iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 **Issue:** XII **Month of publication:** December 2016

DOI:

www.ijraset.com Volume 4 Issue XII, December 2016
IC Value: 13.98 ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Driving Alert System through feature extraction on facial images using neural network classifier

V. Ezhilarasi [1], N. Srinivasan[2], M. Kavitha[3]
[1]*Assistant Professor, Department of IT, A.V.C College of Engineering*
[2]*Assistant Professor, Department of Computer Applications, A.V.C College of Engineering*
[3]*Assistant Professor, Department of CSE, A.V.C College of Engineering*

Abstract: Any person driving for a long period of time without taking rest causes them to be weary. This driving alert system alerts the driver from causing accidents. It uses Radial Basis Function neural network (RBFNN) for classifying the drivers' facial expression. This approach extracts the features from facial characteristics points (FCP) of face images. Nearly,19 FCP are selected from the face image at variable lighting condition .The state of the eye is detected by processing frontal or side views of the face image taken by a camera mounted in the car and then automatically trained using a cross correlation based optical flow method. Forty eight features are extracted from the FCP based on openness and closeness of eye, width of mouth. The input features are then categorized into normal, anger and drowsiness expression. The performance is evaluated in terms of recognition rate of RBFNN classifier.

Index Terms – Face tracking, Feature Extraction, Emotion recognition, RBFNN.

I. INTRODUCTION

Understanding human emotions is one of the necessary skills for the computer to interact intelligently with human users. Facial expression plays an important role in interactive communication and emotion recognition is useful for designing new interactive devices which offers the possibility for human to interact with the computer system.

The goal of emotion recognition is to find a model for non rigid patterns of facial expressions, so that emotions can be classified in spite of wide range of variation. In the simplest form, facial expressions indicate whether a person is normal or sleepy.

Driving alert system needs to first recognize the state of the eye of driver to ensure whether the eye is open or not in variable lightening condition.For this,the system needs to detect the facial images first, then needs to extract features and track eye for its status. After all these steps are carried out, then the emotions are to be recognized using classier. The drowsiness emotion is considered to be unsafe and hence if that particular emotion is detected then the driver of the car is given an alert.

A most popular hybrid approach by Yoneyama[2], fit a quadratic window to normalized facial image. Then an average optical flow is calculated in each of the quadratic regions, the magnitude and direction of the calculated optical flows are simplified to ternary value magnitude in only vertical direction.

The information about the horizontal direction is excluded. The face should be without facial hair and glasses and no rigid head motion may be encountered for the method to work correctly.

In Hara and kobayashi[3] back propagation neural network ,the units of the input layer correspond to the number of the brightness distribution data extracted from an input facial image, while each unit of the output layer correspond to emotion category.

The neural network is trained using set of images and a different set of images is used as test cases. Our approach to emotion recognition uses a hierarchical algorithm for estimating the optical flow to automatically track the facial features in both horizontal and vertical flows. The extracted feature forms a feature vector for each expression. These feature vectors are then used to train RBFNN classifier to classify one of the three basic emotions.

II. SKIN COLOR SEGMENTATION FOR FACE DETECTION

The first step in emotion recognition is to classify facial and non-facial images. Skin color segmentation uses two approaches for segmenting the image based on the skin color: Either converting the RGB picture to YCbCr space or to HSV space. An YCbCr space segments the image into a luminosity component and color components, whereas an HSV space divides the image into the three components of hue, saturation and color value. Face detection is invariant to skin type and changes in lighting condition.

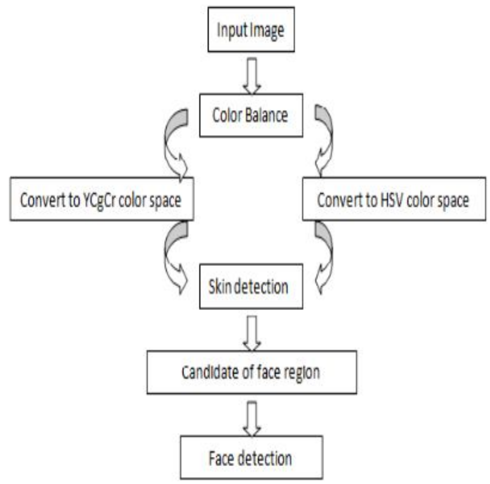


Fig 1.Architecture of skin color based face detection

Here, the facial parts of an image are determined using skin color segmentation. Distinct primary and perceptually related colors of face images are extracted in RGB space. Then the RGB space extracted from each image are converted into the YIQ space. Depending on the amount of color content of these dominant colors, the images are searched in YIQ space and checked whether the skin color value is considerably present in an image or not.

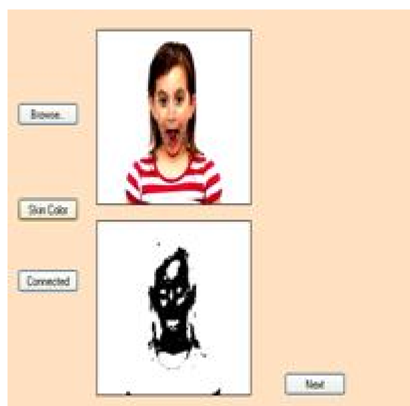


Fig 2. Largest Connected area

III. OPTICAL FLOW METHOD FOR FEATURE EXTRACTION

Feature extraction process aims at reducing the information fed into the neural network and categorizes each facial expression according to feature vector. Top-down and Bottom-up are two approaches of optical flow method. In this bottom-up approach, the facial expression is recognized directly from the optic flow fields over a grid of 11 *11 and 21*21 small image rectangles. Mean and variance of the optic flow within each rectangle along both the horizontal and vertical directions are calculated.

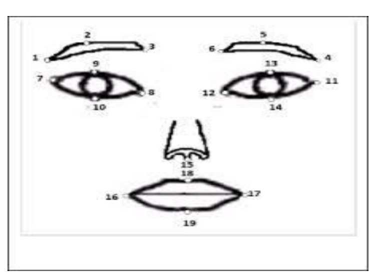


Fig 3.Facial Characteristics Points

The maximum cross correlated value of neighboring windows is taken as position of feature point in the next window. Then, the positions of all feature points are normalized as zeroes & ones Gaussian membership function is used for classifier outputs. 48 features were extracted from feature points. The extracted features are then processed by RBFNN classifier. Below are some facial images representing basic facial expressions.

a)Drowsy b)Neutral c)Anger

Fig 4. Facial Expressions

The features are extracted based on width of the eye, height of eyebrows and openness of mouth.

IV. EMOTION RECOGNITION USING RBFNN

RBFNN is a 3-layer network. The input layer is simply a fan-out layer and does no processing. The second or hidden layer performs a non-linear mapping from the input space into a (usually) higher dimensional space in which the patterns become linearly separable.

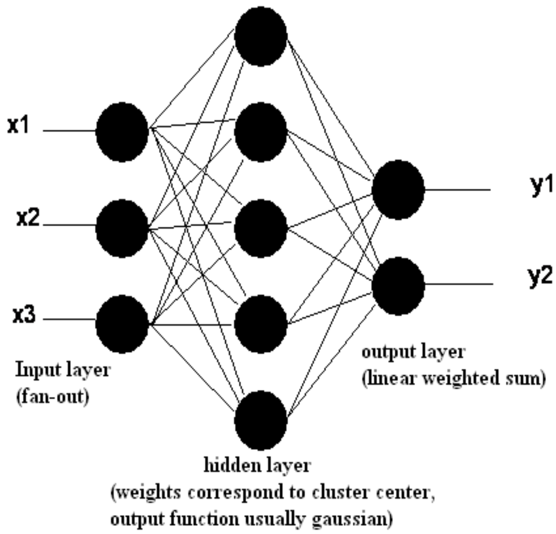


Fig 5. Architecture of RBFNN

Width of the Eye:

$We=(x_8-x_7) + (x_{13}-x_{12}) / 2$

Openess of Eye:

$Oe=(Y_{10}-y_9)+(y_{14}-y_{13})/2$

Openness of mouth:

$Om=y_{19}-y_{18}$

The hidden layer and weights between the middle and output layer are responsible for analyzing the expression. The neural network is trained using back propagation algorithm. Shape and positions of the membership functions are determined by training set of extracted features. A set of hundred images are taken for each expression & trained. The trained neural network is tested by features that are not used in training. Test is repeated for different outputs.

Expression	Normal	Anger	Drowsiness
Normal	98	1	1
Anger	5	93	2
Drowsiness	3	2	95

Table 1. Confusion table for emotions using RBFNN

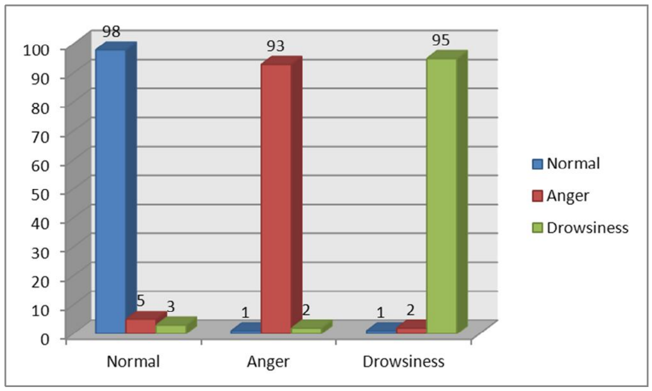


Fig 6.Performance of Emotion Recognition

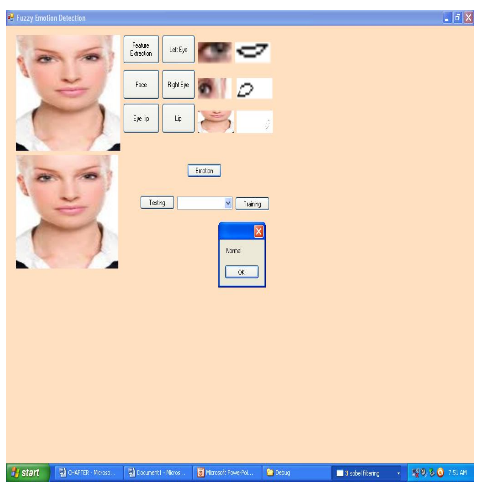


Fig 7. Expression classified as Normal

V. CONCLUSION

Here, we presented RBFNN for classifying the facial emotions from facial inputs. Using cross correlation based optical flow model features are extracted from feature points. The extracted features are given as input to RBFNN for classifying the emotions to alert the driver. The set of several images are taken as input and emotions are classified for them. RBFNN classifies emotion at a rate of 95%. Whenever the drowsiness expression is recognized the driver is alerted.

REFERENCES

[1] H. Seyedarabi, A. Aghagolzadeb and S.Khanmohammadi,"Recognition of six basic facial expressions by feature points tracking using RBF Neural Network and Fuzzy Inference System", IEEE International Conference on Multimedia and Expo (ICME), 2004.

[2] M. Yoneyama, Y. Iwano, A. Ohtake, and K. shirai, "Facial Expression Recognition using Discrete Hopfield Neural Networks," Proc. Int'l Conf. Information Processing,Vol. 3, pp. 117-120,1997.

[3] H. Kobayashi and F. Ham, "Facial Interaction between Animated 3D Face Robot and Human Being" Proc.Int'l Conf Systems,Man Cybermetics,pp,3732-3737,1997.

[4] R. C. Gonzalez and R. E. Woods, Digital Image Processing,2nd ed. Englewood Cliffs, NJ: Prentice-Hall, 2001.

[5] Devendra Singh R, DheerajAgrawal," Human Face Detection by using Skin Color Segmentation, Face Features and Regions Properties",International Journal of Computer Applications (0975 – 8887)Volume 38–No.9, January 2012

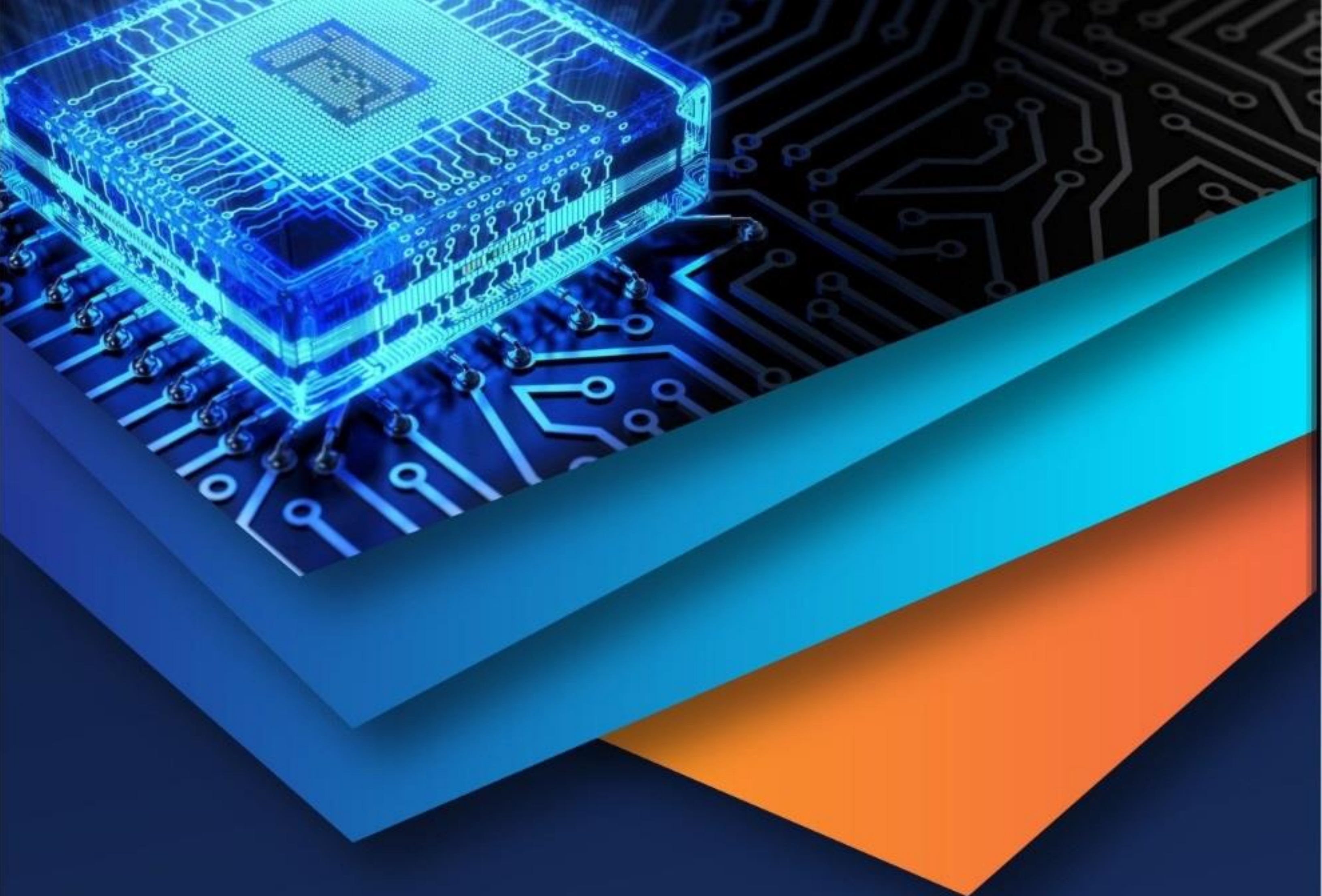
[6] Yogesh Tayal, Ruchika Lamba, Subhransu Padhee "Automatic Face Detection Using Color Based Segmentation", International Journal of Scientific and Research Publications, Volume 2, Issue 6, June 2012.

[7] C. L. Lisetti, D. E. Rumelhart "Facial Expression Recognition Using a Neural Network" In Proceedings of the 11 th International FLAIRS Conference, pp. 328-332, 2004.

[8] C. Busso, Z. Deng , S. Yildirim , M. Bulut , C.M. Lee, A. Kazemzadeh , S.B. Lee, U. Neumann , S. Narayanan Analysis of Emotion Recognition using Facial Expression , Speech and Multimodal Information, ICMI'04, PY, USA, 2004.

[9] Ch.V.Ramireddy,K.V.Krishna Kishore "Facial Expression Classification using Kernel based PCA with Fused DCT and GWT Features" IEEE International Conference on Computational Intelligence and Computing Research,2013.

[10] Shweta A. Vyas, Apurva A. Suke, Mrunali Gedam,"Real-time Intelligent Alert System on Driver's Hypo-Vigilance Detection Using Template Matching Technique", International Journal on Recent and Innovation Trends in Computing and Communication Volume: 3 Issue: 2, 2015.



10.22214/IJRASET

INDEX COPERNICUS
45.98

IMPACT FACTOR:
7.129

IMPACT FACTOR:
7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY