Implementation of sleeping driving detection and car accident notification systmems

Min-ju Kim, Chan-song Park and Kook yeol Yoo
Department of Information and Communication Engineering, Yeungnam University Address of the University
alswn9554@naver.com, jk01063@gmail.com, kyoo@yu.ac.kr

Abstract—**In this paper, after receiving input from a video camera of the Android handset with LBP feature face recognition function techniques, and detection techniques eyes with Haar features to judge drowsiness by a beep and prevent sleepiness.**

In addition, it is determined by sensing the collision of a car accident by the acceleration sensor and to prevent secondary accident by the automatic report by sending the incident position to the Server.

Keywords-facial recognition; eye recognition; drowsiness detection; collision detection;

I. INTRODUCTION

The number of people who died because of the drowsiness from the deaths caused by traffic accidents in the past three years 307 people, reaching 31%. In addition, the mortality rate of the type of highway accidents caused by the secondary accident than common accident is more than annual average of 60%. In most cases the secondary accident are being sacrificed when the vehicle is stationary by the car accident or breakdown then another driving car hit the accident car.

Therefore, the development of the automatic notification system that it is possible to prevent drowsy driving and secondary accident is very necessary.

The remainder of this paper is, in Chapter 2, was described OpenCV for image processing. In Chapter 3, facial recognition, and explains how recognized for the recognition and sleepiness of the eye. In Chapter 4, the evaluation and performance analysis, and derived improvement measures. And the conclusion at the end of Chapter 5.

II. RELATED RESEARCH

A. *OpenCV*

OpenCV is an image processing and computer vision library materials is open to the public. OpenCV function has been implemented in a total of more than 500, there are a variety of implementation of image processing and algorithms related to computer vision, the more you can easily create a video and video-related applications. In particular, it is used in applications such as object and face recognition and motion tracking and behavior. HIGHGUI library of OpenCV library serves such that the user more easily call up the image, store, and display the window. To use these features were used OpenCV.

In this paper, after the more easily detect the face and eyes, face and eye recognition through GRAY conversion. The OpenCV 3.0.1 was provided to show the images to the terminal through the RGB video.

III. FACIAL RECOGNITION, EYE RECOGNITION, DROWSINESS DETECTION

A. *Functional Diagram*

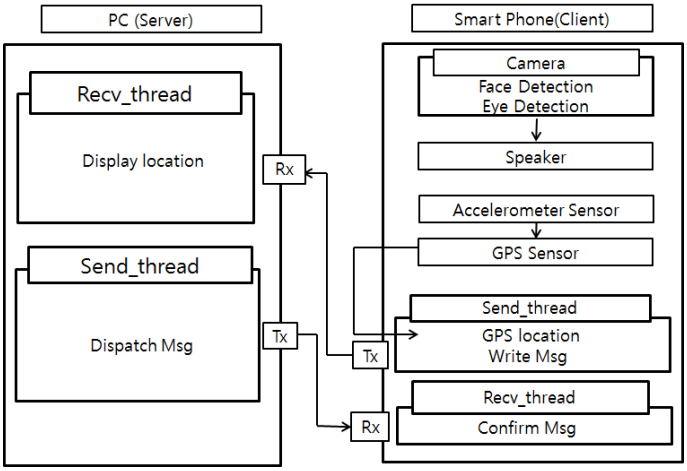

Figure 1. Functional Diagram

Figure 1 is from the image input via the Android device camera to image processing, it generates an alarm sound in Speaker Mexican, preventing drowsiness. It detects a collision from the acceleration sensor of the terminal, showing the overall flow of transmitting the position to the Server receives the location information from the GPS sensor.

B. *Face Recognition*

LBP is a feature developed for the purpose of classifying the texture of the original image, and it has been used, even after the image recognition applications, such as face recognition

LBP is an index value coded in binary, the relative brightness change of the peripheral region of each pixel 3x3 as a value that is calculated for every pixel in the image. The result is shown in Figure 2.

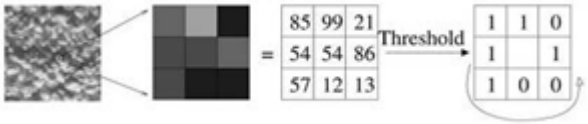

Figure 2. LBP feature

After obtaining the histogram computed index value for each pixel, a method of using as a feature to a vector obtained by connecting the histogram in a row to detect a final look. The result is shown in Figure 3.

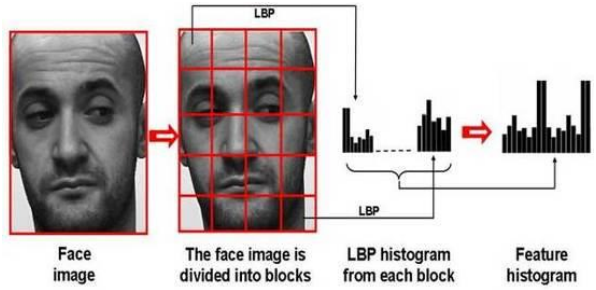

Figure 3. Histogram

However, when you calculate the LBP for each pixel, rather than the pixels for the disadvantages the greater the amount of calculation capacity is increased, and split any video area to the 3x3 block, calculate the LBP index for each average of block.

Thus, the use of LBP in blocks rather than pixels, it is possible to extract the texture information of a large scale. In addition, calculating the MB-LBP for the location of image and various scales is possible to extract various feature for a single target.

After extracting various feature recognizes faces are shown in Figure 4.

Figure 4. Face Recognition

C. *Eye Recognition*

In order to recognize the eyes, using the Haar feature that uses the brightness difference between the area and the area of the video. By combining a number of elementary Description feature of Figure 5, by extracting the feature of the eyes, recognized eye.

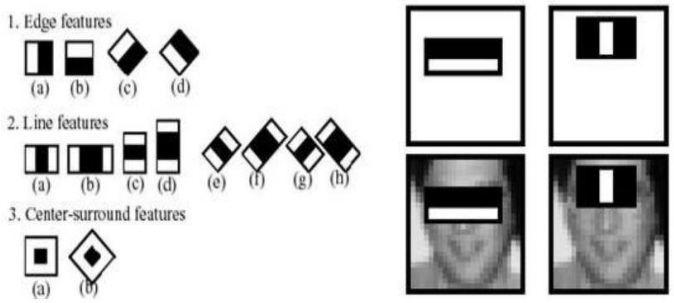

Figure 5. Basic features

Feature values of each elementary feature is the difference minus the sum of the brightness of the black part there is the brightness of the image corresponding to the white part of the feature pixel calculation. The identification of an object using feature is brightness difference calculated area is used whether it is smaller than the assigned threshold in feature. For use in combination a number of feature, when satisfying the threshold given to each feature simultaneously, a method to determine that the object.

By combining various Description feature, the result of recognizing find the characteristics of the eyes, but as shown in Figure 6.

Figure 6. Eye recognition

D. *Drowsiness*

Because prior to detection eyes to recognize the time floating eye, detection of drowsiness is, in a state in which the face has been recognized, to determine the drowsiness with whether or not to recognize the eye.

Being aware of the eyes on this person's face is recognized status does not mean a person sleeping. But if person drowse when face is recognized status, eyes will be closed and it is no longer recognized. So causing warning tone can detect drowsiness when eyes are not detected with the status of face recognition.

E. Collision Detection

In the Android terminal, acceleration sensor is built. Accelerometer has a -9.8 while the terminal laid flat on the table. The terminal measures the acceleration values upon impact via an experiment showing the force applied to the reaction of gravity from the table, and determines the presence or absence of collision detection praise accident notification window when it reaches the particular value.

F. Identifying accident location

By using the built-in GPS sensor like an acceleration sensor, Server immediately receives a position from the GPS sensor when the accident woke and then, accident position was identified.

IV. PERFORMANCE EVALUATION AND ANALYSIS

A. The final implementation

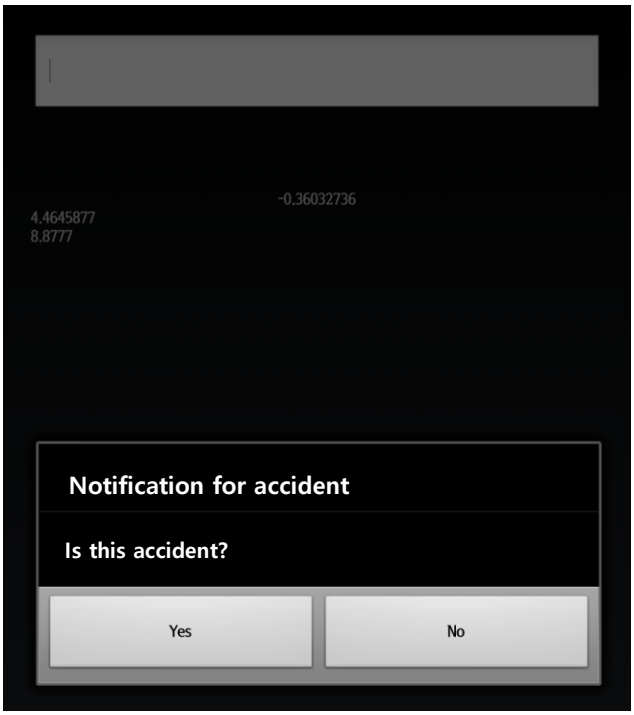

Figure 7. Capture result

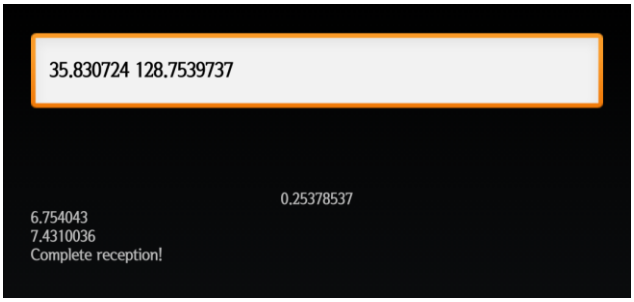

Figure 8. Capture result

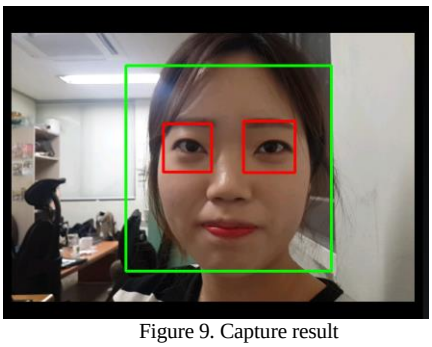

Figure 9. Capture result

B. Analyzing result

As a result the drowsiness detection conducted experiments with 20 people a variety size of the eyes, the show had a high detection rate of 80% because 16 people succeeded and TCP / IP communication between the terminal and the PC when an accident location identifying represents a 100% detection rate.

Despite eyes closed, for characterization of Haar feature, influenced the direction of the lighting and the plurality of light sources, if the eye is recognized, drowsiness detection rate falls.

If extraneous LBP lighting techniques applied to the eye will be able to increase the drowsiness detection rate.

V. CONCLUSION

For detecting the face and eyes through this overall design project, not just LBP Description feature and Haar feature, by implementing an algorithm for detecting drowsiness in which the recognition of the eye based, It was equipped with the ability to apply theoretical OpenCV algorithm in business.

Further, In addition, using the various sensors of the Android terminal through the Android Studio detects a collision occurred in the terminal, and confirmed the results of the algorithm design a program that transmits the current position information to the Server directly.

Haar feature is difficult to detect when being influenced to change the image brightness of the object is rotated and the changes image of contrast because they basically keeping the giometrical information of the object and use the brightness difference between the unit areas. Believes also can improve the drowsiness detection rate when applied to the eye recognizes the LBP Description feature technique that not affected by brightness.

REFERENCES

[1] Ho-youl Jung, lecture note of multimedia signal processing, 2016

[2] heon-jae Park, Android communication programming call miracle, 2HNS, 2013

[3] in-kook Cheon, Android programming using picture,sang neung publisher, 2014

[4] Daum blog, darkprogrammer