Design of Palm Acupuncture Points Indicator

Wen-Yuan Chen, Shih-Yen Huang and Jian-Shie Lin

Abstract The acupuncture points are given acupuncture or acupressure so to stimulate the meridians on each corresponding internal organs with a treatment of physical illness. The goal of this study is to use image technique to automatically find acupuncture positions of a palm to help non-related professionals can clearly identify the location of acupuncture points on him palm. In this paper, we use the skin color detection, color transform, edge detection, histogram and fast packet method to extract the palm and find out the acupunctures. First, we use fast packet method to get the acupunctures of the finger. And then a histogram technique was used to obtain the acupuncture points of the valley of the fingers. Finally, the valley points and fingertips of the finger are used as a reference combined with the standard deviation of data images to calculate the position of the palm acupuncture points. From the simulation result, it is demonstrated that our design is an effective method for indicating the acupuncture points of a palm.

Keywords Acupuncture · Image recognition · Finger valley
Palm · Histogram

1 Introduction

For finding the acupuncture points of a palm, a palm extraction from image or hand gesture method and acupuncture knowledge are necessary. Mazumdar et al. [1] published a hand gesture detection method for human and machine interaction. Its

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goal is focus on the video hand gesture recognition. In this research, they estimate the performers of the hand tracking and announce a hand extraction scheme by wear the glove. This method can handle the finger at part by part manner. Throughout the tracking, the hand still motion freely. Besides, the system can move the noise effectively and working well in complex background.

Duan et al. [2] research the hand gesture and human-machine interaction deeply. It provide a core for accuracy and fast to identify the hand gesture in motion object. Meanwhile, they also propose a new building mode of dynamic and real time hand gesture extraction technologies. First, they check the rate variation of motion to confirm the start and stop of the dynamic hand gesture. And then a mean-drift algorithm associated with the target detection of the hand gesture motion and color information to achieve the real time tracking. Experimental results reveal the method reach the real time and stability advantages.

Causon et al. [3] use multiple camera as the Fig. 1 shown to extract hand image and capture many pictures on different angular. The system is used to extract data to construct the hand model by 3D image structure. From simulation result, it demonstrates the 3D structure is a well design for hand gesture detection. About the other hand extraction and gesture research can be found in [4–6].

Yang et al. [7] proposed a method use data mining technique to analyze the effects of treatment and the influence of behavioral variables by using fifty patients with juvenile myopia. On acupuncture treatment, myopia patients were divided into two classes for clustering analysis. From the experiments result, it is demonstrate that a good treatment of acupuncture could slow the progression of juvenile myopia.

Birch and Hammerschlag [8] release a future issues of clinical acupuncture and oriental medicine include four topics: designing clinical research to evaluate traditional East Asian system of medicine; identifying and controlling for the non-specific effects of acupuncture; assessing strength and weakness of systematic reviews of acupuncture; identifying research questions relevant to the acupuncture

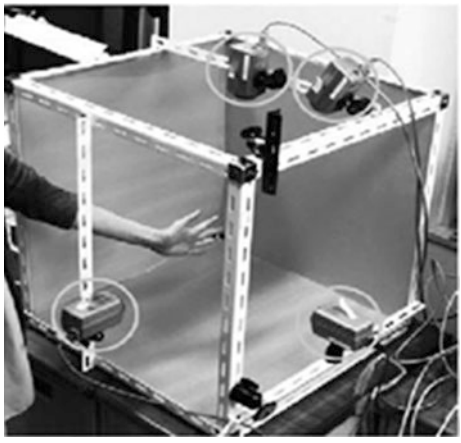

Fig. 1 The schematic of the multiple camera structure for hand gesture extraction

community. Those topics are plain to describe the clinical acupuncture is good for the human health. About the other acupuncture research can be found in [9, 10].

Using artificial lift with an image function Lu et al. [11] proposed Brain Intelligence (BI) for the events without having experienced. To gain the binary code learning, Xu et al. [12] used class label and proposed a method to decrease the quantization loss. To increase the computing efficiency, Lu et al. [13] used an additive operator-splitting algorithm and proposed model-based method to alleviate the intensity inhomogeneity. Lu et al. [14] proposed Filtering Deep Convolutional Network (FDCNet) and shown this method was better than state-of-the-art classification method.

2 System Algorithm

In this study, we enter a test image with hand message and then verify if the image has a palm. If the answer is no then the system loop to the enter image stage otherwise go to the skin detection stage. On skin detection, a color transformation is

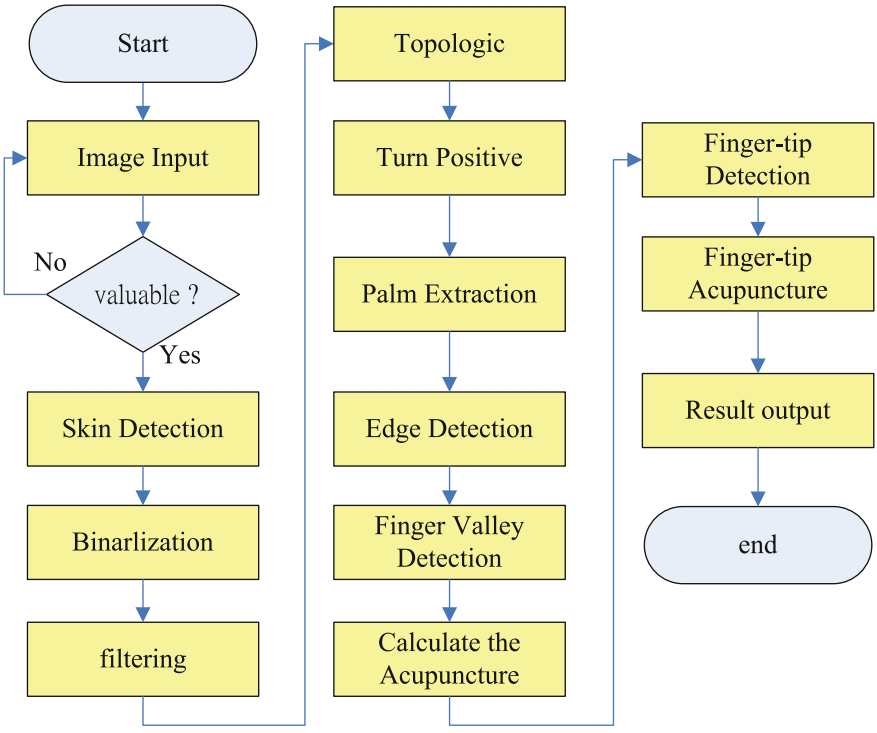

Fig. 2 The flow chart of the acupuncture of a palm

hired to map a color image from RGB space to YCbCr space. Then a set of equations was used to identify the pixels are belong to the skin color or not. Due to binary image is suitable for the feature detection; we convert the color image into the binary image. Next, a filter use to filter the noise out. A topologic method is used to patch up the object. Certainly, turn positive stage is necessary for providing to obtain a well detection. Successively, a palm extraction method was used to distinguish the palm portion. Then, edge detection extracts the edge of the image. It is provided the system to find the valley of the finger. It is well known, the valley of the finger is a location of the acupuncture. In this research, the acupunctures of the palm were obtained by calculate the position according to the database and acupunctures of the valley. As for the fingertip, we used a fast packet method associate with the edge of a palm image can easily to get. Finally, we add the all acupunctures, the acupunctures of a palm was completed. The details of the above mention can be found in Fig. 2.

3 Experiment

3.1 Acupuncture Location Calculation of a Fingertip

The acupuncture location of fingertip is a part of the palm; therefore we develop a fast packet method to calculate the position of the fingertips in a palm. In order to describe the details of finding process, we use Fig. 3 to explain the theoretic and operation. Figure 3a shows the general acupuncture positions of a palm. Meanwhile it is an original test image. Since the binary image is easily to extract something features, therefore we transfer the color image into binary image. Figure 3b display the result after binarlized corresponding to the Fig. 3a. It is well known the fingertip must be on the contour of an image. Since a method to find the image contour is necessary, we transfer the color image to the binary image. Figure 3c is the contour image that is extract from Fig. 3b. In this research, we develop a fast packet method to get the tips of a finger. Figure 3d shows the schematic of the fast packet method. From Fig. 3d we see the tips are all on the intersection between contour image and the line on the fast packet. Certainly, by the fast packet method, we can easily to obtain all the fingertips. Finally, Fig. 3e shows the result of all the fingertip acupuncture points from a palm.

3.2 Acupuncture Location Calculation of a Man Palm

Figure 4 shows the case of an acupuncture location calculation of a man palm. Figure 4a shows the result of a fast packet method when it is applied to fingers of a palm. This method can fast to find out the tips of fingers from a palm. In other

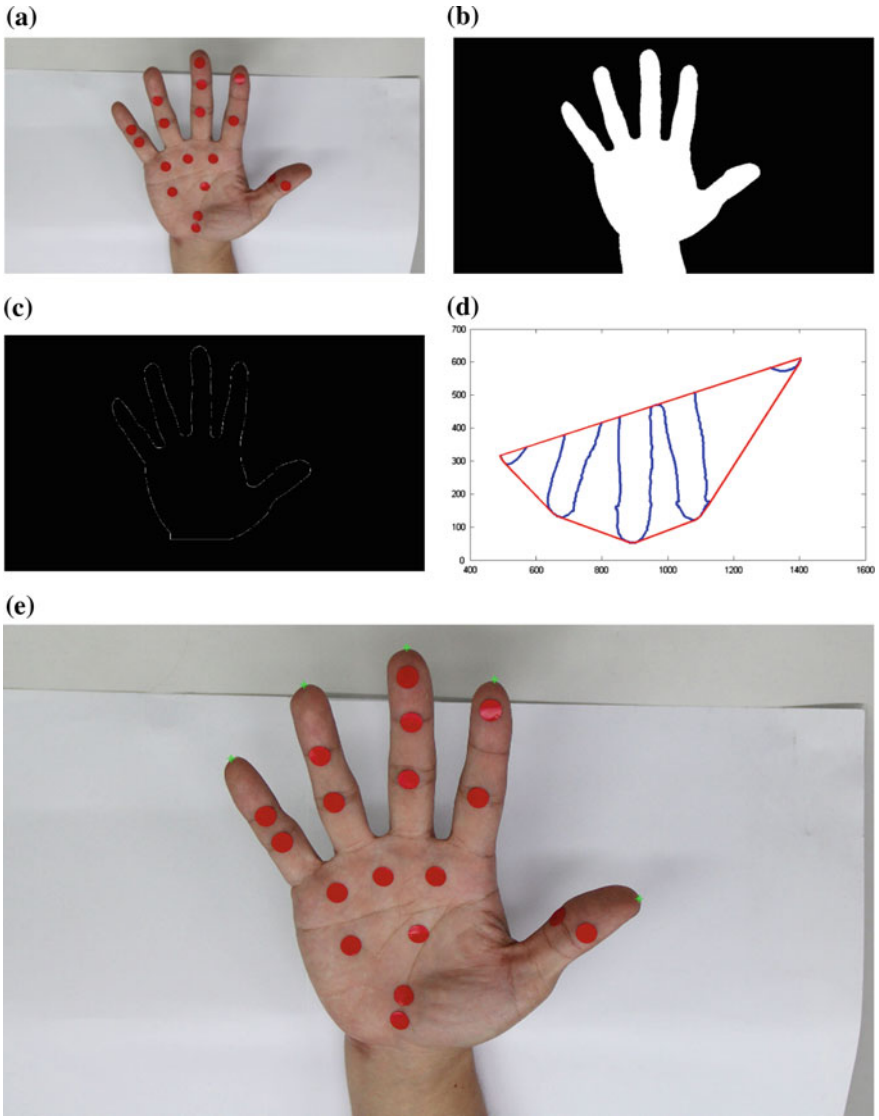

Fig. 3 The tip of finger grab case: **a** the original image, **b** the result after binarization, **c** the contour of a palm, **d** the schematic of a fast packet method **e** the result of a tip of finger grabbed

words, we can easily use the fast packet method to extract the acupuncture location of the tip of fingers. Figure 4b shows result of the acupuncture location of a fingertip. Where, the green points are the acupuncture points of fingertip of a palm. Figure 4c is the histogram of a palm corresponding to the Fig. 4b. We use histogram technique to find out all the valleys that it is map to a finger of the palm. It is

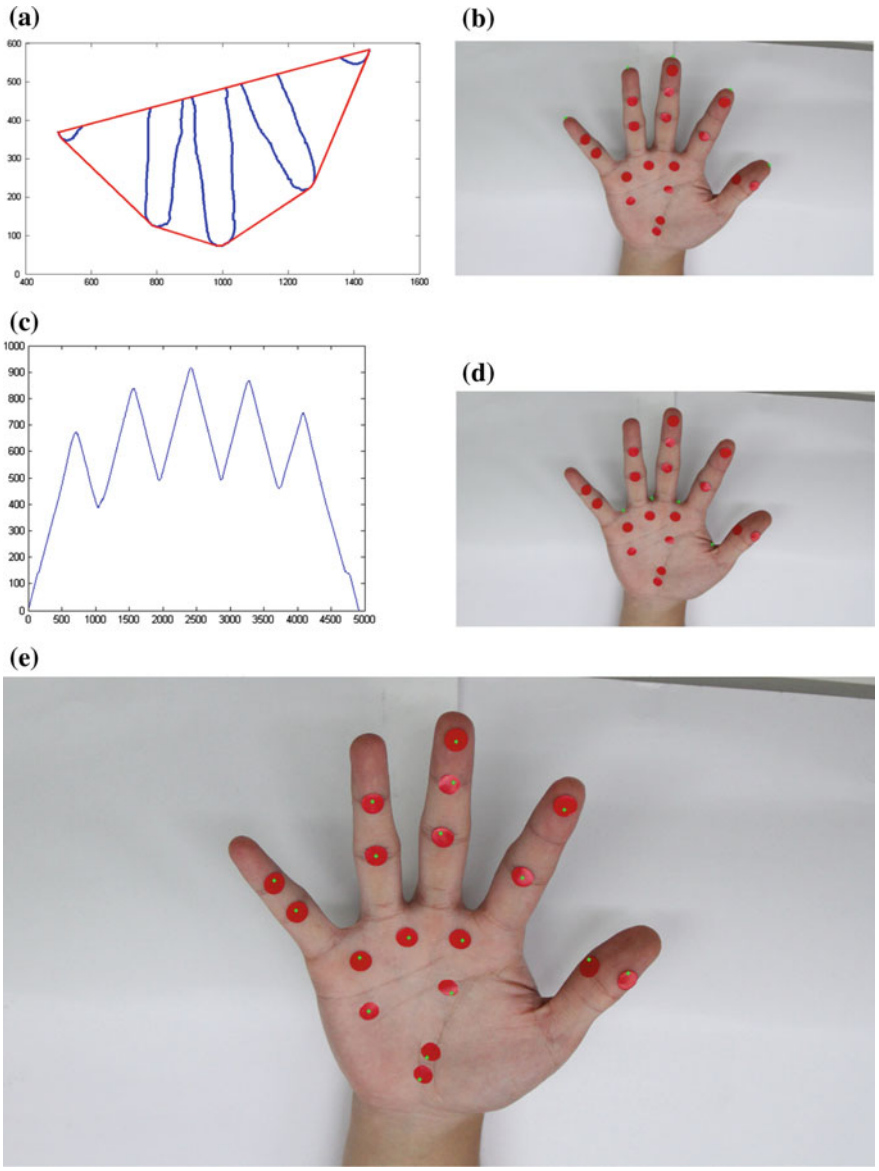

Fig. 4 The location calculation of a man palm case: **a** the result of a fast packet method, **b** the acupuncture location of a fingertip, **c** the histogram of a palm, **d** the acupuncture location of valley of finger, **e** the calculation result of acupuncture of a palm

reveals that the each local valley is corresponding to the each valley of the fingers. This method can exactly to find the valleys of a palm. Figure 4d expresses the acupuncture location of valley of finger; it is corresponding to the Fig. 4c. From the

picture, we can easily to see the acupuncture points; the green points display. Finally, Fig. 4e shows the calculation result of acupuncture of a palm. The same as the Fig. 4b, d shown, the green points is specially use to display the acupuncture location. It is design for peoples to easily to watch. The details can be found in Fig. 4, please to watch it carefully.

4 Conclusion

This study uses the features of the tip and valley of the finger to find out the all acupuncture points of itself of the finger. Meanwhile, we also calculate all the acupuncture points that are located in the palm. In the experiment, the skin color used to extract the palm image. The filter used to filter out the noise to obtain a suitable successive detection image. The topologic technique used to fill out the image for further edge detection. Certainly, the principle axis method used to turn the image into positive position. Finally, the histogram and fast packet method are adopted to extract the five tips and four valleys acupuncture of the fingers. By the way, according to find out acupunctures and database, we calculate all the acupunctures of a palm. From the simulation result, it reveals our system is an effective and corrective method for pointing all the acupuncture points of a palm.

References

1. Mazumdar, D., Talukdar, A.K., Sarma, K.K.: Gloved and free hand tracking based hand gesture recognition. In: ICETACS 2013, pp. 197–202 (2013)
2. Duan, H., Zhang, Q., Ma, W.: An approach to dynamic hand gesture modeling and real-time extraction. In: IEEE conference, pp. 139–142 (2011)
3. Causo, A., Matsuo, M., Ueda, E., Takemura, K., Matsumoto, Y., Takamatsu, J., Ogasawara, T.: Hand pose estimation using voxel-based individualized hand model. Adv. Intell. Mech. 451–456 (2009)
4. Zhang, H., Zhu, Q., Guan, X.-F.: Probe into image segmentation based on Sobel operator and maximum entropy algorithm. In: IEEE 2012 International Conference on Computer Science and Service System, pp. 238–241 (2012)
5. Zhao, Y., Zhang, D., Wang, Y.: Automatic location of facial acupuncture-point based on content of infrared thermal image. In: 2010 5th International Conference on Computer Science and Education (ICCSE), pp. 65–68 (2010)
6. Ren, X.: RGB change their perception: RGB-D for 3-D modeling and recognition. IEEE Robot. Autom. Mag. **20**(4), 49–59 (2013)
7. Yang, X., Xu, L., Zhong, F., Zhu, Y.: Data mining-based detection of acupuncture treatment on juvenile myopia. J. Tradit. Chin. Med. **32**(3), 372–376 (2012)
8. Birch, S., Hammerschlag, R.: International workshop on acupuncture research methodology papers on Topic 1: Matching research design to research question in clinical trials of acupuncture. Clin. Acupunct. Orient. Med. **3**(4), 191 (2002)
9. Cross, J.R.: Modern Chinese acupuncture—A review of acupuncture techniques as practised in China today. Physiotherapy **81**(5), 302 (1995)

10. Baxter, G.D.: Acupuncture in clinical practice—A guide for health professionals (Therapy in Practice 43). Physiotherapy **81**(11), 701 (1995)
11. Lu, H., Li, Y., Chen, M., Kim, H., Serikawa, S.: Brain intelligence: go beyond artificial intelligence. Int. J. Comput. Sci. Comput. Vision Pattern Recogn. (2017). https://arxiv.org/abs/1706.01040
12. Xu, X., He, L., Shimada, A., Taniguchi, R.-I., Lu, H.: Learning unified binary codes for cross-modal retrieval via latent semantic hashing. Neurocomputing **213**, 191–203 (2016)
13. Lu, H., Li, B., Zhu, J., Li, Y., Li, Y., Xu, X., He, L., Li, X., Li, J., Serikawa, S.: Wound intensity correction and segmentation with convolutional neural networks. J. Concurrency Comput. Pract. Exp. **29**(6) (2017). http://onlinelibrary.wiley.com/doi/10.1002/cpe.v29.6/issuetoc
14. Lu, H., Li, Y., Uemura, T., Ge, Z., Xu, X., He, L., Serikawa, S.: FDCNet: filtering deep convolutional network for marine organism classification. J. Multimedia Tools Appl. 1–14 (2017)

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