MANTECH Publications
Journal of Computational Intelligence, Theory and Its Applications
Volume 2 Issue 2

Mind Reading using Eye Tracking

Nirupa Susan Philipose[1], Nishana Moyan[2], Nivea Peter[3], Surekha Mariam Varghese[4], Linda Sara Mathew[5]

Students[1, 2, 3], HOD[4], Professor[5]

Department of Computer Science and engineering

M A College of Engineering Kothamangalam, India

Corresponding Author: *niveapeter1995@gmail.com*

Abstract

Judging a person's character using physical tests is not always accurate as they may voluntarily change their answers. Hence a new way of understanding ones personality is introduced by calculating their interest level on the basis of various factors like the first picture the person looks at, the amount of time he/she stares at an image etc. Here using a webcam we track the gaze movement of a person's eye and determine the required values. The gaze capturing is done by displaying images in an interface and then the gaze feature is extracted from the captured image which depends on number of times the user's gaze lies at a particular image. The displayed images are in such a way that each image corresponds to different characters portrayed by humans. A combination of images is selected based on the persons interest level and using an algorithm we determine the most likely character description for that person. Thus the proposed work constitutes a less complex method for gaze tracking using a webcam.

Keywords: *Interest level, Gaze feature, Eye tracking*

Page 1-8 © MANTECH PUBLICATIONS 2017. All Rights Reserved

I. INTRODUCTION

THE history of eye-tracking goes back to the 19th century when scientists tried to study the reading process by direct observation [1], [2]. Eyes are the most important features of the human face. So effective usage of eye movements as a communication technique in user-to-computer interfaces can find place in various application areas. Eye tracking and the information provided by the eye features have the potential to become an interesting way of communicating with a computer in a human-computer interaction (HCI) system..Along with the development of eye-tracking equipment, experimental studies in psychology and engineering have taken advantage of this new form of implicit human feedback opting for the day that every screen will have an affordable embedded eye-tracker. Some approaches to exploit this implicit feedback can be found in [1]. Eye tracking equipment's are usually costly.

In this paper we are using a simple webcam rather than special eye tracking equipment's. We take images frame by frame from a live video using high resolution webcam in order to track the position of iris. This has less complexity when compared to the expensive commercially available eye trackers. A real-time user adaptive framework is introduced which is capable of measuring the interest of the users to images that appear on the screen by tracking their eyes.

It is difficult to judge a person. For reading a persons mind we use online tests or written tests which contain a set of questions for which the person has to answer and then by analysing those answers we determine his or her character. The main problem with those approaches are that there are a lot of chances for malpractices by the person to get a good character at the end of those tests. Ultimately we can say that these methods are not accurate. Here comes the important of this project, where we determine the persons character by using a set of images. Here a set of images which are corresponds to different characters portrayed by humans are displayed in the screen. Then tell the person to look in to that. The person do not know the features by which we analyse his character, so obviously he will spend more time with the image he likes the most. By analysing a set features like the image the person first looks

Page 1-8 © MANTECH PUBLICATIONS 2017. All Rights Reserved

at and the image in which the person spend more time..etc we can find his character.

II. FRAMEWORK

The entire system can be divided in to two modules .One is the eye tracking part. which is the major one in this paper and the other is the character determination using a set of images.

This paper is done in java. The eye is tracked using an xml file harcascade in OpenCV. An algorithm is written to find the personality using a combination of images.

The purpose of the project is to implement a real-time eye-feature tracker with the following capabilities:

- Real Time face tracking with scale and rotation invariance
- Tracking the eye areas individually
- Tracking eye features
- Eye gaze direction finding
- Remote controlling using eye movements

A. Eye Tracking

Eye tracking is the process of measuring either the point of gaze(where one is looking)or the motion of an eye relative to head[2]. There are a number of methods for measuring eye movement. The most popular variant uses video images from which the eye position is extracted. We use a high resolution webcam to get a good result. Each frame from a live video is taken. This will be given as the input for further processing. We extract the eye portion from each frame and determine the position of the iris . With the combination of all the frames we can understand where that person is looking at. The problem is how to extract the eye.

Java provides a very useful package OpenCV which help us for doing this. OpenCV already contains many pretrained classifiers for face, eyes, smile etc. Those xml file are present in harcascade . Object detection using Haar feature

–based cascade classifies is an effective object detection method. It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is used to detect objects in other images.

Page 1-8 © MANTECH PUBLICATIONS 2017. All Rights Reserved

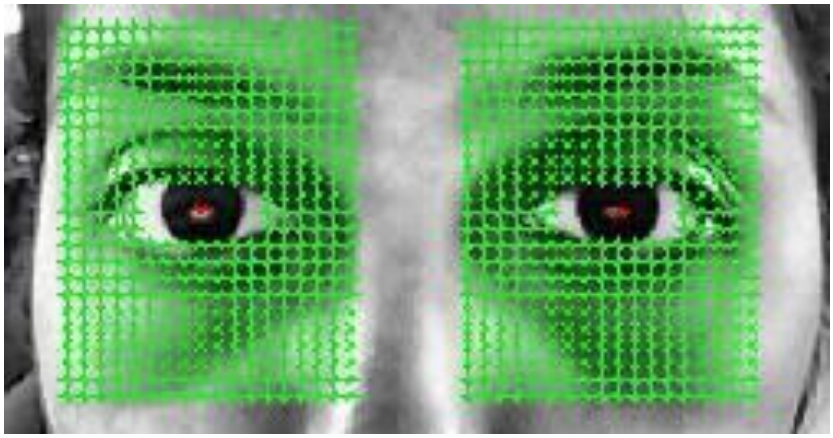


Fig 1 Eye tracking

Now we have the extracted eye portion, from which we need to find the position of pupil. For this we use only the black region since iris is the darkest in the extracted eye portion. Pupil will be the midpoint of the Black region(Iris). When we select the black region eyebrow is also included since it is a part of eye region. So we need to remove the eyebrow. And the size of the eyebrow will be vary from person to person.

We use a y clearance value to remove the eyebrow part which can be adjusted if required. By default the y clearance value is given as 70. By finding the midpoint of the black region we determine the position of the pupil and there by the position where the person is looking at.

To make the eye tracking more accurate we have some additional features.

- Sensitivity
- Colour variation of iris
- Momentum
- Width of the screen
- Gray scale

Page 1-8 © MANTECH PUBLICATIONS 2017. All Rights Reserved

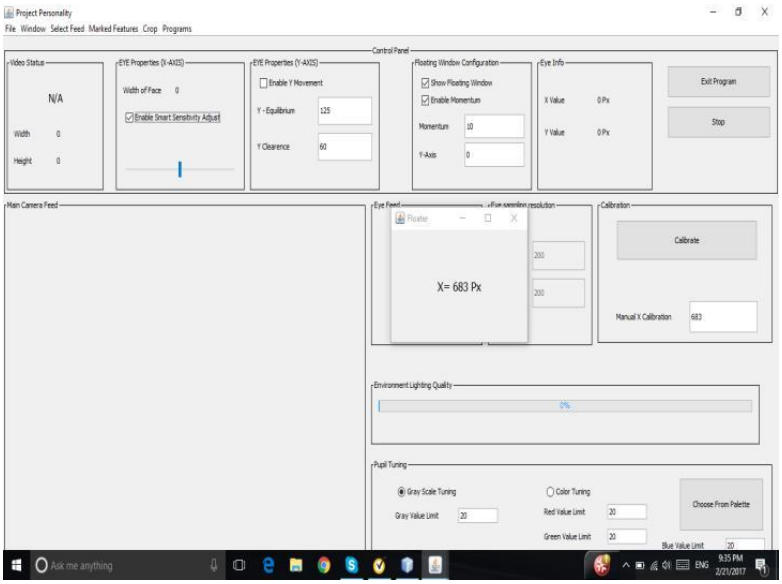


Fig 2 Eye tracking training window

When a person is closer to the webcam the sensitivity of the pupil movement is less compared to that of a person who is away from the webcam. That is the sensitivity varies. To solve this problem we use the help of harcascading which detect the face. When a person is close to the webcam the size of the face detected will be large and hence a smaller value is given as the sensitivity. Similarly when a person is away from the webcam the size of the face detected will be small and hence a large value is given as the sensitivity. Thus each sensitivity value is related to the width of the face at that point of time. This sensitivity calculation is done automatically. A user can also adjust it manually is required.

We cannot say that the iris of a person is black, it may varies from person to person. We have a colour scale to adjust according to the colour of the iris of a particular user.

The gray scale value determines the strength of darker regions to be selected. To get the most accurate result the gray scale should be larger. That is only the darkest spot will be selected.

B. Personality Detection

Nowadays personality of a person is calculated manually using online or written tests, which contain a set of questions for which the person has to answer and then by analyzing those answers we reach with a conclusion. Another commonly used

Page 1-8 © MANTECH PUBLICATIONS 2017. All Rights Reserved

method is by choosing an image which a person is more interested in. In these techniques chances of cheating is high because a common man know which all answers he chooses results in a good character or not. So he may change it when he thinks to hide himself from the society. In this paper we use a method that identifies the image he is more interested in automatically with the persons direct involvement.

We use certain features to identify which image he is more interested in.

- First image the person is looking at
- Image with which the person spend more time
- Number of time person revisit the image

We select a set of images which have certain defined meanings which will help us to determine the character. We show them in different slides. In this paper we selected 20 images and they are displayed in 5 slides each with 4 images. There will be a connection between these 4 images. For example a slide may contain 4 images beach, meadow, desert, mountain or red, blue, green, yellow. Each of these image has an inner meaning.

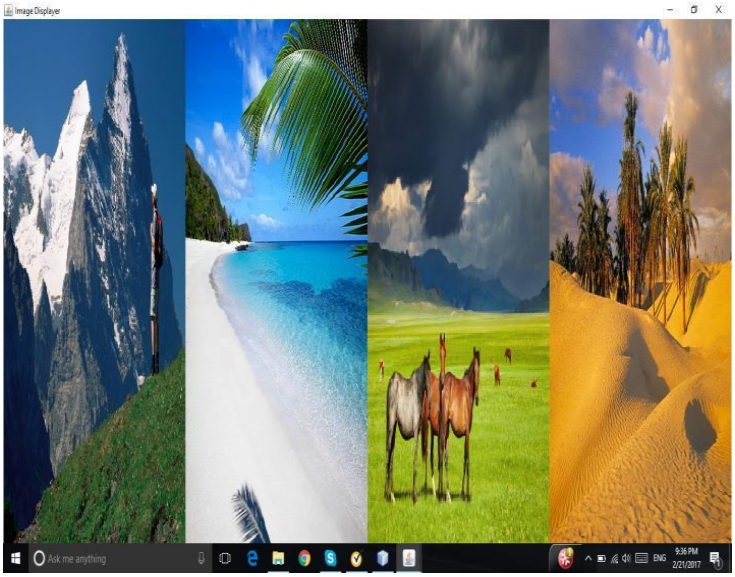


Fig 3: Image Displayer

Page 1-8 © MANTECH PUBLICATIONS 2017. All Rights Reserved

We ask a person to go through the slides. We do not reveal the features we used to find the interest level of the person. The person is not bothered about the features with which we are calculating the character. From each slide we select the most interested image of that person and the combination of the inner meaning of each image gives the personality of the person with the help of an algorithm.

C. Working

We determine the personality by tracking the eye of a person using a webcam. So it is necessary that the person is in correct position with respect to the webcam. To begin the experiment we ask the person to sit in the right position. The user is trained in order to verify whether his eye is tracked correctly, we use a window for this purpose. This is the window where we can manually change the sensitivity, colour, momentum etc. In the next part we display the set of images.

We are selected to determine the personality we ask the person to look to those slides, he is not aware about what criteria we are using to judge his character. Chances of malpractices are less due to this. Thus we can ensure that more accuracy is obtained. Finally, we display the result generated by the algorithm using the combination of images selected.

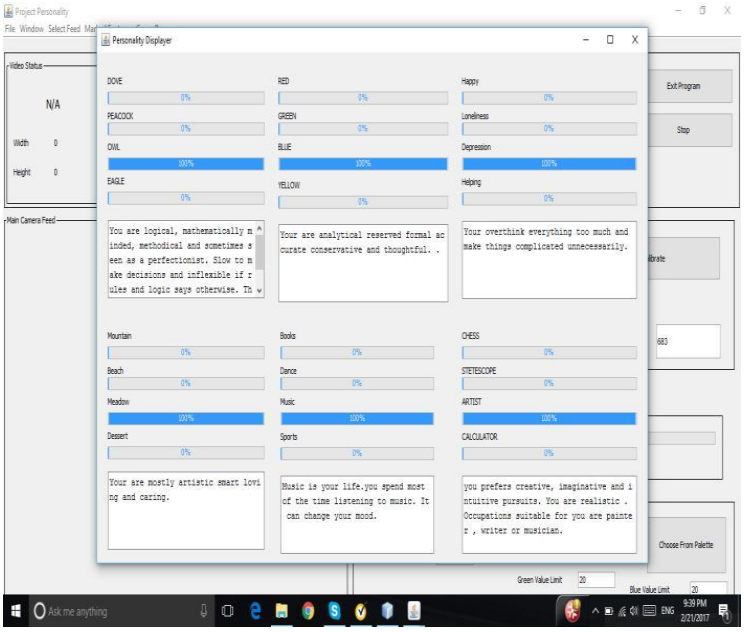


Fig 4: Result

Page 1-8 © MANTECH PUBLICATIONS 2017. All Rights Reserved

CONCLUSION

In this paper, a person's personality is determined successfully with the help of eye tracking using a high resolution webcam An XML file harcascade in OpenCV is used to extract the eye from each frame of a live video. Position of the iris at each frame is used to determine where that person is looking at. Personality is determined using a set of images displayed in different slides, each slide containing 4 images each. Eye tracking is used to find the interest level of a person for images. Combination of the images the person is more interested in is used to determine the personality of a person using an algorithm. Personality identification is only an application of interest level calculation using eye tracking . It can be even used in shopping malls.

REFERENCES

1) Reading Users' Minds From Their Eyes:A Method for Implicit Image Annotation.S. Navid Hajimirza, Michael J. Proulx, and Ebroul Izquierdo, Senior Member, IEEE , IEEE transactions on multimedia, june 2012

2) Teena Mariya Babu and Shibu K R, "Gaze Based Image Retrieval. Using Webcam" , International Journal of Innovative Research in Computer and Communication Engineering, November 2015.

Page 1-8 © MANTECH PUBLICATIONS 2017. All Rights Reserved