NOVEL APPROACH TO EVALUATE THE EMPLOYEE PRODUCTIVITY BASED ON MOOD VARIATIONS EMPLOYING COMPUTER VISION TECHNIQUES

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Abstract: This Research proposes an approach that will help to evaluate the productivity of an employee based on his mood which can be determined on his facial expressions. A real time human face recognition automated system is adopted for automatic facial expressions recognition of individual employee. This system comes up with a solution to recognize the face and its expression i.e. Anger, Disgust, Fear, sadness, surprise and happiness at work, with the help of Support vector machine (SVM) technique/IBM Facial recognition/Embedded facial recognition system, which is best suited to this task because the high dimensionality of the Gabor representation does not affect training time for kernel classifiers, based on these expressions employee's productivity is mapped and compared. The system allows the company administrator to evaluate the productivity of the employee which increases management efficiency.

Keywords: Facial expressions, Computer Vision, Mood Variations, Employee Productivity, Support Vector machine.

I. INTRODUCTION

In the present era, evaluating employee productivity is becoming crucial than ever in order to keep pace with the competing business world. Along with recording attendance for a general measurement of individual working hours of the employees, it is job of the administration of the companies to make sure that the employees are working efficiently while they are in their office campus. Traditionally, besides recording handwritten attendance, many of the companies use fingerprint, facial and card based attendance system for automatically recording the office hours of the employees which gives time based unit productivity. However, it is practically very critical and time consuming process for the administration to monitor every employee individually to ensure their presence. In solution to this problem, we present a system which not only records the employee attendance, but also recognizes facial expressions and determine their mood and in evaluates productivity. Since a significant portion of the employees in every company generally performs desk job where everyone has a fixed workstation, this system can significantly improve the efficiency of the management through reducing the hassle of manually monitoring their employees. The system performs human face detection and recognition algorithms on video feeds received from the workstation cameras in order to record whether individual employees are present in their workstation or not ensuring the transparency of data served to the management.

II. EARLIER RESEARCH

No recorded research work related to evaluation of the employee productivity based on mood variations with the help of computer vision techniques has beencarried out yet. Research works that will assist the proposed research are discussed below.

A. Earlier Research work carried out on face detection:

Philipp Michel, Rana El Kaliouby in their paper present a real timeapproach to emotion recognition through facial expression inlive video. They have employ an automatic facial feature tracker toperform face localization and feature extraction using Support Vector Machine technique. [4]

Krishnareddysangati, D.Narendarsingh in their paper have proposed a Face recognition system which makes use of latest, less power consumptive, small size and fast working microcontroller like S3C2440.It uses an USB camera to take a snapshot of the users that are present in front of camera. Thecaptured images are stored into NAND flash. [5]

Vinay Bettadapura in his paper has made surveys on some of the published work since 2001 till date. The paper presents a time-line view of the advances made in this field, the applications of automatic face expression recognizers, the characteristics of an ideal system, the databases that have been used and the advances made in terms of their standardization and a detailed summary of the state of the art. The paper also discusses facial parameterization using FACS Action Units (AUs) and MPEG-4 Facial Animation Parameters (FAPs) and the recent advances in face detection, tracking and feature extraction methods. [6]

Weihao Gao's report proposes a face recognition application based on embedded system [8].

Navin Prakash, Dr.Yashpal Singh in their paper have proposed a support vector machine based facial recognition system.[9].

Prasad M,AjitDanti have proposed in their paper an approach to recognize facial expressions based on mouth feature using SUSAN operator. [15]

T Muni Reddy, V Prasad1, N V Ramanaiah have proposed a face recognition system based on embedded LINUX. [19]

B. Earlier Research work carried out on facial expression detection and mood determination with the help of computer vision:

Rajneesh Singlaand Sahil Bansalin their paper have depicted an idea regarding detecting an unknown human face from input imagery and recognize his/her current mood [2]
Aleix Martinez, Shichuan Du havepresented in their paper have worked on a revised model that
justifies the results reported in the cognitive science and neuroscience literature of Facial Expressions of Emotion byHumans. This model consistsof C distinct continuous spaces. Multiple (compound) emotion categories can be recognizedby linearly combining these C face spaces. [10]
Melanie Dumas in his paper has proposed how to apply Support Vector Machines to the
problem of classifying emotion on images of human faces. [11]
Philipp Michel and Rana El Kaliouby in his paper has proposed a support vector based facial expression detection system.[12]
Philipp Michel & Rana El Kaliouby have proposed in their paper a revised SVM based facial expression detection system.[13]
Kuang-Yu Chang, Chu-Song Chen and Yi-Ping Hung in their paper have proposed how to Intensity Rank Estimation of Facial Expressions Based on A Single Image [16]
Marian Stewart Bartlett, Gwen Littlewort, Ian Javier R. Movellanin their paper have proposed human face detection facial expression recognition and application of that for computer interaction, [17]

C. Earlier Research Work carried out on facial expression detection and mood determination with other techniques without computer vision:

Ralph Adolphs, in his paper have reported about the relation between emotions and facial expressions [1]
Paul Ekman and Wallace V. Friesen in their paper have obtained the first evidence of a facial expression unique to contempt.Contrary to our prediction, this contempt expression was not culture-specificbut was recognized by people in Estonia S.S.R., Germany, Greece, HongKong, Italy, Japan, Scotland, Turkey, the United States, and West Sumatra.Pan-cultural agreement about the contempt expression was as high as hasbeen found previously for other emotions. [3]
Chapter 2 ofthe book "The Foundations of Psychological Research" has shown evidence of the relation between mood and expressions. [7]
Chris L. Kleinke, Thomas R. Peterson, and Thomas
R. Rutledge in their paper have conducted Two experiments in which Participants attempted to communicate these facial expressions as accurately as they could to a video camera while viewing themselves in a mirror or without viewing themselves in a mirror. [14]

D. Earlier Research Work carried out on Relation Between Emotions and productivity:

Andrew J. Oswald, Eugenio Proto, and Daniel Sgroi have conducted experiments to show that a happy person is more productive, [18]
Andrew J. Oswald, Eugenio and Proto Daniel Sgroi's discussion paper gives evidence of relation between moods and productivity.

III. PROPOSED APPROACH

The proposed system uses face recognition technique for identification of employee facial expressions. There are many available facial recognition systems available that can be adapted like IBM Facial Recognition system, Linux based recognition system etc.
The research proposes to capture facial expression and determine the mood of individual employees using the above mentioned experimental set up and calculate the productivity of the individual based on his different mood variations using computer image gradient and compare them and determine at which mood the employee can be more productive. Determining this will help HRD to find out the problems with the employees if not productive and take corrective measures to cope up with it. The mathematical model of productivity can be determined as follows:

Step 1: Choose the output you will measure. Units completed are a useful measure if it can be so measured. Select a period of time, such as an eight-hour day, and measure the total output for your employee. This averages any anomalies during any particular hour of the day.
Step 2: Find your input figure, which is the hours of labor put into production. Measure an employee's productivity over several hours, because any single hour might not be representative of the usual output from that employee. Choosing a full shift is helpful. The longer the period of time, the better average you will receive.
Step 3: Divide the output by the input.
Step 4: Assign cost values to measure your cost-benefit ratio.
From the above we can deduce
Employee Productivity = Cost of produced unit X No of units produced per hour by 1 employee
Wage Per hour of an employee
Units in non-production sector are number of assignments/projects/tasks given to individual

employee.
The study will be carried out on four mood variations Anger, Sadness, Happiness, Disgust i.e. Individuals with fixed workstation will be monitored for a period of time and the productivity will be determined based on one mood at a time.
Which will helps us define in what mood the individual employee is more productive.

CONCLUSIONS

There are no substantial works aimed towards supervision of employee productivity analysis using facial recognition are in existence. The proposed system thus fulfills its purpose of increasing efficiency for the office management in order to monitor the employees and determine their productivity on daily basis without any hassle.

ACKNOWLEDGMENTS

This research paper is made possible through the help and support from everyone, including: parents, family, friends, colleagues, management and in essence, all sentient beings. Especially, please allow me to dedicate my acknowledgement of gratitude toward the following significant advisors and contributors: First and foremost, I would like to thank GOD for his unconditional guidance and wisdom as i make my research. Secondly, I would like to thank my guide for his most support and encouragement is doing this research. This gives us the experience on how to cooperate and engage ourselves in a serious project. Finally, I sincerely thank to my parents, family and friends, who provide the advice and support. This research paper would not be possible without them.

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