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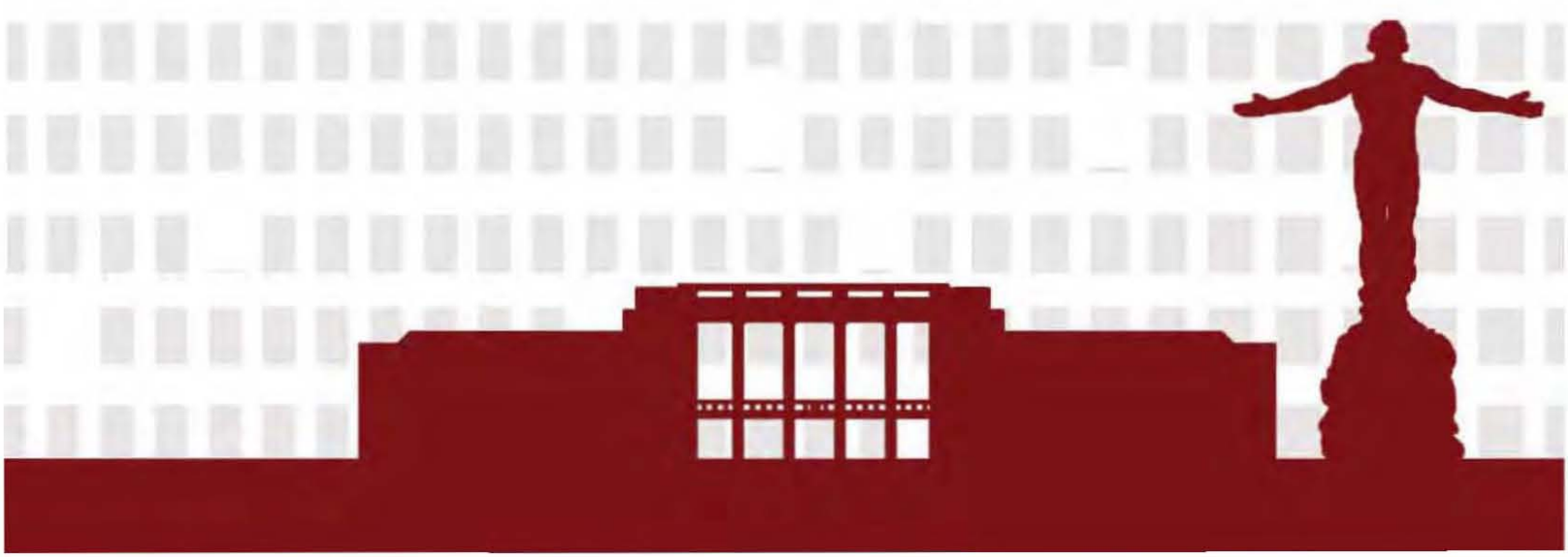
on Semiconductor and Electronics, Information and Communications Technology and Energy

16-17 November 2015
Metro Manila, Philippines



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FACE AND EYE DETECTION USING KINECT BASED ON HK-CLASSIFICATION

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ABSTRACT

This paper presents real-time face and eye detection, which can be applied to many applications, such as a human-computer interaction, facial expression recognition and a fatigue warning system. The depth images provided by Kinect are used for our proposed method, including two algorithms: (1) AND operation between gradient of depth images of x and y axis to find the face region, (2) HK-classification [2] to find the nose-tip and the eye-corners. To show an accuracy of the correct detection areas, we compare the overall performance of our proposed method with Haar-like features extraction[1].

Kinect, released by Microsoft, is extremely popular for 2D and 3D image applications, such as a gesture recognition, facial recognition and motion analysis. The resolution of a depth image is 640 x 480 pixels and the frame rate is 30 frames per second, so that it is suitable for real-time system. Moreover, an additional depth image does not depend on light conditions so is has an advantage over using a normal color image alone.

Our algorithm focuses on an application with single face detection. The depth image sometimes gets holes and spikes, so we apply median filter to increase the quality of the depth image. For the face detection, AND operation of gradient images is able to find the pair-eye surface as the contour and identify it as the face area, shown in Fig1.b. For the eye detection, HK-classification is able to find the nose-tip and the eye-corners by thresholding H and K value in [3]. The coordinate of nose-tip is used to separate two areas, including the left and the right eye, and extract coordinate of these eyes. The areas of the left and the right eye are shown in Figure 1.c.

Figure 1. a) Input depth image, b) Binary image for finding the face region, c) HK- classification on the thresholded image, d) Output image.

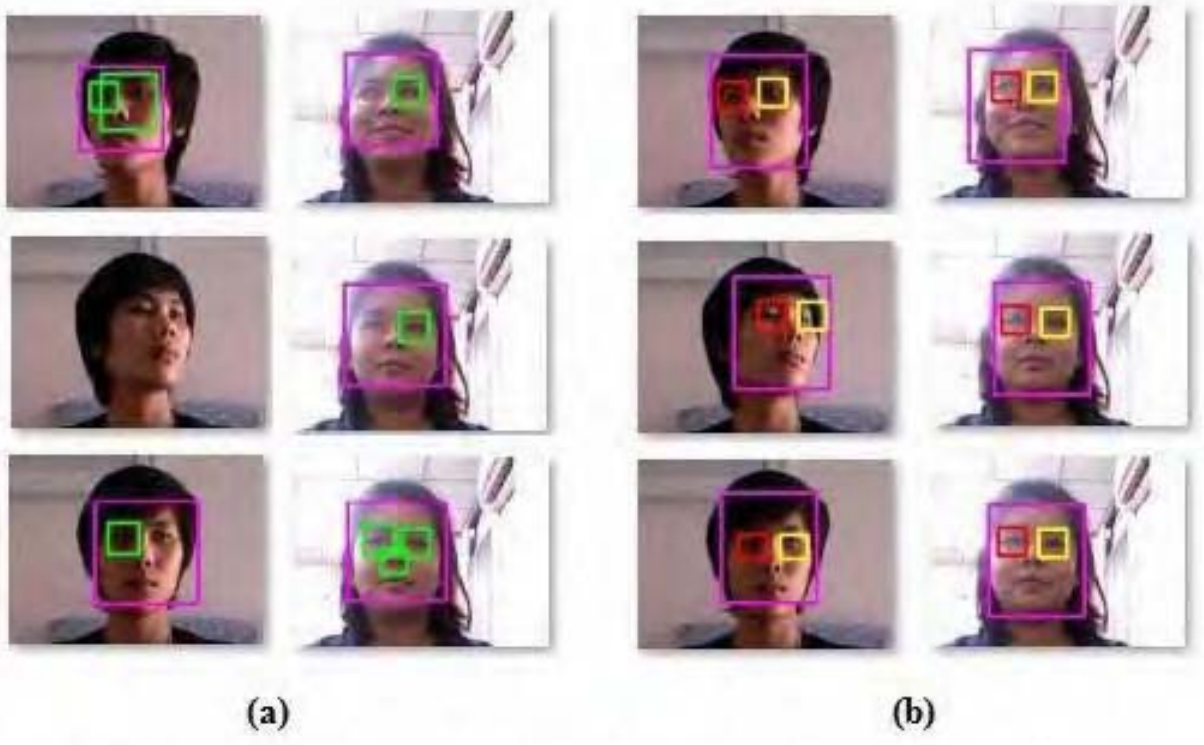

Figure 2. Regions of detection from: a) Haar-like features, b) Our proposed method.

We implement our algorithms and Haar-like feature extraction using Visual C++ in Visual Studio 2012 and Open Source Computer Vision Library (OpenCV). The empirical results show that our method can accurately detect output areas compared to Haar-like features extraction, as shown in Figure 2.

In this paper, we have proposed the method for face and eye detection using Kinect's depth image. This method is suitable for practical applications, since it does not depend on light conditions. In the future, we will further investigate on applications for eye-blink and head-pose detection.

Keywords: Face and eye detection, Kinect, Depth image, Color image, HK-classification, Haar-like feature.

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