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CONTRIBUTION OF FACIAL TRANSIENT FEATURES IN FACIAL EXPRESSION ANALYSIS: CLASSIFICATION & QUANTIFICATION

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ABSTRACT

The understanding of an image deals with the consideration of the most banal information conveyed by each pattern. A crucial anchor for facial expression analysis is to consider not only permanent features but transient ones too. In this work we are interested by all the outcomes of transient features in the analysis of facial expressions. Three processes based on transient features are proposed.

The first process is proposed to classify a facial expression as one of the six universal expressions. The presence or absence of transient features on different facial regions is studied to associate each transient feature to a specific facial expression. The result is generally a doubt between two or more than two expressions. A post processing step is added to reduce doubt if exists between expressions. The second process is proposed to classify expressions into negative, positive or unknown classes. In this process, transient features are associated to negative or positive expressions. The angle formed by the nasolabial furrows (if it exists) came to complete the classification of the considered expression in the two classes. Finally a process to quantify an expression with nasolabial furrow comes to conclude the outcomes of transient features in facial expression analysis, where the angle formed by the nasolabial furrow is calculated to deduce if the expression intensity is “High” or “medium”. Obtained results are given to prove the reliability of each process.

Key words: *Facial expression, Facial Transient features, expression Intensity, quantification, classification, Fusion data, transferable belief model.*

1. INTRODUCTION

Facial expression is a basic mode of nonverbal communication among people. The most important studies in facial expression analysis field are often limited to deformations and motions of permanent features like eyes, eye brows and mouth. Transient features (TF) appearing on the face like wrinkles and furrows, are another aspect of facial behavior which can occur with visible movement. The appearance changes deals with permanent features as well as transient ones. Permanent and transient changes are due to muscular activities that produces momentary changes in facial appearance. As the muscular activity increases, more appearance changes become visible (like wrinkles and furrows), and appearance changes already present become more evident.

One important way to focus upon the contribution of transient features in the analysis of facial expressions is to prove the importance of information conveyed by transient features, not only to classify the studied expression in different types of classes but to quantify its intensity too.

TF can be easily detected and decide if they are absent or present. Based on their presence or absence, besides other TF characteristics, our challenge is to prove that these features contain enough information to deduce several conclusions, like as defining the mood of a subject, recognizing the expressed emotion and why not quantifying expression intensity.

Several studies in the literature focused on transient features but not to recognize expressions and not to quantify them. The presence or absence of TF on a face can be determined by edge features analysis [1], [2] or by Eigen-image analysis [3], [4]. Terzopoulos

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and Waters [5] detect the nasolabial furrows for driving a face animator, but with artificial markers. Kwon and Lobo [1] detect furrows using snakes to classify pictures of people into different age groups. Ying-li Tian and Takeo Kanade [2] detect horizontal, vertical and diagonal edges using a complex face template, and then they use the Canny edge detector to quantify the amount and orientation of furrows [6].

Description of transient features contribution involves three operations and the reliability of each one can be studied. In the second section we give a Classification process of facial expression into the six universal expressions based on TF. Section 3 presents a method to classify expressions in negative, positive or unknown classes. Section 4 gives the details of the third operation to quantify some facial expressions with nasolabial furrows by associating the intensity "High" or "Medium" to the studied expression. Obtained results corresponding to each section are given followed by discussions. To evaluate the performance of our proposed processes, we give comparisons with other systems results (when possible). Conclusions are given in the last section to finish with investigations on transient features.

2. CLASSIFICATION OF FACIAL EXPRESSION IN ONE OF THE SIX UNIVERSAL EXPRESSIONS

Classification in one of the six universal expressions process was the object of our precedent work [17], here we briefly report the most important steps. The process consists mainly of five steps: segmentation, data extraction, data analysis, classification and post processing.

2.1 Segmentation: In this step, two facial images with and without expression are presented to the system to detect contours of permanent and transient features. As it is not the aim of the present work, permanent facial features detection is not automatically done. 18 characteristic points around permanent features are manually pointed. These characteristic points represent mouth corners, bottom and top of lips, eye corners, bottom and top of eyelids, the centers of irises and finally eye brow corners. Selected points allow calculating some biometric distances as well as automatically determining regions of interests where TF might appear (Fig.1). Here nine regions are considered: The forehead, regions surrounding eyes and mouth, nasal root, nasolabial regions and finally chin.

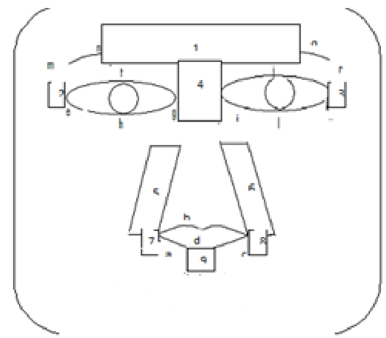

Fig. 1: The nine regions corresponding to transient facial features

To determine if TF are present or absent, the Canny edge detector associated with a thresholding stage [24] is used to extract contour points. We compare the number of edge pixels in every wrinkle area in case of expressive face with the number of edge pixels in the same area in case of neutral face. If the ratio is larger than a threshold (T), the furrows are considered to be present, otherwise, they are considered to be absent.

2.2 Data Extraction: In this step, the state "Present" is assigned to the region where TF appear, else the state "Absent" is assigned to. Besides this, if expression presents TF on the nasolabial region, the formed angle is calculated. The last set of extracted data is about permanent features where the state "Increase" or "Decrease" is assigned to some distances extracted from characteristic points of permanent features. This set is used in the post processing step.

2.3 Data Analysis: In this step, we characterize each TF region by a combination of a set of expressions where we can detect TF on these regions. This process is done after a training step. In the training step we trained the detection program on all images coming from 3 databases (90 images from Hammal_Caplier database [7], 462 images from EEbase database [8] and 144 images from Dafex database [9]). If TFs can appear on a transient region, we associate "1", else the state "0" is assigned to this transient region (The state 1U0 means that TF can be present or absent on the considered region).Table 1 resumed the possibility of the presence or absence of transient features on each region with each facial expression.

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Table 1 : Presence or absence of transient features on each region for each facial expression.

Transient features	JOY	SUR P	DISG	ANG	SAD	FEA R
Chin	(0)	(0)	(0)	1U0	1U0	1U0
Mouth corners	(0)	(0)	(0)	(0)	1U0	1U0
Nasolabial regions	1U0	(0)	1U0	1U0	1U0	1U0
Eyes corners	1U0	(0)	1U0	1U0	(0)	(0)
Nasal root	(0)	(0)	1U0	1U0	1U0	1U0
Forehead	(0)	1U0	(0)	1U0	1U0	1U0

2.4 Classification: As we have several extracted data, all these data will be fused. The Transferable Belief Model is a powerful fusion process [10], [11], [12], [13]. Its salient character is the powerful combination operator that allows the integration of information from different sensors. It can deal with uncertain and imprecise data obtained from automatic segmentation algorithms. In addition it is able to model intrinsic doubt which can occur between facial expressions in the recognition process (see Figure 2).

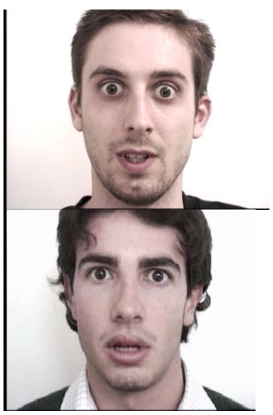

Fig 2 : Example of doubt between Surprise and Fear

Belief Theory principle [14], [15]:

The Belief Theory is a generalization of the probability theory [16]. It has been introduced by Dempster & Shafer and then by Smets. It requires the definition of a set Ω = {E1,E2,…,EN} of N exclusive and exhaustive assumptions. We also consider the power set 2Ω that denotes the set of all subsets of Ω. To each element A of 2Ω is associated an elementary piece of evidence m(A) which indicates all confidence that one can have in this proposal. The function m is defined as:

$$m: 2^{\Omega} \rightarrow [0,1] \quad A \rightarrow m(A) \quad \text{where : } \Sigma m(A)=1 \qquad (1)$$

As we have several sources of information, we have to take into account all available data. The global evidence is obtained using the rule of conjunctive combination or orthogonal sum. In the case of two assumptions, the orthogonal sum is defined in the following way:

$$m_{Dij}(A) = (m_{Di} \oplus m_{Dj})(A) = \sum_{B \cap C = A} m_{Di}(B) m_{Dj}(C) \qquad (2)$$

A, B and C denote propositions and B ∩ C denotes the conjunction (intersection) between the propositions B and C.

In our application, the first sensor Ω corresponds to the six facial expressions: joy, surprise, disgust, Anger, sadness and fear ; 2Ω corresponds to single expressions or combinations of expressions and A is one of its elements. The second sensor Ω' corresponds to the two states taken by each wrinkle region : present and absent.

In the other hand, and for each region where wrinkles can appear, we associate the piece of evidence "1" to the region if TF are present in this region and associate the piece of evidence "0" if TF are absent. This piece of evidence corresponds to the evidence of all considered expressions where TF appear in these regions.

Generally, final result presents doubt between two or three expressions, so, we proceed to a post processing step to eliminate or reduce this doubt.

2.5 Post processing: In this step, two kinds of post processing are proposed:

2.5.1 Post processing using Permanent features: In this step, if the classification result presents doubt between expressions, we use a result of the study done in [17], this result represent the potential differences which can exist between each two expressions from universal ones(Table 2). It is used to eliminate expressions which do not correspond to the studied description. As an example, the difference between Joy and surprise is: with surprise, the mouth is opened vertically but with

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joy it is opened horizontally. For the case where there is no difference between two expressions (Distances evolve in the same way for the two expressions) like between surprise and fear, the doubt cannot be removed.

Table 2: The potential Differences between universal expressions[17].

Expressions	Differences
Joy vs surprise	Joy: distance between mouth corners increases; Surprise: it decrease or relax
Joy vs anger	Joy: distance between mouth corners increases; Anger: it decrease or relax
Surprise vs Disgust	Surprise: distance between lids increases; Disgust: it decrease The same thing with Distance between eye and eye brow
Surprise vs Anger	Surprise: distance between eye and eye brow increases; Anger: it decrease
Surprise vs Sadness	Surprise: distance between lids increases; Sadness: it decrease
Disgust vs Sadness	Disgust: distance between eye and eye brow decreases; Sadness: it increase
Disgust vs Fear	Disgust: distance between lids decreases; Fear: it increase or relax The same thing with distance between eye and eye brow
Anger vs Sadness	Anger: distance between eye and eye brow decreases; Sadness: it increase
Anger vs Fear	Anger: distance between eye and eye brow decreases; Fear: it increase or relax
Sadness vs Fear	Sadness: distance between lids decreases; Fear: it increase or relax

We can see that joy is generally confused with disgust, disgust is generally confused with anger and surprise is generally confused with fear. Sadness is the only expression which is not confused with any other expression.

2.5.2 Post processing using transient features: An information conveyed by the nasolabial furrows which is the angle formed between the adjusted line representing the nasolabial furrow and the horizontal one, connecting mouth corners (Figure 3), allows to reduce doubt between joy and disgust.

Joy nasolabial furrows appear due to the activation of AU12. With Disgust, Anger, Sadness or Fear, nasolabial furrows appear due to the activation of AU9 (Nose wrinkle) or AU10 (Upper lip raiser) [21]. And the angle, between the line approximating the nasolabial furrow direction and the horizontal line connecting both mouth corners, formed when AU12 is activated is lower than the angle formed when AU9 or AU10 is activated [21].

Figure 3: Angle formed by the nasolabial furrows with from left to right: *Anger* (72.6°), *Disgust* (71.2°) and *Joy* (43.4°).(Eebase, H_Caplier databases)

2.6 Obtained Results: The proposed process has been tested on all images of Dafex Database (78 images have transient features). Recognition rates after the post processing step are presented in table 3.

Table 3: Primary expression classification based on presence of transient features with post processing on permanent features.

EXPERT/ SYSTEM	Joy_ Med	Joy_ High	Dis Med	Dis High	Ang Med	Ang High
Joy	50%	87,5 %				
Disgust						
Anger						
Sadness						
Fear						
Surprise						
JoyORDis	32,5					
AngORDs			100	100	100	85,7
Fear OR Surp						
Error	12,5	12,5 %				14,3
Total	100	100	100	100	100	100

EXPERT SYSTEM	Sad Med	Sad High	Fea_ Med	Fea_ High	Sur Med	Sur High
Joy						
Disgust						
Anger						
Sadness	100	100				
Fear			66,67%	42,86%		
Surprise						
JoyORDis						
AngORDs						
Fear OR Surp			33,33%	57,14%	100	100
Error						
Total	100	100	100	100	100	100

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We can note that Recognition rates of Joy are better when intensity is maximum. Disgust and Anger are generally confused, this can be explained by the fact that transient features can appear with both expressions on the same facial regions so expressions cannot be differenced. Sadness is the only recognized expression without any confusion with another one. Fear is sometimes recognized and other times, is confused with Surprise (It is recognized without doubt when TF are formed with fear in the nasal region, and it can be confused with surprise when no TF are formed on this region). However, surprise is always confused with fear, because, with surprise we can have images with TFs only on the forehead exactly like with fear.

2.7 Comparison with other classification system:

To evaluate the performances of our approach, we compare the current system (based on transient features) with that of Hammal et al. [18] (based on permanent features). The two works use the same method: "the Belief Theory", but on two different databases.

Table 4: Comparison of recognition rates between our system and other system [18]

	Hammal et al research/ CKE Database	Our research/ Dafex Database
Joy	64,51%	50% if intensity = Medium 87,5% if intensity = high
JoyORDisgust	32.27%	32.5% if intensity =medium 0% if intensity=high
SurpriseORFear	84%	100%

Comparisons are summarized in table 4. The system gives rates of recognition of three expressions: Joy, Disgust and Surprise. We have compared results of this system with results of the same expressions obtained from our system. For joy expression, the classification rates are very comparable. When intensity expression is high, best performances are given by our classification system. In another hand, the both systems introduce two sources of confusion, the first one is between Joy and Disgust, and the second one between Surprise and Fear. Classifications rates of JoyORDisgust and SurpriseORFear are almost the same.

These results provided converging evidence for the similarity in using either transient facial features or permanent facial features, the obtained classification rates are almost the same. Another source of confusion is introduced by our system: doubt between Disgust and Anger, this source does not appear with the other system, because anger is not studied in the referenced system.

3. CLASSIFICATION OF FACIAL EXPRESSION INTO NEGATIVE, POSITIVE OR UNKNOWN CLASSES

Cowie and colleagues [19] proposed an emotion dimension model which is the activation-evaluation space. The model describes two dimensions, from very passive to very active and from very negative to very positive. Considering the second dimension, we propose a new process to classify a studied expression in negative, positive or unknown (positive, negative or neutral) classes (when possible).

3.1 Classification based on the presence of transient features on certain facial regions: In This process, we follow the same steps of segmentation and study of presence of transient features, on each region with each facial expression, like it is explained in section 2.3. Table 1 is used. The presence of TF on each region corresponds to positive, negative or positive and negative expressions. Our goal is to determine, which TF corresponds to which class of expressions: Negative or Positive.

3.1.1 Primary Classification of negative expressions based on the presence of transient facial features:

Joy expression constitutes the only positive expression among the universal expressions. Because there is no TF on eye corners, on mouth corners, on the nasal root or on the nasolabial regions with surprise, according to table 1, this expression is not considered in this work.

From table 1, we can see that when nasolabial TF and/or on the eye corners appear (features which appear generally with joy expression), we cannot confirm that it is a positive expression because these type of TF can appear with negative expressions like disgust, anger or with sadness and fear too even if it is with very small rates. Thus, we made an opposite study where we look for transient features which can appear only with negative expressions. When TF appear on the chin, on mouth corners or on the nasal root, the studied expression is negative (Anger,

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Sadness, Fear and Disgust). It means that the presence of these three types of TF is correlated with only negative expressions, but the opposite is not obvious. It means, if TF are absent on these regions we don't know what is the nature of the studied expression (Positive, negative or neutral).

To prove this finding, we selected the Chi square statistic (X^2) as a dependency criterion to test the correlation between the presence of TF on some facial regions and the nature of facial expression:

$$X^2 = \sum_{i,j}^{p,q} \frac{(Oij - Eij)^2}{Eij} \quad (3)$$

Oij is the observed number of images expressing Ei expression with TF on region Rj and Eij is the corresponding theoric value.

With the assumption of independency between the considered class of expression and the presence of TF on the specific facial regions, and by choosing an error threshold of α=0.05, the calculated statistic is larger than the observed one on the statistical table relating to the X^2 law. This means that there is a strong dependency between the two variables. This measure achieves the generalization of the deduced rule.

3.1.2 Testing of deduced rule: To validate these results, we tested another database which was not used in the training step. Tested database is JAFFE database [20].

JAFFE database contains 10 Asiatic woman subjects, seven expressions namely: Joy, anger, Sadness, Fear, Disgust, surprise and neutral, each expression with different intensities.

We have summarized obtained results on table 5:

Table 5 : Rates of presence of wrinkles on chin, mouth corners and on the nasal root According to each facial expression in JAFFE database

Exp.	TF on Chin	TF on mouth corners	TF on nasal root
Joy	/	/	/
Surprise	/	/	/
Disgust	/	/	60%
Anger	60%	/	30%
Sadness	20%	20%	40%
Fear	/	/	50%

In this table Lines correspond to the six universal expressions, and columns correspond to the number of subjects which have TFs on chin, mouth corners and nasal root; We can note that the presence of TFs on chin, mouth corners or on the nasal root, is associated to Disgust, Anger, Sadness or fear (100%). These four expressions are all negative expressions.

3.2 Classification based on the angle formed by the nasolabial furrows (positive or negative classes): As we have explained bellow (section 2.5.2), nasolabial furrows can appear with Joy, Anger, Disgust and sometimes with Sadness or fear. Joy is the only positive expression among those five expressions. But These furrows are not due to the same action units, joy nasolabial furrows appear by the activation of AU 12[21] however, nasolabial TF appearing with Disgust, anger, Sadness or fear are activated by AU9 (Nose wrinkler) or AU10(Upper lip raiser)[21](Fig.3), this is why the angle formed between the adjusted line representing the nasolabial furrow and the horizontal one, connecting the two corners mouth, formed when AU 12 is activated is lower than the angle formed when AU9 is activated (Fig.3) like it has been proved by Eckman[21].

To validate this idea, we have measured nasolabial angle formed with all subjects with Disgust, Anger and Joy expressions of the two databases EEbase and Dafex, then we calculate thresholds according to each intensity (Medium or High) for each expression. The highest thresholds are computed as the average of the highest values corresponding to each intensity of each expression, and the lowest thresholds are the average of the lowest ones. These calculated thresholds are represented on Fig.5 : where, abscises represent thresholds values, and the orders represent arbitrary values used to separate between expressions.

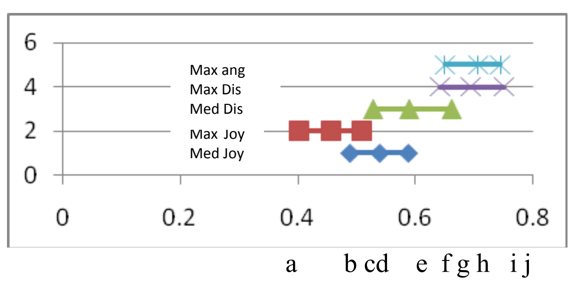

Fig. 5 : Thresholds of Joy ; Disgust and Anger expressions Representation

From this figure we can see that the angle formed by the nasolabial furrows with Joy expression is lower than the angle formed with Disgust or Anger, so we deduce results summarized on table 6 :

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Table 6: Classification of positive and negative expressions based on the nasolabial furrows.

Concerned intervals	Positive Expressions	Positive Exp. U Negative Exp.	negative Expressions
[a,d]	X		
[d,e]		X	
[e,j]			X

a:is the maximum threshold corresponding to Joy expression with high intensity.
d:is the minimum threshold corresponding to Disgust expression with medium intensity.
e:is the minimum threshold corresponding to Joy expression with medium intensity.
j:is the maximum threshold corresponding to Disgust expression with high intensity.

We note that if the angle formed by the nasolabial furrows is in the interval [a,d], the considered expression is positive, if the angle is in the interval [d,e], the considered expression correspond to a doubt between positive and negative expressions, and if the angle is in the interval [e,j] so, expression is negative.

3.2.1 Results of Classification with EEBASE database :

Table 7: Classification rates of positive and negative expressions based on the nasolabial furrows.

	positive Expressions	negative Expressions
Number of concerned subjects	66 subjects	83 subjects
positive Expressions	**60,60%**	8,4%
negative Expressions	7,6%	**83,2%**
positive U negative Expressions	31,8%	8,4%
Total recognized	**92,40%**	**91,6%**
Total	100%	100%

We note that classification rates of positive or negative expressions based on the angle formed by the nasolabial furrows are sufficiently conclusive for saying that an expression is positive or negative, especially for the negative expressions where the rate without any doubt is significantly high (83,2%).

We note that classification rate of negative expressions obtained in the precedent section decreases from 100% to 83,2% and we have not a rate for positive classification, but with this analysis we have the advantage to know whether the expression is negative or positive .

We note too, that both 100% or 83,2% are good rates to know if expression is negative.

In an other hand, an important rate is given to the recognition of doubt between positive and negative expressions(31,8%), this is due to the fact that joy which is a positive expression is generally confused with Disgust which is a negative expression. This confusion was proved in different analyses systems [18], [22].

4. QUANTIFICATION OF FACIAL EXPRESSIONS

Quantification of facial expressions consists on estimating expression intensity. Because expression is always associated to its intensity (I feels deeply sad , I am so surprised, She is very anger …) , because it will not influence the dialogue in the same way according to its degree (a slightly irritated person will not behave in a violent way as a furious person against his/her interlocutor) and because the number of recognized expressions is too small (Joy, Surprise, Disgust, Anger, Fear, Sadness), we quantify each expression to make the dialogue as natural as possible, to know how to act with the interlocutor and to make leave sub expressions classes. For example, we can deduct: rage, anger or boredom instead of anger, and anxiety, fear or terror instead of fear, this is why the quantification becomes primordial.

When studying the presence or absence of facial transient features, on images coming from different databases, we deduce that all images with low intensity do not present TF or that are undetectable but the opposite is not always true. It means that if TF are not detected on the studied expression, we cannot say that its intensity is low.

4.1 Characterization of transient features:

4.1.1 Density: Transient features can be characterized by their density. The density of a feature is calculated according to region of interest, after a thresholding, the binary image is estimated to allow computing density. When studying the possibility of this criterion to estimate expression intensity, we found that when the density of a TF attend a threshold (especially in the presence of TF due to age) it becomes unchangeable, however the expression intensity become more and more important. We conclude that this criterion cannot be an absolute criterion to estimate intensity (fig.6).

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Figure:6 Density of nasolabial TF is equal to 0,131: inchangeable for the two images left: Medium Joy, right : High joy.
The nasolabial angle is equal to: left (intensity Medium): 55,009°; right (intensity high):49,98°: intensity is more important.

4.1.2 Nasolabial furrow angle: Another characteristic of transient features concern the nasolabial furrow if it exists. To estimate expression intensity, we calculate the angle formed by the nasolabial furrows like it is explained in section 3.2. The experiment indicates that with joy, calculated angles of images with medium intensity are higher than those with high intensity, but with disgust and anger, calculated angle of images with medium intensity are lower than those with high intensity like it is shown on fig 7 and 8.

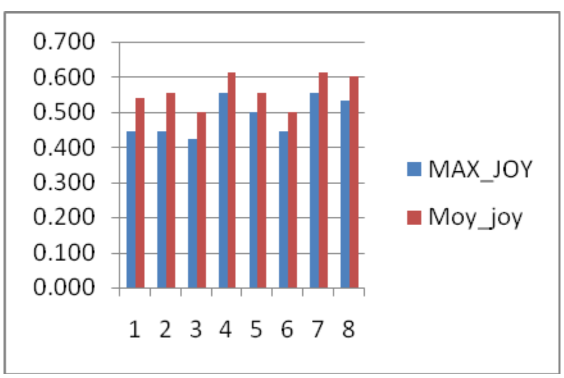

Figure 7 : Calculated angles with Joy expression for medium and high intensities Of Dafex database

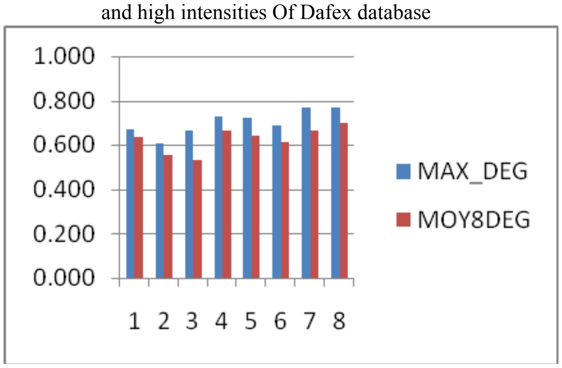

Figure 8 : Calculated angles with Disgust expression for medium and high intensities Of Dafex database.

In section 3.2, Fig. 5 has been used to discriminate between positive and negative expressions. In this section, we use the same figure to discriminate between medium and high intensities. We can deduce intervals for medium, mediumORHigh and high intensities for expressions with nasolabial furrows. The considered intervals are in table 9:

Table 9: Intensity Classification according to nasolabial angle

	Medium intensity	Medium U high intensities	High intensity
[a,b]			X
[b,c]		X	
[c,f]	X		
[f,h]		X	
[h,j]			X

We can see that if the nasolabial angle is in the interval [a,b] or in the interval [h,j], the studied expression is an expression with high intensity, else if the angle is in [b,c] or in [f,h] we are in a doubt between medium and high intensities, if the angle is in [c,f], intensity is medium.

4.2 Obtained results:

4.2.1 Classification rates of expression intensity based on the nasolabial angle with EEbase database:

Table 10 : Classification rates of expression intensity(Joy, Disgust and Anger) on EEbase database

Expert/ System	Exp. Medium intensity	Exp. High intensity
	Medium joy + medium disgust	High joy + high disgust + high anger
Number of concerned subjects	33 + 31	33 + 32 + 20
Exp. With medium intensity	**68,75%**	23,53%
Exp. With high intensity	26,56%	**69,41%**
Exp.Medium U Exp.High	4,7%	7,06%
Total	**100%**	**100%**

4.2.2 Classification rates of expression intensity based on the nasolabial angle with Dafex database:

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Table 11: Classification rates of expression intensity(Joy, Disgust and Anger) on Dafex database

Expert/ System	Exp. Medium intensity	Exp. High intensity
	Medium joy + medium disgust	High joy + high disgust
Number of concerned subjects	8 + 8	8 + 8
Exp. With medium intensity	**68,75%**	25%
Exp. With high intensity	18,75%	**68,75%**
Exp.Medium U Exp.High	12 ,5%	6,25%
Total	**100%**	**100%**

Classification results of intensity expressions when nasolabial furrows appear are almost the same for the two databases EEbase and Dafex. In another hand we can see that classification rates of medium intensity are almost equal to classification rates of high intensity. These rates can be considered as good since only one feature is considered (Nasolabial furrow), this can give an early idea about the expression intensity without enough effort.

Finally, another study is done to estimate expression intensity based on the intensity of the activation of the muscle which produce transient features. This study is conclude by the fact that this study introduce the use of permanent features what is not from the context of this work.

5. CONCLUSION

In this work, we have just proved that investigation on transient features is a new research orientation. TF represent important features in facial expression analysis as well as permanent features (eyes, eye brows or mouth). TF can be used to recognize an expression and classify it in one of the six universal expressions; TF can be used to detect if the mood of a person is good or bad. And TF can be used to quantify the intensity of any expression which produce nasolabial furrows and eventually make leave new classes to increase the number of recognized expressions. Different methods where used to give results and several databases where tested to validate these results. What is interesting with these features is the facility of their study. It is easier to detect the presence or absence of some TF to know more about expressions than to detect other features, compute several distances then fuse all available data to give the same results. Transient features can give an early idea about: the considered classes (universal expressions or mood expressions) as well as expression intensity without enough effort.

Proposed comparisons indicate that permanent feature based method performs just as well as transient feature based method. We feel that we have to combine both approaches to achieve optimal performances.

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