International Journal of
Emerging Research in Management &Technology
ISSN: 2278-9359 (Volume-2, Issue-4)

Research Article | **April 2013**

Human Computing and Machine Understanding of Human Behaviour

M. Indra Sena Reddy[*], K. Subba Reddy, V. Uday Kumar, P. Venkat Vijay Kumar
School of CSE , RGMCET
India

Abstract:

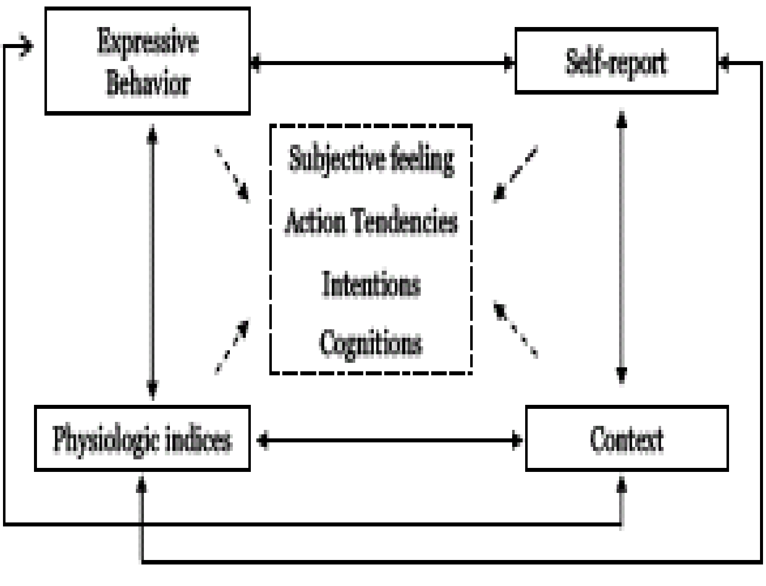
A widely accepted prediction is that computing is moving background projecting the human user into the foreground. Today computing has become a key in every technology. If this prediction is to come true, then next generation computing, which we will call as human computing is about anticipatory user interfaces that should be human centered, built for humans based on human model.In the present paper we will discuss how human computing leads to understanding of human behavior , number of components of human behavior, how they might be integrated into computers & how far we are from enabling computers to understand human behavior.

Keywords— human model, human behavior, human computing, human computer interactions

I. INTRODUCTION

Futuristic movies often contain visions of human environments of the future. Fitted out with arrays of intelligent, yet invisible devices, homes, transportation means and working spaces of the future can anticipate every need of their inhabitants. This vision of the future is often referred to as "ubiquitous computing" [1] or "ambient intelligence" [2]. In this vision of the future, humans will be surrounded by intelligent interfaces that are supported by computing and networking technology embedded in all kinds of objects in the environment and that are sensitive and responsive to the presence of different individuals in a seamless and unobtrusive way. This assumes a shift in computing – from desktop computers to a multiplicity of smart computing devices diffused into our environment. It assumes that computing will move to the background, weave itself into the fabric of everyday living spaces and disappear from the foreground, projecting the human user into it. However, as computing devices disappear from the scene, become invisible, weaved into our environment, a new set of issues is created concerning the interaction between this technology and humans [3], [4], [5], [6], [7]. How can we design the interaction of humans with devices that are invisible? How can we design implicit interaction for sensor based interfaces? What about users? What does a home dweller, for example, actually want? What are the relevant parameters that can be used by the systems to support us in our activities? If the context is key, how do we arrive at context-aware systems?

One way of tackling the problems is to move away from computer-centered designs toward human-centered designs for HCI. The former involves usually the conventional interface devices like keyboard, mouse, and visual displays, and assume that the human will be explicit .But, a goal of human-centered computing is computer systems that can understand human behavior in unstructured environments & respond appropriately. Efforts at emotion recognition however are inherently flawed unless one recognizes that emotion-intentions, action tendencies, appraisals, and feelings- is not an observable. Emotion can only be inferred from context, self report, physiological indicators, and expressive behavior. (See the following figure)



Here we will focus on expressive behavior, in particular facial expression, and approaches to measurement. This article discusses the front end of human computing, that is, what is communicated, how, and why. It focuses on certain human behaviors such as affective and social signaling, how they might be understood by computers, and how far we are from realizing the front end of human computing. For discussions about the back end of human computing, readers are referred to, e.g., [8], [9], [10].

II. FACIAL ACTION DETECTION

Numerous techniques have been developed for face detection i.e.…, identifying all regions in the scene that contain a human face. Tracking is the essential step for human-motion analysis since it provides the data for recognition of face head/body postures and gestures.

III. APPROACHES TO MEASUREMENTS

A. *REAL TIME FACIAL EXPRESSION RECOGNITION FOR NATURAL INTERACTION:*

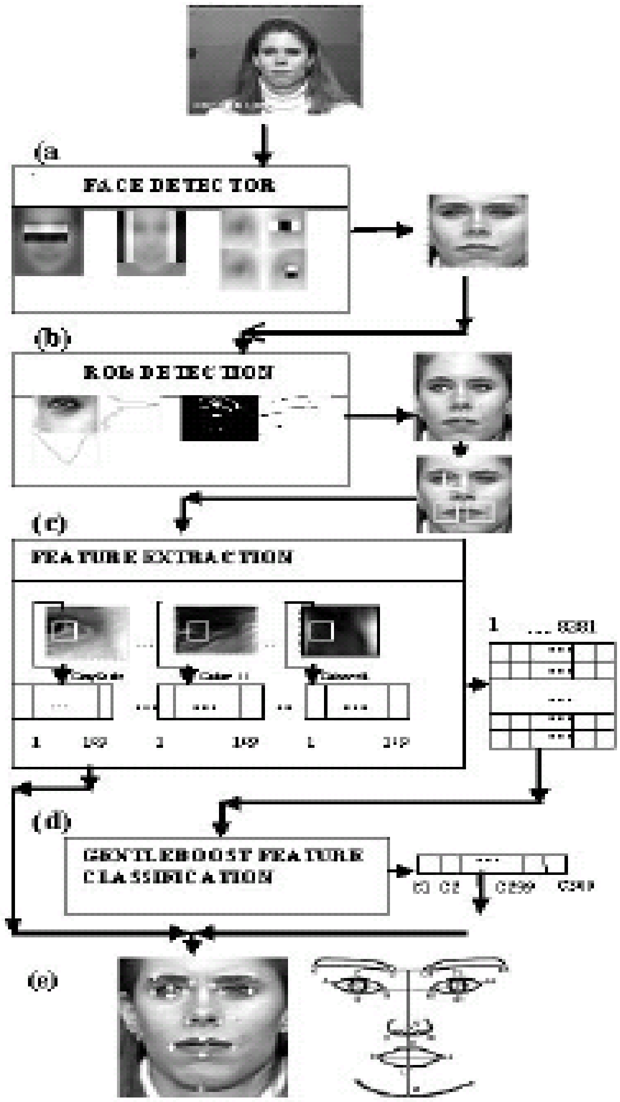
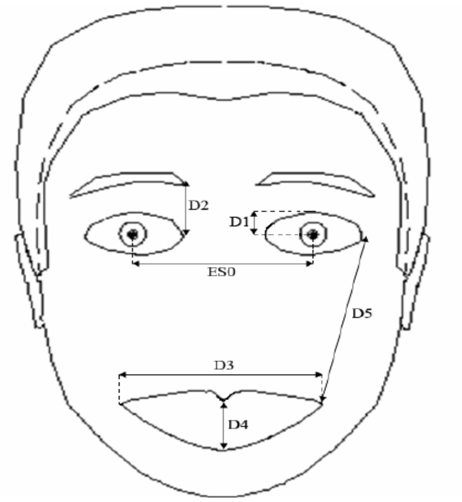


Fig. 1 ***Real Time Facial Expression Recognition For Natural Interaction***

In this the basic step is facial action detection. The process of facial action detection is as follows. Take a look at Fig 1. First, the face image is captured, and then the main important features that are needed are extracted. They are then normalized based on the distance between the eyes. Now let us see about behavioral recognition by real time facial expression recognition for natural interaction. Here mainly 5 distances are taken into account. They are distances between right eye & eyebrow, left eye & eyelid, left eye & left corner of mouth, the width of the mouth, and height of the mouth. Now initially the distances are stored in the database. Now each parameter can take three different states for each of the emotions: C+, C- , and S. State C+ means that the value of the parameters has increased with respect to the neutral one; state C- that its value has diminished with respect to the neutral one; and the state S that its value has not varied with

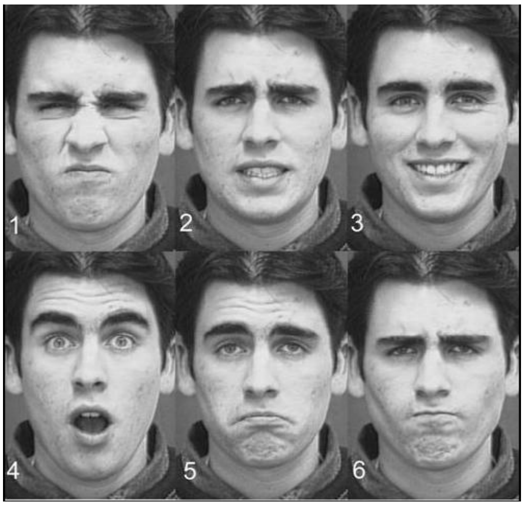
respect to the neutral one.First, we build a descriptive table of emotions, according to the state of the parameters, like the one of the table below:
Now based on the above table we will know the 6 basic emotions of a human. For example: take a look at the first row in the above table. Distance D1 must diminish, D2 must be neutral or diminished, D3 must be increased, D4 must be increased, D5 must be diminished, width / height must decrease or neutral to the stored value, in order to exhibit the emotion **Joy**. Like that all the remaining 5 emotions will be known from the above table.



	D_1	D_2	D_3	D_4	D_5	Ang 1	Ang 2	W/H
Joy	C-	S/C-	C+	C+	C-	C+	S/C+/C-	S/C-
Surprise	S/C+	S/C+	S/C-	C+	S/C+	C-	C+	C-
Disgust	C-	C-	S/C+/C-	S/C+	S/C-	S/C+/C-	S/C+	S/C-
Anger	C-	C-	S/C-	S/C-	S/C+/C-	C+	C-	C+
Sadness	C-	S	S/C-	S	S/C+	S/C+/C-	S/C-	S/C+
Fear	S/C+	S/C+/C-	C-	C+	S/C+	C-	C+	C-

Fig 2: state of parameters for image capturing

MESSAGE JUDGMENT:
Generally all the facial expressions will be given some Action Units (AU's) (i.e.), all the facial expressions are fed into computer with some AU's. Based on those Action Units the corresponding expression is displayed by the computer. There are actually 40 AU's, but the recent systems can recognize only 15 to 27 AU's.
Generally for each and every part of a face according to the features the Action Units are given two points plotted on the faces (i.e.) FACE FEATURE POINTS. Based on these points the system designates the behavior of a Human.
The task is to describe the surface of behavior with the judgment based approach that is making judgments, such as "this face is happy just by seeing a smile on his face." But whereas an observe with a sign based approach would code the face.



Actually there are six “basic emotions.” They are joy, surprise, sadness, disgust, fear and anger. An example of facial expressions for the six basic -motions are shown in the figure above. There are some contradictory emotion expressions, for example consider “MASKING SMILE,” in which smiling is used to cover up or hide an underlying emotion. So such type of underlying emotions can be observed with sign based approach.

B. *SIGN MEASUREMENT:*

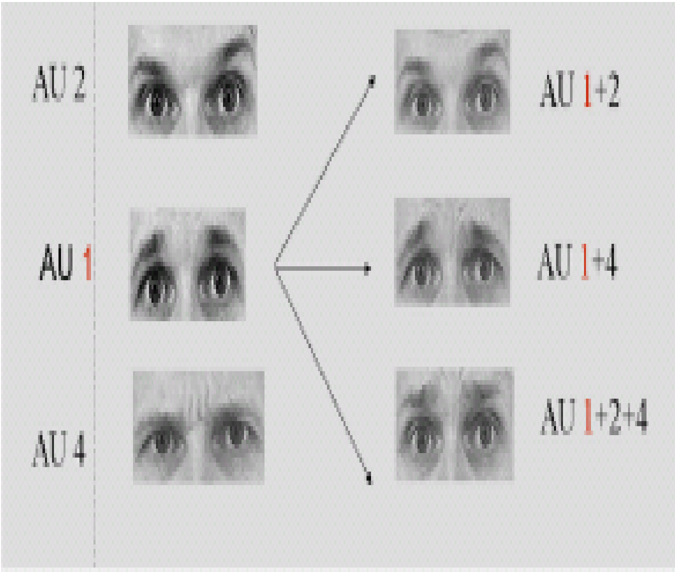
Of the various methods, the Facial Action Coding System (FACS) is the most comprehensive, psychometrically rigorous, and widely used. The most recent version of Facial Action Coding System specifies:

- 9 Action Units for upper face
- 18 Action Units for lower face
- 11 Action Units for head position and movement
- 9 Action Units for eye position and movement and

Action Units may occur singly or in combinations. Action Unit Combinations may be Additive Combinations or Non-Additive Combinations. In Additive Combinations, the appearance of each Action Unit is an Independent, where as in Non-Additive Combinations the Action Units modify each other’s appearance. Non-Additive Combinations are analogous to co-articulation effects in speech, in which one phoneme modifies the sound of one’s with which it is contiguous.

An Example of an Additive Combinations in Facial Action Coding System is (AU 1+2), which often occurs in surprise (along with eye widening, AU 5) and in the brow-flash greeting. The combination two Action Units raise the inner (AU 1) and outer (AU 2) corners of the eyebrows and causes horizontal wrinkles to appear across the forehead. The appearance changes associated with (AU 1+2) are the product of their joint actions.

The Examples of Non-Additive Combinations are (AU 1+4) and (AU 1+2+4), comparable to co-articulation effects in speech. Here (AU 1+4), which often occurs in sadness. When AU 1 occurs alone, the inner eyebrows are pulled upward. When AU 2 occurs alone, they are pulled together downward. When AU 1 and AU 4 occur together, the downward action of AU 4 is modified. The result is that the inner eyebrows are raised and pulled together. This action typically gives an oblique shape to the brows and causes horizontal wrinkles to appear in the center of the forehead, as well as other changes in appearance.



IV. RESEARCH CHALLENGES

A. SCIENTIFIC CHALLENGES:

1**. Modalities:** We should know how many and which behavioral signals has to be combined for realization of robust and accurate human behavior analysis .Here the behavioral channels include face, body and tone of the voices of the human.

2**. Fusion:** Here the main challenge is to know at what abstraction level the input modalities have to be fused. We should know whether the input modalities depend upon the machine learning techniques or not .One should know whether the tight coupling persists when the modalities are used for the human behavior analysis.

B. *TECHNICAL CHALLENGES:*

For understanding of human behavior we should meet the technical challenges which are as follows.

1 .**Robustness:** Most methods for human sensing, context sensing and human behavior understanding works only in the constrained environments. Here the environment should be very calm without any noise. If the environment is noisy then it causes them to fail.

2. **Speed:** Many of the methods in the field do not perform fast enough to support interactivity. The speed of the signals should be fast enough to the destination point. Many of the researchers choose for more sophisticated processing rather than for real time processing .The main challenge is to find faster hardware paragraphs must be indented. All paragraphs must be justified, i.e. both left-justified and right-justified.

V. CONCLUSIONS

Human behavior understanding is a complex and very difficult problem. It is still far from being solved in a way which is suitable for anticipatory interfaces and human computing application domain. In the past two decades there has been significant progress in some parts of the field like face recognition and the video surveillance .While in the other parts of the field it is non basic affective state recognition and multimodal multi-aspect context-sensing. Although there remain significant, scientific and technical issues to be addressed, it is optimistic about future progress in the field. The main reason is that anticipatory interfaces and their applications are likely to become the single most widespread research topic of artificial intelligence and human computer interaction research communities. Now there are a large and steadily growing number of researches Projects which are concerned with the interpretation of the human behavior at a deeper level.

REFERENCES

[1] Weiser, M. The Computer for the Twenty-First Century. Scientific American, 265, 3 (Sep. 1991), 94-104.

[2] Arts, E. Ambient intelligence drives open innovation. *ACM Interactions, 12*, 4 (July/Aug. 2005), 66-68.

[3] Nijholt, A., Rist, T. And Tuinenbreijer, K. Lost in ambient intelligence. In Proc. Int’l Conf. Computer Human Interaction, 1725-1726, 2004.

[4] Streitz, N. and Nixon, P. The Disappearing Computer. ACM Communications, 48, 3 (Mar. 2005), 33-35.

[5] Zhai, S. And Bellotti, V. Sensing-Based Interaction. ACM Trans. Computer-Human Interaction, 12, 1 (Jan. 2005), 1-2

[6] Nijholt, A., de Ruyter, B., Heylen, D. And Privender, S. Social Interfaces for Ambient Intelligence Environments. Chapter 14 in: True Visions: The Emergence of Ambient Intelligence. Arts, E. And Encarnaçao, J., Eds. Springer, New York, 2006, 275-289.

[7] Nijholt, A. And Traum, D. The Virtuality Continuum Revisited. In Proc. Int'l Conf. Computer Human Interaction, 2132-2133, 2005.
[8] Traum, D. Back end of human computing: Multimodal and multi-party interaction management. In Proc. Int'l Conf. Multimodal Interfaces, 2006.
[9] Ruttkay, Z.M., Reidsma, D. And Nijholt, A. Human computing, virtual humans and artificial imperfection. In Proc. Int'l Conf. Multimodal Interfaces, 2006.
[10] Maat, L. And Pantic, M. Gaze-X: Adaptive affective multimodal interface for single-user office scenarios. In Proc. Int'l Conf. Multimodal Interfaces, 2006.