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ARM BASED AN REAL TIME IMPLEMENTATION BASED ON TRANSPORTATION SYSTEMS

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ABSTRACT-- The main idea behind this project is to develop a system which can detect drowsiness of the driver and giving an indication in the form of alarm. Since a large number of road accidents occur due to the driver drowsiness, here we are proposing a new transportation system which will reduce the accidents. This system will monitor the driver's eyes using camera and face detection which is very important system in human life for transportation purpose.. So this project will be helpful in detecting driver drowsiness before itself which will save the life of the driver.
This paper presents a real-time driver fatigue detection system for driving safety. Based on skin colors, the driver's face is located from a color video captured in a car. Then, edge detection is employed to locate the regions of the driver's eyes, which are used as the templates for eye tracking in subsequent frames. Finally, the tracked eyes' images are used for fatigue detection in order to generate warning alarms for driving safety.

Keyword: Intelligent Transportation System, Driver Fatigue Detection, Eye Detection, Face Detection, Template Matching

I. INTRODUCTION

The Real Time dangerous behaviors which are related to fatigue whether in form of eye closing, head nodding or the brain activity. Hence we can either measure change in physiological signals, such as brain waves, heart rate and eye Blinking or by measuring physical changes such as sagging posture, leaning of driver's head and open/closed state of eyes. The previous technique, while more accurate, is not realistic since highly sensitive electrodes would have to be attached directly on the driver's body and hence which can be annoying and distracting to the driver. As the standard of living has improved in the past few decades, many families possess their own transportation vehicles. Therefore, people often drive their cars for business or trip. However, long distance driving usually makes drivers exhausted. Thus, the *driver fatigue* problem has been an important factor of traffic accidents. In order to decrease traffic accidents, many countries have begun to pay attention to the driving safety problem. Some psychologists [1,2] have investigated the drivers' mental states relating to driving safety. Furthermore, many other researchers [3_6,10_19] have proposed various auxiliary mechanisms to improve driving safety. Other researchers based on image processing [7] and computer vision [8,9] techniques to detect driver's fatigue from images captured by a camera to improve driving safety. Some of these researchers [10_14] utilized infraredCCD cameras to locate the driver's face and eyes positions easily. However, infrared cameras are very expensive, which makes them of limited usage. In addition,the influence of infrared light on human eyes is not known yet. To be practical, some other researchers [15_19] employed ordinary CCD cameras to perform fatigue detection. However, most of those driver fatigue detection method suffer from the illumination change problem. In addition, they might not be suitable for real-time applications due to their complicated computations.

In this paper, we propose a vision-based real-time driver fatigue detection system based on ordinary CCD cameras to cope with the above drawbacks for practical usage to improve driving safety. For the illumination change problem, we adopt the HSI color model to represent face skin, not only because the model detaches the intensity from the hue of a color, but also because face colors have fixed distribution range on the hue component. Since eyes have the nature of sophisticated edges, we use the Sobel edge operator and the projection technique to locate eyes' positions.

BLOCK DIAGRAM

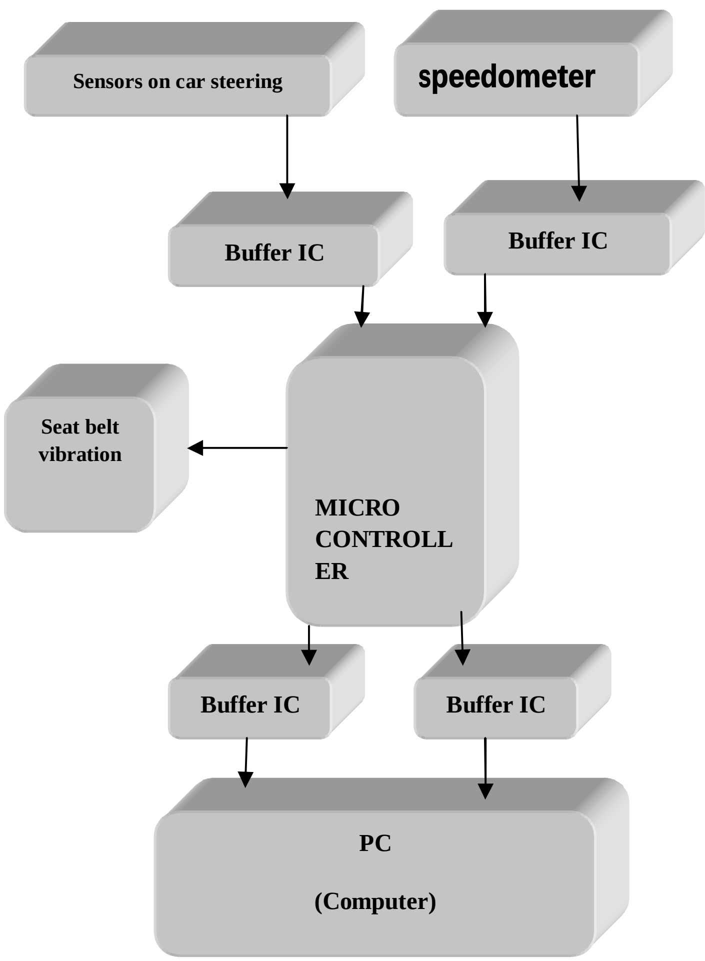

Figure 1: Block diagram

2. RELATED DRIVER FATIGUE DETECTION METHODS BASED ON ORDINARY CCDS

In this section, we briefly review the related visionbased driver fatigue detection methods using ordinary CCD cameras. In 1997, Eriksson and Papanikolopoulos proposed a method to detect driver fatigue from ordinary videos. In this method, the symmetric property of the face is used to detect the facial area of the driver on an image. Then, pixel difference is performed to find the edges on the facial region, and horizontal projection is used to locate the vertical position of the eyes. Finally, a concentric circle template is used to locate and track the exact eyes' positions. Although face symmetry is an obvious feature for an upright face, it usually fails to locate the correct face position when the face tilts, rotates, or is shadowed. In this method, the Gaussian distribution of skin colors in the RGB color model is used to distinguish skin and non-skin pixels for face detection. Then, the Sobel vertical edge operator is used for eye detection on the driver's face. Besides, a set of eye images as templates in a database is used for eye detection and tracking. Although the Gaussian distribution of skin colors based on the RGB color model is used to predict skin quite well, the method cannot get rid of the factor of illumination changes. In addition, the eye images in the database as templates may be quite different from drivers' eyes, which will reduce the accuracy for locating eye positions. In 2003,Wang et al. [17] proposed a method for monitoring driver fatigue behavior. Like [16], the Gaussian distribution of skin colors in the RGB color model is used to locate a face region. Then, the face is binarized with a fixed threshold to locate the eyes' positions with some geometric restrictions and to track the eyes by using the Hausdorff distance template matching. Finally, the features of the eyes are analyzed by the Gabor filters, and the states of driver's eyes are classified by neural networks.

3. THE PROPOSED DRIVER FATIGUE DETECTION SYSTEM

The proposed system uses an ordinary color CCD camera mounted on the dash board of a car to capture the images of the driver for driver fatigue detection. The flow chart of the proposed fatigue detection system is depicted in Figure 1. The first image is used for initial face location and eye detection. If any one of these detection procedures fails, then go to the next frame and restart the above detection processes. Otherwise, the current eye images, as the dynamic templates, are used for eye tracking on subsequent images. If eye tracking fails, the processes of face location and eye detection restart on the present image. These procedures continue until there are no more frames. The detailed steps are described in the following subsections.

3.1 Face Detection

Digital images usually adopt the RGB color space to represent colors. However, any color in the RGB space not only displays its hue but also contains its brightness. For two colors with the same hue but different intensities, they would be viewed as two different colors by the human visual system. In order to accurately distinguish skin and non-skin pixels so that they will not be affected by shadows or light changes, the brightness factor must be excluded from colors. Since in the HSI color model, hue is independent of brightness, this model is well suited for distinguishing skin and non-skin colors no matter whether the face is shadowed or not. Thus, in this paper it is used for face detection

3.2 Eye Detection

After locating the eye region, the original color eye region is converted into gray scale by Equation (4) as follows (refer to [7]).

$Y = 0.299R + 0.587G + 0.114B$ (4)

where Y is the gray value of a color (R, G, B). Then, the Sobel edge operator is used to compute the edge magnitude in the eye region to find the vertical position of the eyes. In order to save computation time, an approximatecalculation of the edgemagnitude, $G(x, y)$, is computed in Equation (5) as follows.

$G x y S S x y (,)\_ \_$ (5)

where Sx and Sy are the horizontal and vertical gradient values obtained, respectively, from the Sobel horizontal and vertical edge operators, and $|Sx|$ represents the absolute value of Sx.

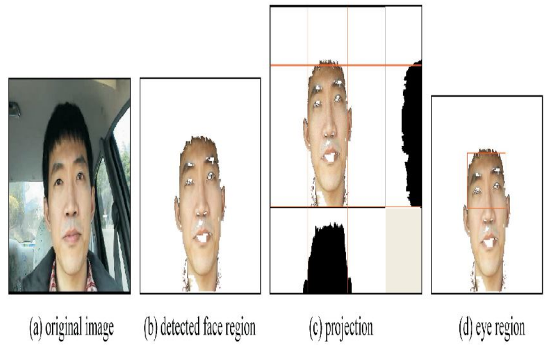

Figure 2: Showing eye detection

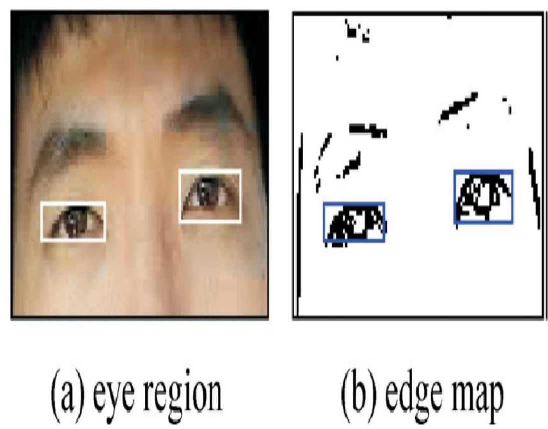

Figure 3: Showing eye ball detection and edge map

3.4 Fatigue Detection

At this stage, the colors of the eyeballs in the eye templates are used directly for fatigue detection. Since the property that the eyeball colors are much darker is a quite stable feature, the eye templates are inverted (negated) and then converted to the HSI color model. The original darker eyeballs become brighter ones in the inverted image. According to the observation, the saturation values of eyeball pixels normally fall in the range between 0.00 and 0.14. This observation is used to distinguish whether a pixel in an eye template is viewed as an eyeball pixel, as shown in Figure 3. When the eyes are open, there are some eyeball pixels, When the eyes are closed, there are no eyeball pixels, By checking the eyeball pixels, it is easy to detect whether the eyes are open or closed.

4. CONCLUSION

This system will detect eye movement to detect the drowsiness state of driver and gives warning in half second and also develop the performance record of driver By monitoring the eyes using camera and using this new algorithm we can detect symptoms of driver drowsiness early enough to avoid an accident. This paper has presented a vision-based real-time driver drowsiness detection system for driving safety. The system uses an ordinary CCD camera to capture the driver's images, which makes the method more practical. So if this project gets implemented by the government in all transportation of systems we can at least avoid accidents and can save the life of driver

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REFERENCES

[1] S. Jane, W. Jean, V. Bradley, **"Why Do People Have Drowsy Driving Crashes, Input From People Who Just Did"**, AAA Foundation for Traffic Safety, 1999.

[2] Mc. Affect, Kevin, **"The Safety Network",** *Réseau-Sécurité,* Canadian Association of Road Safety Professionals (CARSP), 2000.

[3] M.H Sugar, **"Driver Hypo-Vigilance Detection based on Eyelid Behavior,"** in Proceedings of the Seventh International Conference on Advances in Pattern Recognition, IEEE Computer Society, 2009. pp. 426-429.

[4] H. Jonathan, D. Thomas, Hanowski, Richard, W. Walter, A. Christina, **"In-Vehicle Information Systems Behavioral Model and Design Support: Final Report"**, U.S Department of Transportation, Federal Highway Administration, 2000.

[5] W. W. Wierwille, S. S. Wright, C. L. Kin, L. A. Ellsworth, R. J. Fairbanks III, **"Research on vehicle-based driver status/performance monitoring: development, validation, and refinement of algorithms for detection of driver drowsiness"**, National Highway Traffic Safety Administration, U.S. DOT Tech Report No. DOT HS 808 247, 1994.

[6] Dr. P.R Bajaj, M.S Devi, **"Driver Fatigue Detection Based on Eye Tracking,"** in Proceedings of the First International Conference on Emerging Trends in Engineering and Technology, IEEE Computer Society, 2008, pp. 649-652.

[7] R. Grace, V.E Byrne, D.M Bier man, J.M Legman, D Gricourt, R.K Davis,J.J Staszewski, B Carnahan, **" A Drowsy Driver Detection System for Heavy Vehicles,"** in Proceedings of the IEEE, 1998, pp. I36-1-8.

[8] K. Amber, R Atria, R Ismail, **"Intelligent Transport System for Motorcycle Safety and Issues,"** in Proceedings of the European Journal of Scientific Research, Vol. 28, No. 4, 2009, pp. 600-611.

[9] G. Richard, B. Vicky, B. Damian, L.J.Michel, G. David; Davis, R.S. James; C. Brian, **"A Drowsy Driver Detection System For Heavy Vehicles"**, IEEE 0-7803-5086-3, 1998.

[10] A. Kocher, M. Oddment, J. Sandi, **"Vehicle control and drowsiness,"** Project Report in Proceedings of the Swedish National Road Transport, Linkoping Sweden, 2002.

[11] C.D Wylie, T. Shultz, J.C Miller et al: **"Commercial Motor Vehicle Driver Fatigue and Alertness Study"**, TP Report No. 12876E, July 2001.

[12] E. Breviaries, S. Nikolaou, A. Mousadakou, **"System for effective Assessment of driver vigilance and Warning According to traffic Risk Estimation,"** Project Report in Proceedings of the Design Guidelines for Driver drowsiness detection & avoidance, AWAKE Consortium, 2004.

[13] T. D'Orazio, M. Leo, G.Cicirelli, A. Distant, **"An Algorithm for real time eye detection in face images,"** in Proceedings of the 17th International Conference on Pattern Recognition, IEEE Computer Society, Vol. 4, 2004,pp. 1051-4651.

[14] R. Dawn, "**National Survey of Distracted and Drowsy Driving"**, The Gallup Organization and NHTSA, 2003.

[15] K. Lin, J. Huang, J. Chen, C. Zhou, **"Real-time Eye Detection in Video Streams,"** in Proceedings of the Fourth International Conference on Natural Conference on Robotics and Biomimetics Bangkok, Thailand, 2009, pp.1105-1110.

[18] J. F. May, C.L. Baldwin, **"Driver fatigue: The importance of identifying causal factors of fatigue when considering detection and countermeasure technologies,"** in the Proceedings of the Transportation Research Elsevier, Part F 12, 2009, pp. 218–224.

[19] I. Park, J.H. Ann, H. Bryon, **"Efficient Measurement of Eye Blinking under Various Illumination Conditions for Drowsiness Detection Systems,"** in Proceedings of the18th International Conference on Pattern Recognition, IEEE Computer Society, Vol. 6, 2006, pp. 111-120.

Computation, IEEE Computer Society, Vol. 9, No. 8, 2008, pp. 193-196.

[16] M. Pereira, H. Hamama, N. Dipole, M.P. Buras, A. Similes, **"Simultaneous interaction with in-vehicle systems while turning left: comparison among three groups of drivers,"** in Proceedings of the IETIntelligent Transport Systems, Vol. 3, No. 4, 2009, pp. 369–378.

[17] E. Rosado, J.L. Garcia, R. Brea, L.M. Bergasa, E. López, **"Driver Fatigue Detection System,"** in the Proceedings of the IEEE International

[20] L. Zuni, Y. Memling, S. Xiaoping, L. Xinxiang, O. Xiangtan, **"Recognition of Eye States in Real Time Video,"** in Proceedings of the International Conference on Computer Engineering and Technology, IEEE Computer Society, Vol. 10, No.105, 2009, pp. 554-559.

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