International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249 – 8958, Volume-1, Issue-2, December 2011

Real Time Squint Eye Detection

R. M. Potdar, Anil Mishra, Somesh Yadav

Abstract: This paper provides a survey on Real Time Squint Eye Detection. This is due to defective binocular vision which causes Vision loss in the turned eye. The eyes need to be straight for the brain to combine the images seen by the two eyes into a single picture. This gives us 3-D vision, which allows us to judge depth. Any turn of the eye can interrupt 3-D vision, if an eye turns in, it can reduce the total field of vision. Over the years, many methodologies have been developed to detect squint eye. In this paper, we have proposed an overview on squint eye detection system and their classification with some drawback and basic assumption for squint eye detection[1][2].

***Index Terms*: Hough transform, image Processing, modelling, projection function, segmentation.**

1. INTRODUCTION

Squint is the term used when the eyes are not pointing in the same direction or eyes are not aligned with respect to each other they point towards different direction. Most commonly one eye either turns in or out. Occasionally one eye may be higher than the other.

If the eyes are not looking in the same direction then they are sending different signals to the brain and this can cause double vision. In this condition eyes are not straight. In most cases one eye appears to look straight ahead while the other eye turns inwards, outwards, upwards or downward and stop working with other eye. The medical name for Squint (or crossed-eye or lazy eye) is Strabismus which means misalignment of eyes. The incidence of squint is approximately 1.5% to 2% of population worldwide [3].

1.1 What Causes Squint

A squint can occur for a number of different reasons these include:

Manuscript published on 30 December 2011.
* Correspondence Author (s)
R. M. Potdar , Sr. Associate Professor, Department of Electronics & Telecommunication Engineering, Bhilai Institute of Technology (BIT), Durg , Chhattisgarh, India, (E-mail ID - ravi_potdar@rediffmail.com)
Anil Mishra , Associate Professor, Department of Electronics & Telecommunication Engineering, Bhilai Institute of Technology (BIT), Durg , Chhattisgarh, India, (E-mail ID - anilmishra20042005@yahoo.co.in)
Somesh Yadav , Assistant Professor, Department of Electrical & Electronics Engineering, Chhatrapati Shivaji Institute of Technology (CSIT), Durg, Chhattisgarh, India, Mobile – 09584079693, (E-mail ID – someshyadav@csitdurg.in)

• Damage to the muscles controlling the eye

• Damage to the nerves controlling the muscles

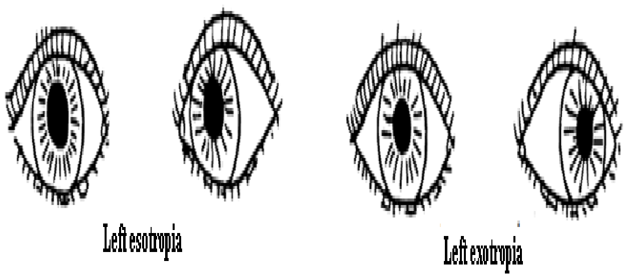
• Poor development or damage to the eye muscle control centers in the brain

• Poor vision in the eye can stop the brain being able to keep the eyes together. This occurs in adults who have had a squint as a child.

1.2 Classification of the squinting eye

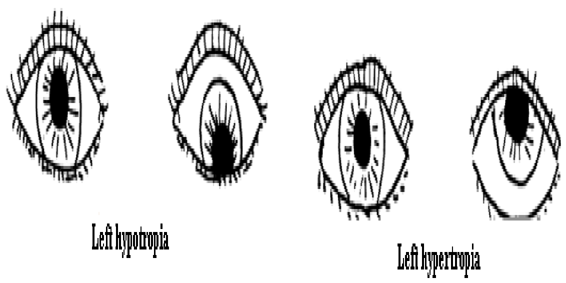
1. *Esotropia / Exotropia:*

a. An eye that turns towards the nose bridge is called an esotropia
b. An eye that turns towards the ear is called an exotropia.



2. *Hypertropia / Hypotropia:*

a. An eye that turns upwards is called a hypertropia
b. An eye that turns downwards is called a hypotropia



1.3 Assumptions

For squint eye detection the following assumptions should be taken: -

1) Image should not be too noisy.

2) Eyes should be in normal horizontal position (i.e. the head should not be tilted).

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)

3) Iris diameter shouldn't be very small in respect to the size of image.

4) The two candidate circles for irises must have similar radiuses. For a normal human subject, the irises are not that different, and have a diameter of around 12 mm (the normal human pupil is around 2-3 mm in daylight and can go to 7mm during nighttime).

5) The distance between the two centers of the circles divided by the average radius of one circle had to be bounded between some values. In a normal human, the inter eye distance is of about 63 mm with an iris diameter of about 12 mm, this means that the value of the fraction has to be around 5. We could also use the distance between the centers of the ellipses for similar considerations.

2. METHOD

While the patient is looking on front of camera or object, his eyes are photographed simultaneously by using CCD or standard camera and point flashlights mounted at the center of iris. Based on the position of the reflexes point visible on the iris squint eye, percentage amount of squint and the angle of squint can be determined by multiple biometric traits simultaneously. By asking the user to present a random subset of biometric traits, the system ensures that a live user is indeed present at the point of acquisition. However, an integration scheme is required to fuse the information presented by the individual modalities [1] [3].

2.1. Digital image processing

Detection of squint eye may be achieve by measuring the landmark points (eye corners, iris center points), from which the approximate eyelid contours are estimated and thus the exact determination of the squint angle is achieved and by processing and extracting the information from the digital image captured by the camera amount of squint may be calculated. At a first step, the position of the iris is defined **as** a region of interest (ROI) [3].

2.2 Using Projection Function

Due to its indifference against disturbances of the contour of an object Mean and variance projection functions are utilized in each eye pair window to validate the presence of the eye for locating the corner and center point of the eye., So in this technique possible eye areas are localized using a simple thresholding in colour space followed by a connected component analysis to quantify spatially connected regions and further reduce the search space to determine the contending eye pair windows.

2.3 Detection using Hough Transform

The Hough-Transformation (HT) [5] is also suited for the detection of the squint eye. The HT is based on the idea of transforming ***all*** contour points belonging to the structure into ***one*** point of transformation space (accumulator array (AA)). This point is identified as the global maximum of the AA. It becomes more prominent the greater the number of contour points belonging to the transformed object is. The HT can be calculated for any curve described by parameters, which turn into the axes of the AA. Centre, corner and radius of the circular iris in space can thus be read as coordinates of the global maximum of the AA which in this case is three-dimensional. The binary edge image is produced by calculating the modulus of the gradient of the original image.

2.4 Automatic detection by Modelling

This is the simplest yet efficient method for squint eye detection. Modelling the eye by means of its light-refracting layers - cornea, aqueous humour, crystalline lens and vitreous body. is calculated. We modelled the human eye as a circle circumscribed in an ellipse, where circle represents the iris of human eye and the ellipse represents the eye lashes. This is not the only model for an eye; there are infinite models possible and they can be applied as per requirement. From the analytical description of the diffraction figures, a rotatory symmetrical model function.

Due to the low resolution of signals, a simple matched filter is not sufficient for the detection of the squint eye since the digitization only yields a few pixels. Thus, the normed Cross-Covariance- Function is calculated.

2.5 Detection by Nonlinear Enhancement and Segmentation

This algorithm based on histogram-techniques for the problem of squint eye evaluation. The detection of anomalies in human eye's retina is a biomedical problem, appropriate for image processing and automated segmentation, whose solution is intended to help the doctors in their decision making process. Use of the proposed detector may reduce false negatives and give reliable detection accuracy in both position and mass size. Histogram- based enhancement technique (MLE), uses histogram equalization as its core operator and a histogram-based segmentation technique (HALT) to segment areas that differ slightly from their background regions. This method is able to detect actual drusen in all cases. Even in hard-to-diagnose cases, where many small and vague drusen exist.

3. DRAWBACK

Detection of the iris becomes indifferent to disturbances which can be created by spectacle lenses. Glass reflexes appear as

bright spots on dark background and lead to wrong detections even though they may have a radius

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

corresponding to that of the iris. Problems are created by reflexes on spectacle frames which act as the amplitude of the gradient is taken into account may falsify the HT to such an extent that the iris is

not detected. If the image is blurred and the model function for the Cross-Covariance-filter no longer matches and is discarded. Through the automatic analysis of images, strabometry becomes suitable for screening. The high sensitivity of the system leads to an early recognition of symptoms, and thus to the desired treatment of the illness at an early stage of its development.

4. CONCLUSION

In this paper we have focused the different squint aye detection technique. We also focus on classification and cause of squint eye. So the detection of abnormalities in human eye's retina is a biomedical problem, appropriate for image processing and automated segmentation, whose solution is intended to help the doctors in their decision making process. Hough Transform can be used for the detection of aforesaid circle and ellipse then final eye is detected with amount of squint by neglecting the wrong detections and ruling out a pair of eyes based on geometrical considerations. This method is also applied for online eye detection purpose. It can not be supposed that the contour of the iris is closed and free of distortions .Due to the indifference to interruptions of the contour of an object the Hough-transformation is especially selected for squint eye detection. A significant factor that affects the overall performance of other approaches is the presence of noise, which makes surfaces look rough and renders the segmentation process difficult. Although, it is not a common case, since the presence of noise is rare in such images and provides adequate results even in the case of noise contamination.

ACKNOWLEDGMENT

Mr. R. M. Potdar , Sr. Associate Professor (ETC)
Bhilai Institute of Technology Durg, Chhattisgarh, one of the authors is indebted to give permission for sending this paper to the journal. Mr. Anil Mishra Associate Professor (ETC) Bhilai Institute of Technology Durg, Chhattisgarh also thankful for giving me permission to send the paper for publication. We would also like to thanks our colleagues for supporting us.

REFERENCES

(1) R. Effert, J.C. Barry, **A.** Kaupp and M. Dahm, Eine neue photographische Methode zur Messung
von Schielwinkeln bei Sauglingen und Kleinkindern, *Klinische Monatsblatter fur Augenheilkunde,*
198:284-289,1991.

(2) R. Effert, J.C. Barry, **A.** Kaupp, M. Kleine, New method for the assessment of eye deviations in
strabismus. *Chibret International Journal* ***of*** *Opthalmology,* 9(2):49-6 1 , 1992.

(3) J.C. Barry, R. Effert, and **A.** Kaupp, Objective measurement of strabismus in infants and children
through photographic reflection pattern evaluation, ***Ophthalmology,*** 99(3):320-328, 1992.

(4) T. Lehmann, **A.** Kaupp, D. Meyer-Ebrecht, R. Effert, Automatische Schielwinkelmessung durch
Hough-Transformation und Kreuz-Kovarianz- Filterung, In: S.J. Poppl, H. Handels (Hrsg.), *Mustererkennung 1993,* pp. 237-244, Springer-Verlag, Berlin, 1993.

(5) P.V.C. Hough, ***A*** *method and means for recognizing complex pattern,* US Patent 3069654, 1962.

(6) T. Lehmann, **A.** Kaupp, **D.** Meyer-Ebrccht, R. Effert, Automatische Schielwinkelmessun ***5*** durch
Hough-Transformation und Kreuz-Ko\ arianz-Filterung, In: S.J. Poppl, H. Handels :Hrsg.),***Must*** e ***re rkennung 1993,*** p p . **237-244,** Si tringer-Verlag, Berlin, **1993.**

(7) J.C. Barry, R. Effert, A. Kaupp, D. Meyer-Ebrecht, H. Skopnik, B. Sommer, S. Uberhofen,M. Reim, Screening for microtropia in infants and toddlers with digital Purkinje I-IV reflection pattern evaluation: experience with a novel computer system. In: H. Kaufmann (Ed.) ***Tran.:uctions 2lst meeting European Strabismological ILssociation,*** pp. **287-292,** Salzburg **1993.**

(8) **A.G.** Bennett and R.B. Rabbetts, ***Clinica' Visual Optics,*** Butterworths, London, **1988.**

(9) G. Schroder: ***Technische Optik,*** Vogel-Bucliverlag, Wurzburg, **1987.**

(10) E. Hecht and A. Zajac, ***Optics,*** Addison- Wesley Publ. Comp., Reading Ma., **1974.**

(11) D.H. Ballard and C.M. Brown, ***Computer Vision,***Prentice-Hall, Inc., Englewood Cliffs, New Jersey,
1982.

(12) H.D. Luke, ***Signalibertrugung.*** Springer- Verlag,Berlin, **3.** Auflage, **1988.**

(13) W.K. Pratt, ***Digital Image Processing,*** Wiley-Interscience Publication, New York, **1978**

AUTHOR PROFILE

Sr. Associate Professor Mr. R. M. Potdar, received B.E. Electronics, M.Tech.(Hons) Instrumentation & Control. He is having a total teaching experiences of 14 years and industrial experiences of 5 years. His interests are in Image Processing, Neural Network & Fuzzy Logic System Design. His specialization subjects are Adaptive Control System, Optimal Control System, Control System Design, Satellite communication and Optical Communication. He has published the papers in 6 international journals and 2 national journals and also attended 1 international conference and 11 national conferences. Also he is having Life Membership of Indian Society of Technical Education, India (ISTE).

Associate Professor Mr. Anil Mishra, received B.E. Electronics, M.Tech.(Hons) Instrumentation & Control. M.I.E. & M.I.S.T. He is having total teaching experiences of 13.5 years. His interests are in Image Processing, Neural Network. He has published the papers in 1 international journal and 3 national journals and also attended 6 national conferences.

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)

Somesh Yadav, received B.E. (Electronics & Telecommunication Engineering) in year 2005 and in pursuit for M.Tech. (Instrumentation & Control) from Bhilai Institute of Technology (BIT), Durg, Chhattisgarh, India. His interest is in Digital Image Processing. Also he is having Life Membership of Indian Society of Technical Education, India (ISTE) and Institutional Member of Computer Society of India (CSI).

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)