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Nostril in RGB Imaginary by Using NI Vision LabVIEW

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Abstract

Monitoring of breath function is needed for medical science to evaluate condition of patient for some diseases. The patient will be observed continuously on face (nostril). Face recognition is the most important stage to localize the measurement. Because of that need, thermal image is used to record changing temperature on patient face. Thermal image has two type image, gray and RGB image. In this paper, we used RGB image as the raw data and trying to find face, eye and, nostril as breathing indicator. We divided the nostril recognition in three main steps: eyes detection, calculate the center of mass between two eyes, measured the center of mass distance to nose, get nostril location. We applied image processing algorithm such as gray image, binary image and template matching. All those algorithm are programmed in NI Vision LabVIEW. The distance between subject and camera is fixed in 1 meter. The experimental result showed that nostril always detected even though the subjects have some movements during measurement.

Keywords: breath function, thermal image, face detection, nostril

1. Introduction

Nowadays, Vital signs monitoring of patient become important in modern medical observation. Vital sign of human such as ECG, PPG, EMG etc, are usually used wired device that placed on patient body. In other case of disease, patient should be in relax position or feeling scared with all device that placed on their body. Non-contact device is the solution to handle that problem, and use thermal image device to capture some of that.

Facial detection is the most important part in this field, because it contains eye, nose (nostril) and mouth of the patient [1]. First stage of facial recognition usually is focused of eye detection. Eyes detection in thermal image is a little different from common eyes image captured from usb camera [2]. After eyes detected, the stage continues to nose detection by using center location between two eyes. Detecting nose in facial detection some time uses prediction to localize nose location [3].

In this research, our focus is on nostril of nose as our goal to monitoring some of human vital signs (breathing function) [4]. We devided into three stages until nostril detected: face detection, eyes detection, nose detection and nostril detection. FLIR thermal image is our device to capture human face and save into AVI files. We also use above algorithm so that nostrils can be detected automatically. All stage is programmed in NI Vision LabVIEW.

2. Method

2.1. FLIR Thermal Camera and Subject Setup

In this research, we used FLIR thermal camera P384-20 that has resolution 384 x 288 pixels with 50 frames per second (fps) in color mode. Fig. 1(a) shows our camera FLIR thermal Image Camera.

The distance between subjects and FLIR Thermal Camera is 1 meter with manual calibration on camera resolution. Fig. 1(b) shows our experimental setup between camera and subject. The video of subject will be captured using FLIR thermal camera in 5 minutes with minor movement of their head and the files are converted to AVI files. During video recording, the subjects will breathe normally.

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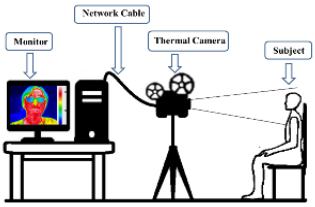
(a)



(b)

Fig. 1 (a) FLIR Thermal Camera, (b) Experimental Setup

2.2. Nostril Tracking Algorithm

In order to detect nostril location, we proposed 4 main steps such as: face detection, eyes detection, nose detection and nostril detection. All algorithms are programmed with NI Vision LabView 2015 by using Virtual Instrument (VI) in NI Vision.

The nostril tracking algorithm is explained below:

(a)

(b)

Fig. 2 (a) Gray Image, (b) Eyes Template

- Step 1 – eyes detection: Detecting eyes on this step through a few process to do, such as convert image to gray, set Region of Interest of eyes location and make eyes templete. The eyes template shows on Fig. 2(b). In this research, we focus on the highest temperature in the corner of the eyes to make the eyes detection faster to find. The next step is to calculate the Centre Of Mass (COF) between to eyes that will be used as the centre point to get the nose location.
- Step 2 – nose detection: The COF then is used as centre point to find nose location by using ratio 1/3 from chin of face[]. By applying that, we can set the ROI of nose location.
- Step 3 – nostril detection: Nostril is easly found on nose ROI because nostril is indicated as the highest temperature in ROI location.

3. Results and Discussion

Fig. 3 shows block diagram of nostril detection in Thermal image which consist of load AVI files, Eyes-nose detection and nostril detection.

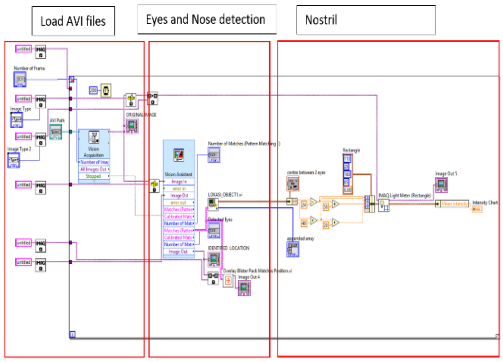


Fig. 3 LabVIEW block Diagram of Nostril Detection

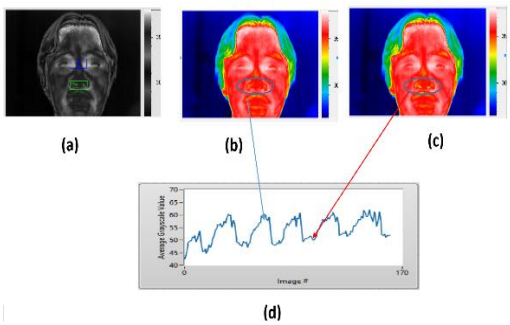


Fig. 4 (a) gray image, (b) nostril not detected, (c) nostril, (d) nostril waveform cycle

Fig. 4 shows our results in nostril detection and location in thermal video. Fig. 4(a) shows the center mass of eyes with blue rectangle and nostril location with green rectangle. Fig 4 (b), (c) and (d) show nostril location and visualize nostril activity with graph.

4. Conclusions

The main objective of this research was to determine the location of the nostril on RGB thermal video. The experimental result showed that nostril always detected even though the subjects have some movements during measurement.

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