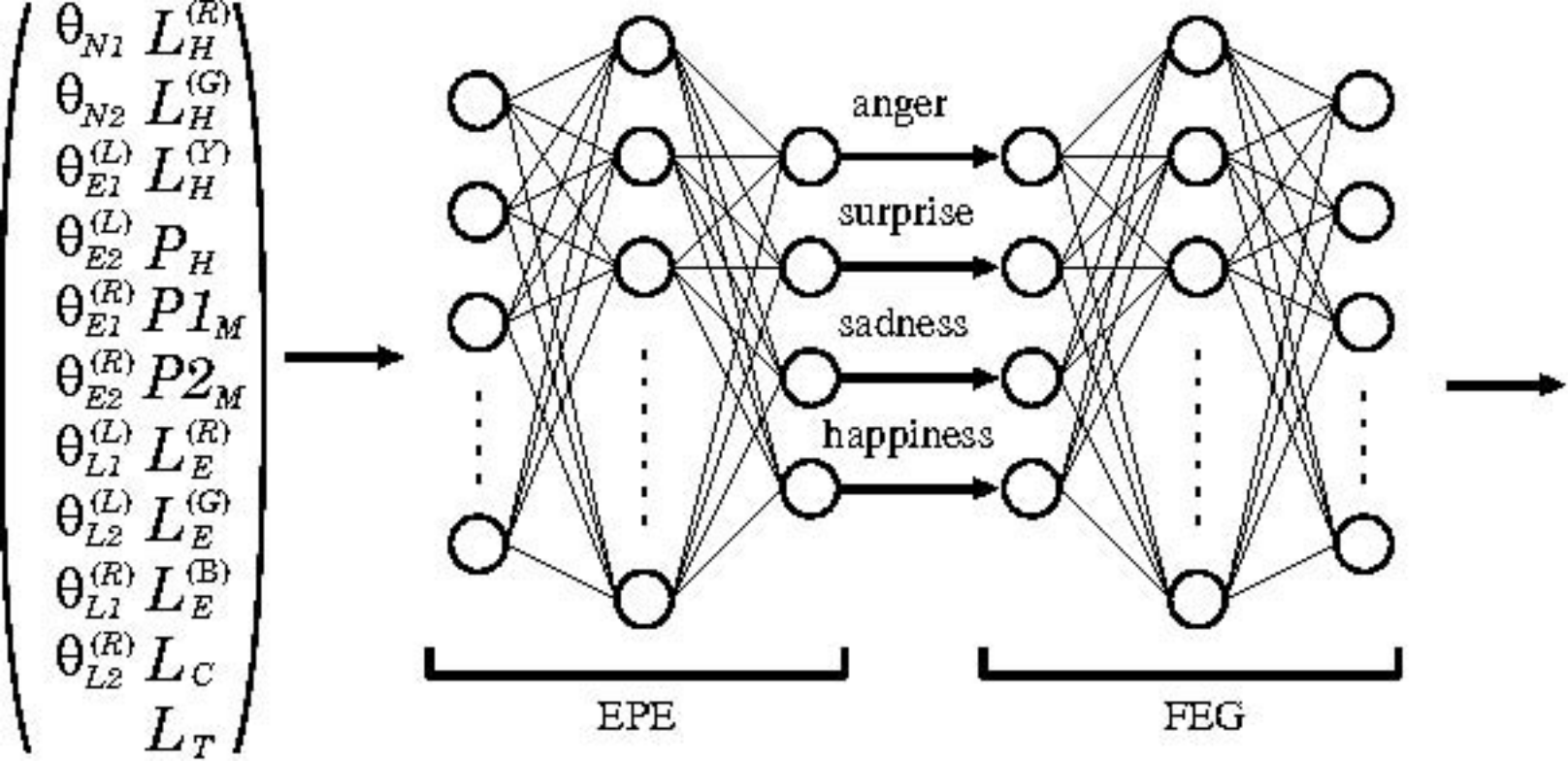
head = L_H

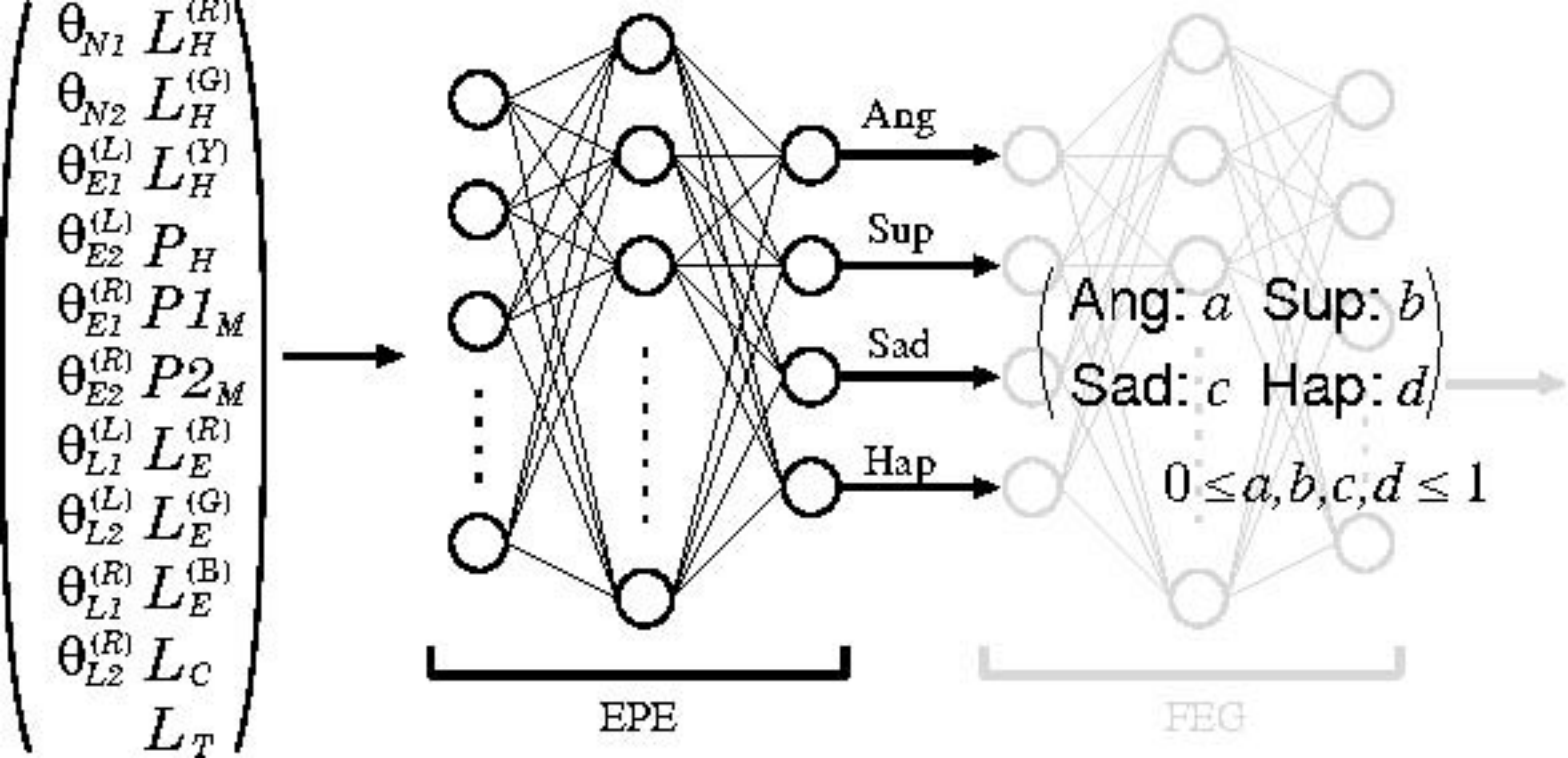
mouth = L_M

eyecolor = L_E

cheek = L_C

tear = L_T

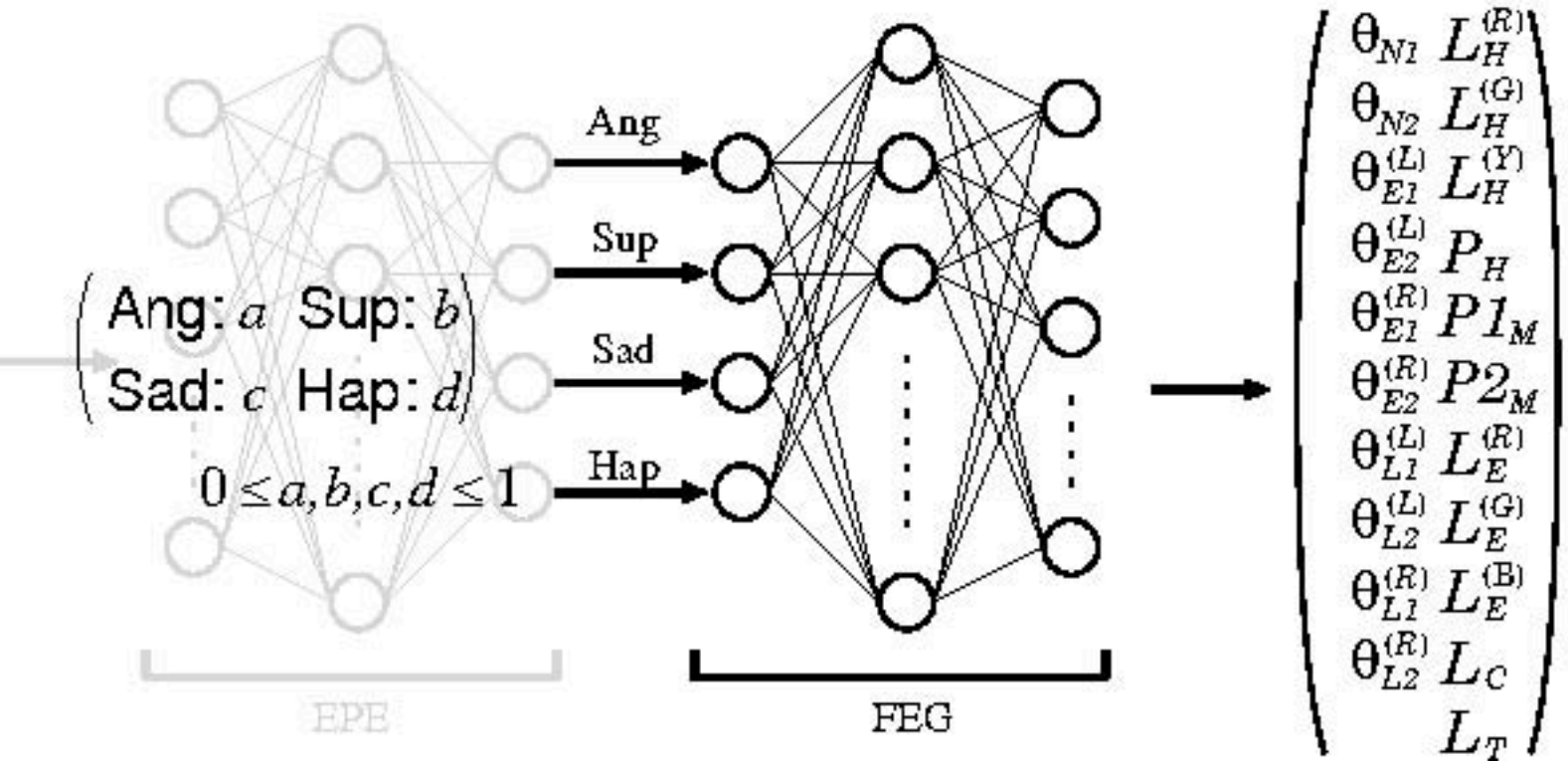

θ_{N1} $L_H^{(R)}$
θ_{N2} $L_H^{(G)}$
$\theta_{E1}^{(L)}$ $L_H^{(Y)}$
$\theta_{E2}^{(L)}$ P_H
$\theta_{E1}^{(R)}$ $P1_M$
$\theta_{E2}^{(R)}$ $P2_M$
$\theta_{L1}^{(L)}$ $L_E^{(R)}$
$\theta_{L2}^{(L)}$ $L_E^{(G)}$
$\theta_{L1}^{(R)}$ $L_E^{(B)}$
$\theta_{L2}^{(R)}$ L_C
L_T
anger
surprise
sadness
happiness
EPE
FEG


θ_{N1} $L_H^{(R)}$
θ_{N2} $L_H^{(G)}$
$\theta_{E1}^{(L)}$ $L_H^{(Y)}$
$\theta_{E2}^{(L)}$ P_H
$\theta_{E1}^{(R)}$ $P1_M$
$\theta_{E2}^{(R)}$ $P2_M$
$\theta_{L1}^{(L)}$ $L_E^{(R)}$
$\theta_{L2}^{(L)}$ $L_E^{(G)}$
$\theta_{L1}^{(R)}$ $L_E^{(B)}$
$\theta_{L2}^{(R)}$ L_C
L_T
Ang
Sup
Sad
Hap
EPE
Ang: a Sup: b
Sad: c Hap: d
$0 \le a,b,c,d \le 1$
FEC

Emotion	Neutral	Anger	Surprise	Sadness	Happiness
Facial expression (Input signal)					
Emotional parameters (Target signal)	⟨Ang: 0 Sup: 0 Sad: 0 Hap: 0⟩	⟨Ang: 1 Sup: 0 Sad: 0 Hap: 0⟩	⟨Ang: 0 Sup: 1 Sad: 0 Hap: 0⟩	⟨Ang: 0 Sup: 0 Sad: 1 Hap: 0⟩	⟨Ang: 0 Sup: 0 Sad: 0 Hap: 1⟩

Emotional parameters (Target signal)	$\begin{pmatrix} \text{Ang: } 0 & \text{Sup: } 0 \\ \text{Sad: } 0 & \text{Hap: } 0 \end{pmatrix}$	$\begin{pmatrix} \text{Ang: } 1 & \text{Sup: } 0 \\ \text{Sad: } 0 & \text{Hap: } 0 \end{pmatrix}$

Fig. 5. Inp

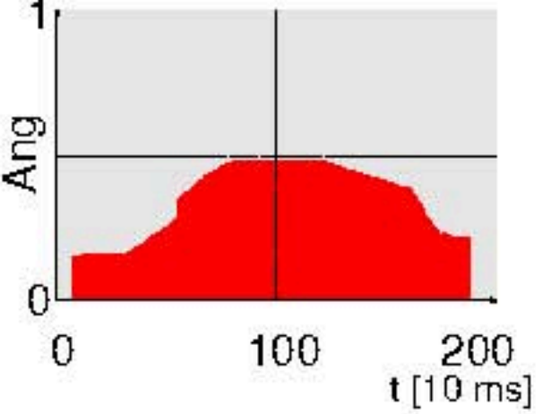


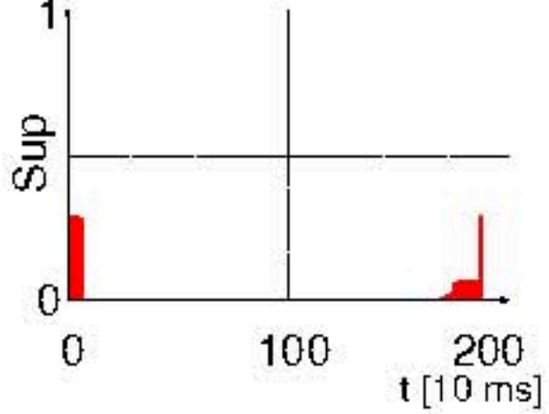
(A) Anger (78%)

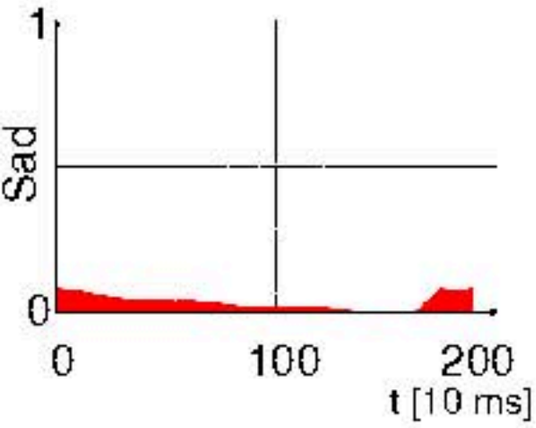
(B) Surprise (66%)

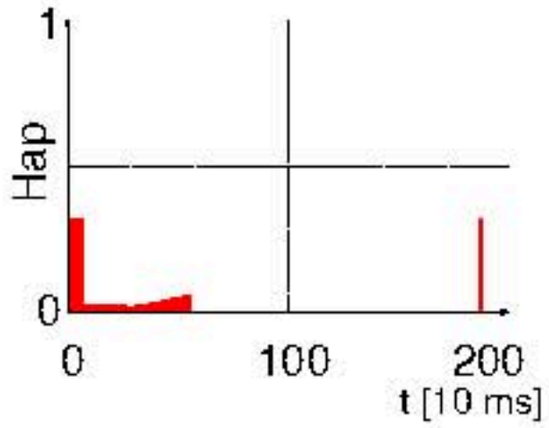
(C) Sadness (86%)

(D) Happiness (84%)

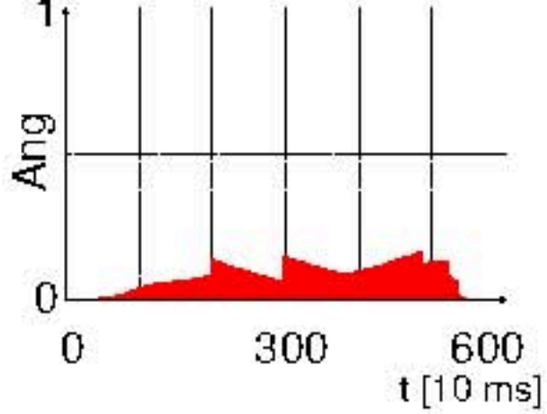


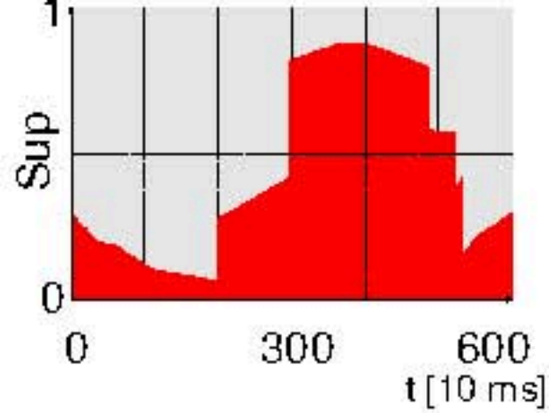


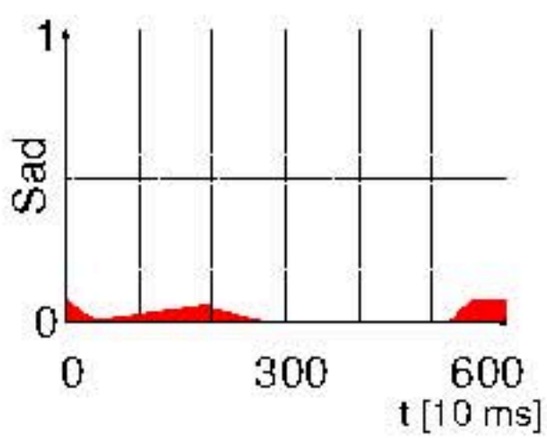


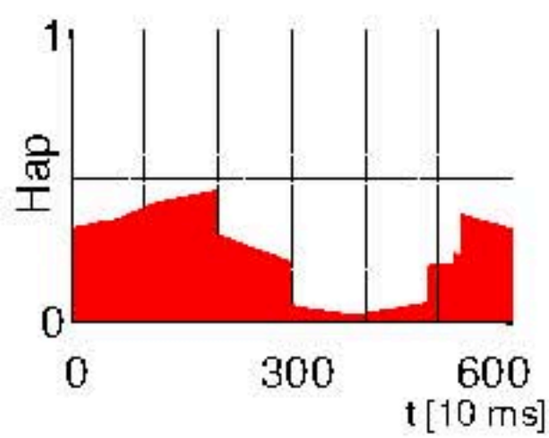


(A)Anger(78%)

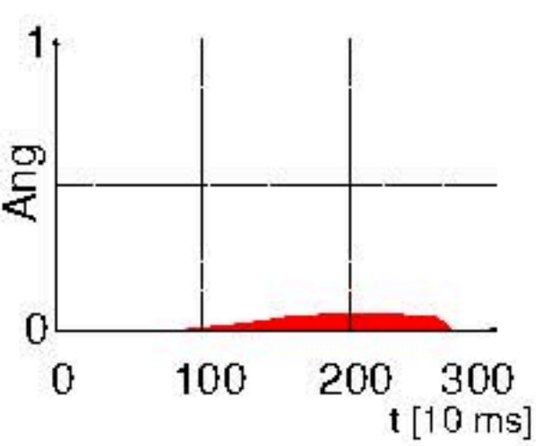


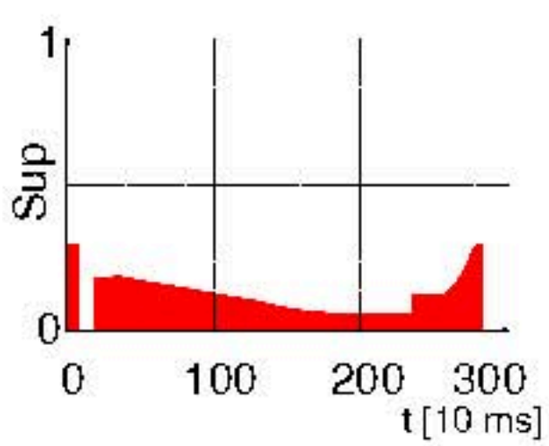


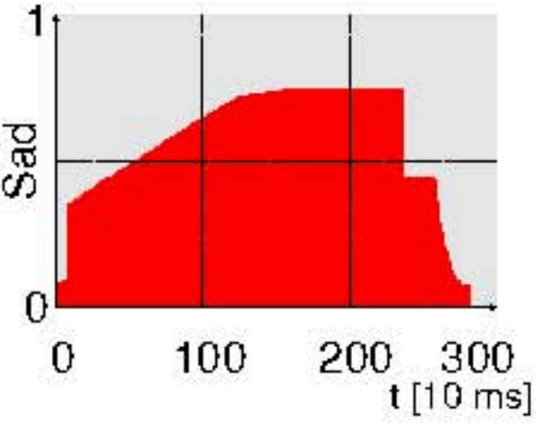


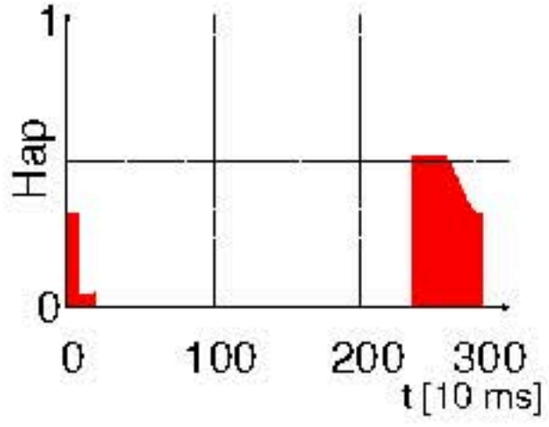


(B)Surprise(66%)

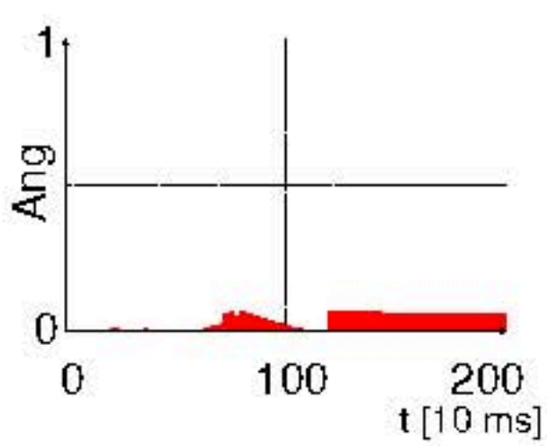


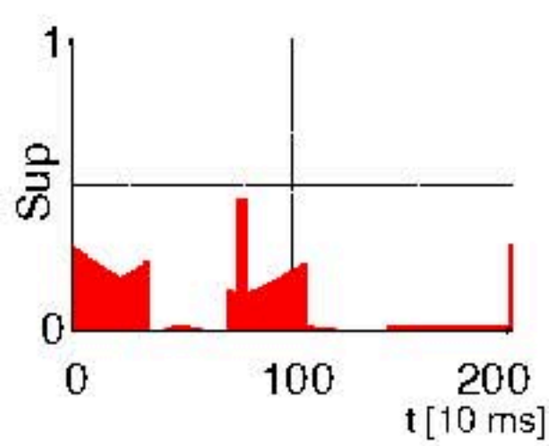


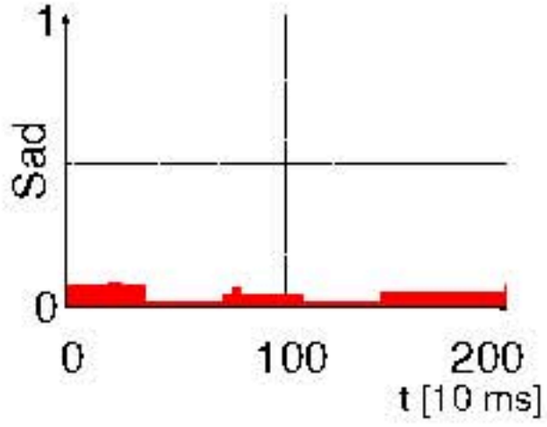


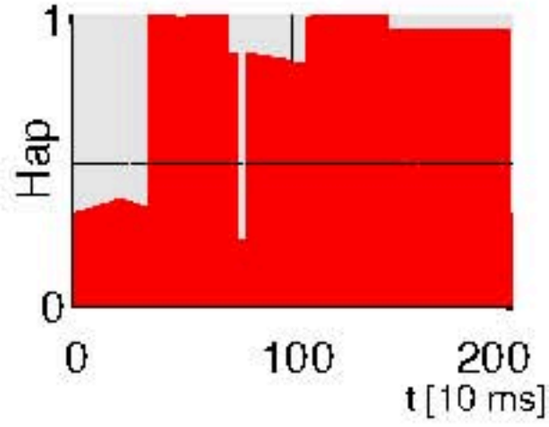


(C)Sadness(86%)









(D)Happiness(84%)

exp1

Anger

exp 2

exp 3

exp 4

exp 5

Surprise

exp 6

exp 7

exp 8

exp 9

Sadness

exp 10

exp 11

exp 12

exp 13

Happiness

exp 14

exp 15

exp 16

exp 17

TABLE I

SUBJECTIVE JUDGEMENT FOR ANGRY FACE.

—	Emotion parameters				Subjective scores			
Exp.	Ang	Sup	Sad	Hap	Ang.	Sup.	Sad.	Hap.
1	**0.00**	0	0	0	**3.0**	1.5	3.5	1.0
2	**0.25**	0	0	0	**7.5**	0.5	3.5	0.0
3	**0.50**	0	0	0	**13.0**	1.5	3.0	0.0
4	**0.75**	0	0	0	**18.0**	0.0	4.5	0.0
5	**1.00**	0	0	0	**18.5**	0.0	2.5	0.0

TABLE III

SUBJECTIVE JUDGEMENT FOR SAD FACE.

—	Emotion parameters				Subjective scores			
Exp.	Ang	Sup	Sad	Hap	Ang.	Sup.	Sad.	Hap.
1	0	0	**0.00**	0	3.0	1.5	**3.5**	1.0
10	0	0	**0.25**	0	2.0	0.5	**11.5**	0.0
11	0	0	**0.50**	0	1.0	1.0	**17.5**	0.0
12	0	0	**0.75**	0	0.0	0.5	**19.0**	0.0
13	0	0	**1.00**	0	0.0	0.0	**19.5**	0.0

TABLE II

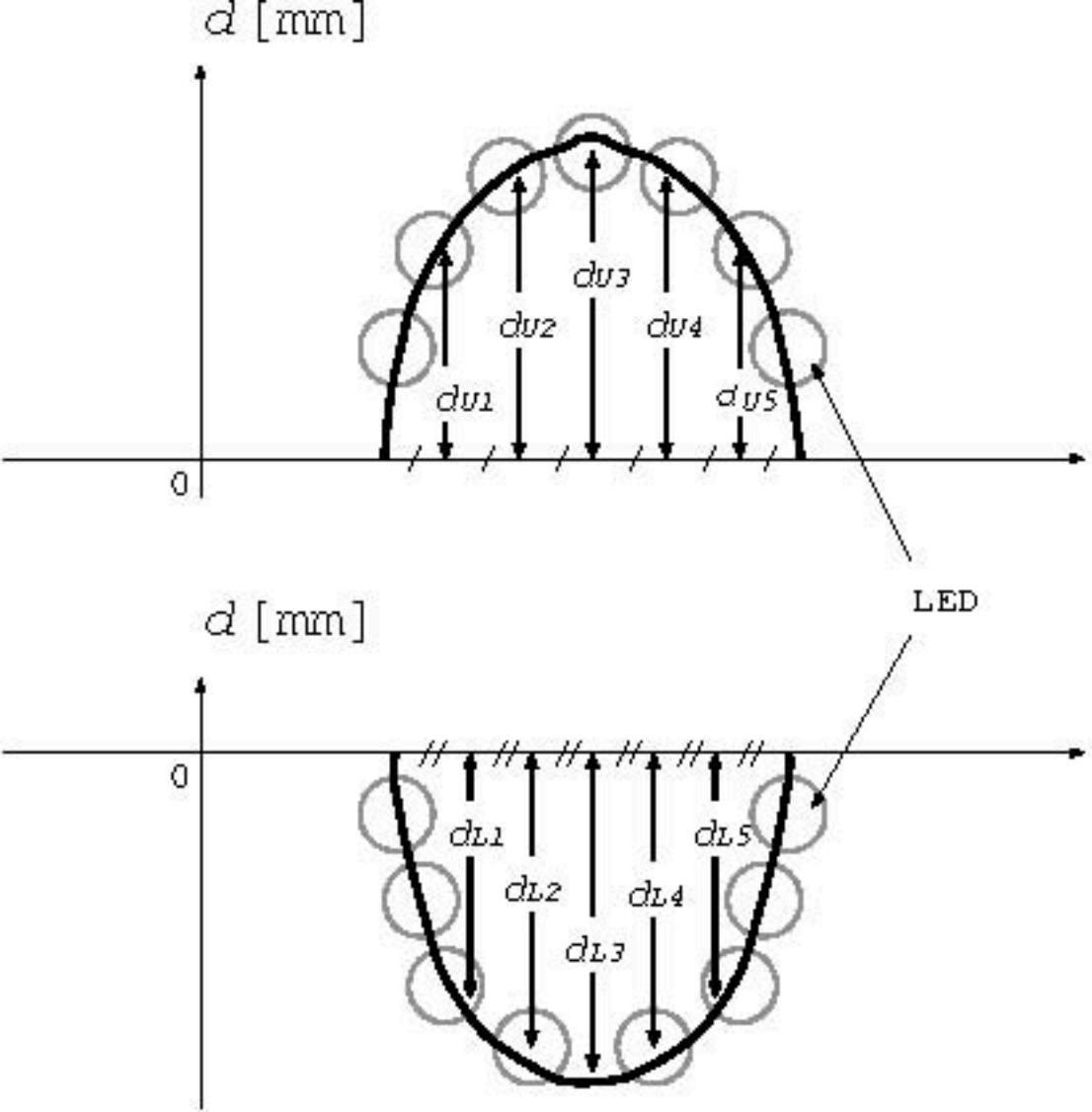
SUBJECTIVE JUDGEMENT FOR SURPRISED FACE.

—	Emotion parameters				Subjective scores			
Exp.	Ang	Sup	Sad	Hap	Ang.	Sup.	Sad.	Hap.
1	0	**0.00**	0	0	3.0	**1.5**	3.5	1.0
6	0	**0.25**	0	0	6.5	**5.5**	7.0	0.0
7	0	**0.50**	0	0	3.0	**6.0**	5.5	0.5
8	0	**0.75**	0	0	0.0	**18.5**	0.0	3.0
9	0	**1.00**	0	0	0.0	**19.0**	0.0	2.5

TABLE IV

SUBJECTIVE JUDGEMENT FOR HAPPY FACE.

—	Emotion parameters				Subjective scores			
Exp.	Ang	Sup	Sad	Hap	Ang.	Sup.	Sad.	Hap.
1	0	0	0	**0.00**	3.0	1.5	3.5	**1.0**
14	0	0	0	**0.25**	2.5	2.5	2.5	**1.0**
15	0	0	0	**0.50**	0.0	0.5	2.0	**12.5**
16	0	0	0	**0.75**	0.0	2.5	1.5	**14.0**
17	0	0	0	**1.00**	0.0	3.0	2.0	**12.5**



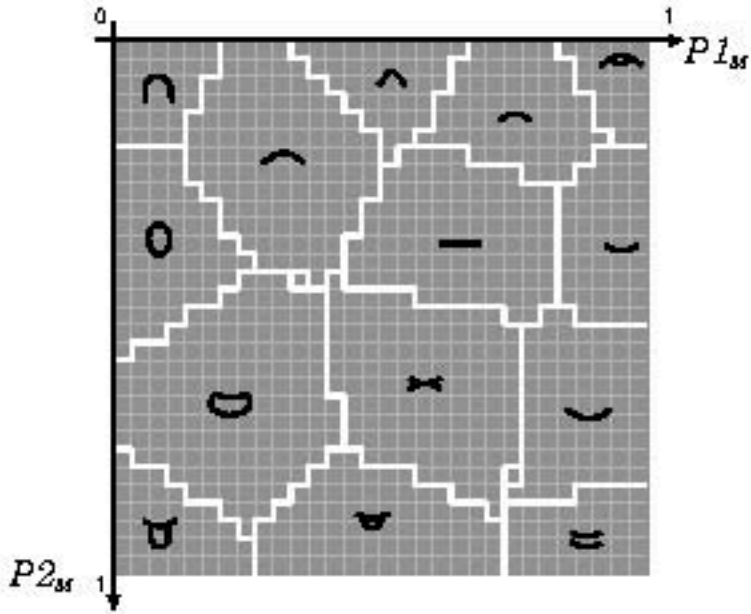


Fig. 12. Trained SOM.

TABLE V

SUBJECTIVE JUDGEMENT FOR MIXED EXPRESSIONS.

—	Emotion parameters				Subjective scores			
Exp.	Ang	Sup	Sad	Hap	Ang.	Sup.	Sad.	Hap.
18	**1**	0	0	**1**	**14.0**	1.0	5.0	**1.0**
19	**1**	0	**1**	0	**8.0**	0.5	**19.0**	0.0
20	**1**	**1**	0	0	**4.5**	**18.0**	0.0	2.0
21	0	**1**	0	**1**	0.5	**5.0**	0.0	**17.5**
22	0	**1**	**1**	0	4.5	**3.0**	**18.0**	0.0
23	0	0	**1**	**1**	0.0	0.5	**10.5**	**10.0**

Anger and sadness (exp 19)

Happiness and sadness (exp 23)