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Interactive Dialogue Technique Based Computer Vision with Palm Tracking

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Abstract *:*

This paper aims to propose natural interactive technique those using biometrics which do not require direct contact or physical engagement with user's input device. One of the natural motion that can be used as a tool is palm tracking. A prototype palm tracking made to control mouse pointer (left click) and cursor keys (left and right arrows) use Haar Cascade to detect movement or shifting of each pixels an object in real-time video. The method is using haar-like features which need to be training first to get a decision tree (cascade classifier) as a determining of whether there is a palm object or not in each frame which being processed.
The prototype has been made to run in real time.

Keywords-component; *palm tracking, haar cascade, mouse pointer, cursor key*

I. INTRODUCTION

Computer usage in need of interaction between human and computer nowadays many developed and led to various computer devices in order to facilitate within process of human interaction. Subsequent interaction techniques would be based on biometrics. The computer will interpret the human behavior and intention instead of just following orders typed by keyboard or pointer controlled by a mouse [1]. Visual input may provide sensing capabilities on a computer as well as humans perform a sensing eye. One of the natural motions that can be used as a tool for communication is palm movement (palm tracking) which replaces mouse pointer function and cursor key on the keyboard. Some of tracking on methods such as Gaussian Mixture Models, Support Vector Machine, Pyramidal Lucas- Kanade, Artificial Neural Network, Haar wavelet and Haar Cascade (Haar Like Feature) proposed by many researchers. Here, Haar Cascade method developed by Paul Viola and Michael Jones presents the best results in terms of computation time [2]. In this research, we propose a method Haar Cascade will be applied to object tracking on different palm to build a prototype which replaces a mouse pointer and cursor keys to allow user to interact with the computer.

II. RESEARCH METHOD

In this research, we proposed methods in order to build a prototype which include detecting or tracking with haar cascade, controlling mouse pointer and cursor keys by doing hook as a result of detection haar cascade.

A. Detection of Palm Object with Haar Cascade

Before performing detection of palm, we conduct training data previously as supervised learning. We make data collection by three categories: positive sample open palm, positive sample closed palm and negative sample. In Haar Cascade, there is a machine learning method that can perform classification to achieve postitive or negative target decision which called AdaBoost algorithm [3][4]. The process of classification with AdaBoost on haar-like feature is done repeatedly until error rate reduced and could divide in two regions (positive and negative) according to haar-like features of target. In general, the classification can be seen in Figure 1.

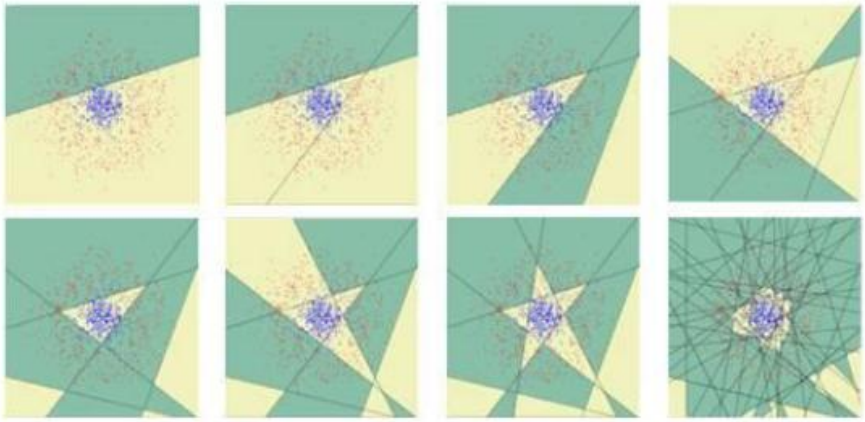

Figure 1. General classification with AdaBoost on data Haar-Like feature

B. Controlling Mouse Pointer

At this stage, each palm that detected will be on-hook or directed on a code that can control mouse pointer. In Figure 2 shows a flowchart process to control the mouse pointer.

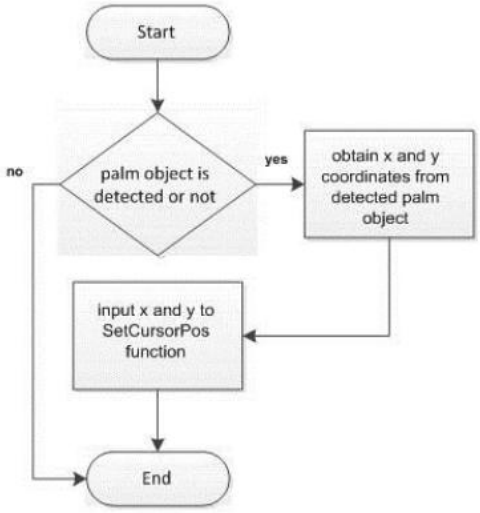

Figure 2. Controlling mouse pointer process

C. Controlling Cursor Key

In this stage, we do the same principle as control of mouse pointer by hooking coordinates that have been obtained from real-time image of the keyboard event functions that exist in C++ programming. In this process also used Euclidean distance [5] is described in Eq. 1 which calculates the distance with velocity determination 40.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad (1)$$

III. RESULT

The experiments cover measurements of palm detection in different position, in same distance and light intensity. Also, we conduct distance measurement in palm object detection and frame rate per second (FPS) at time of tracking.

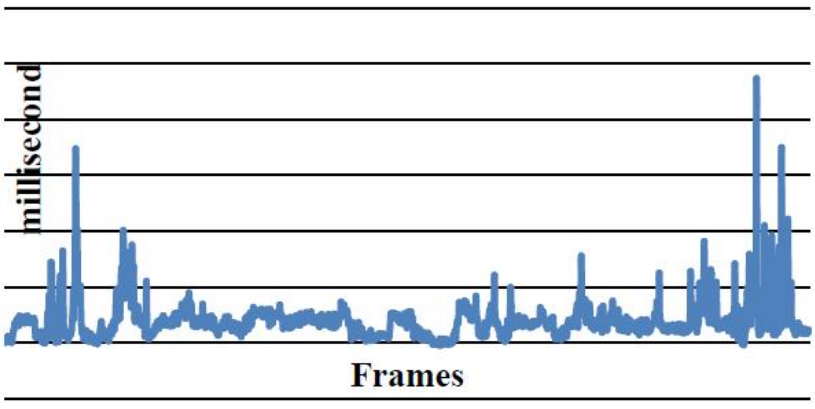

Figure 3. Process time of palm's tracking

IV. CONCLUSION

The results of a series test (position angle and distance between user's palm and screen) shows that the more upright position of hand movement, the detection results would be better. Tracking process can run on 7.16 fps at maximum distance 200 cm with accuracy rate 90.9%. The left click event (mouse pointer) enables to

function at a maximum distance 160 cm with accuracy reaching 63.6%, while left and right cursor keys will be function at maximum distance 180 cm with accuracy 72.7%.

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