Determining Acupuncture Points For Relaxing Massage Using Convolutional Neural Networks

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Abstract. In the era of science and technology development, the people are trying and promoting into traditional medicine. Massage is a method of medicine that has been around for a long time, it brings relaxation to patients and cures human diseases. Before people use different methods to determine acupuncture points, it takes a long time. This study proposes an approach to quickly identify acupressure points on the head by Convolutional Neural Networks – CNN. The study proposals a CNN to recognize the point mounted on the face with the accuracy of , combined with signals from sensors, to determine the necessary dimensions of the human head.

Keyword: Acupressure points, head massage, CNN

1. INTRODUCTION

Currently, the stroke cases and the injuries caused by accidents are increasing, which makes the number of patients needing care in hospitals is increasing and there is a risk of overcrowding. Massge brings relaxation to patients and cures human diseases. Massage according to Arabic “mass~h”, translated in Vietnamese as “light pressure”. This is a method of relaxation and health training based on mechanical effects on parts of the body to treat stress, reduce pain and fatigue. Massage method has appeared since ancient times and is being applied by people all over the world. Over time with the process of cultural exchange, the massage techniques brought by the Japanese to their country were developed in the direction of diagnosis and treatment called Shiatsu. With the benefits ofhead massage, so it is necessary for humans. Currently, the care of patients after special treatment such as radiation therapy, surgery, etc is performed by medical staff at the hospital, which causes a serious shortage of staff. With the development of science and technology, it is necessary for research to be applied into reality to solve human difficulties, reduce overload for medical staff, reduce the risk of

transmitting infections among patients. This study aims to provide good support for doctors and traditional medicine in determining massage acupuncture points. AI can detect points in the face of the patient. AI can quickly detect acupoints on the patient's head with a high accuracy.

Acupoints are areas of skin with high electrical conductivity and histological differences from neighboring tissues [1], according to the theory of Vietnamese traditional medicine, acupoints are the focal points of nerves and blood vessels. Massage acupoints can treat diseases such as back pain, headache, recovery after radiation therapy, etc [2-11]. In this study, we use a CNN network to recognize landmarks on human faces, which is the home point of the system. "μ" or “thốn” (Vietnamese) is a unit of measurement of human biological length, which is used to determine the acupuncture points of the human body.

2. METHODOLOGY

2.1 Determining Acupressure points and parameters of the head by CNN

Head massage brings benefits to human health, especially patient after treatment. In addition, the massage according to acupressure can assist in the treatment of some diseases and recovery treatment. According to the theory of traditional Vietnamese medicine, the distance of acupoints is defined in units of ' μ ' or ‘thốn’, ‘thốn’ is calculated by the formula: $\mu = \frac{M}{75}$,with ‘M’ is the patient's height. The horizontal size of the head is 9μ.

We have 4 steps to determine the acupressure points.

- Step 1: Determining the point that is conventionally the home point on the patient's face.
- Step 2: Calculating the value of the ‘μ’ for each patient.
- Step 3: Determining the patient's head size.
- Step 4: Calculating the remaining acupressure points from input values.

Acupressure points are understood as holes in the skin so that qi energy can flow through, massage acupressure points are considered an effective form of stimulation used to help relax muscles, activate the self-healing mechanism of the body [3]. Currently, patients recovering from serious injuries or after major surgery or radiation therapy, who have difficulty moving, so they need special care. Head massages need to be performed every day and it is practiced by health care staff. With the growing population, the need for medical care equipment for humans is really necessary to replace health care staff. Massage according to acupressure points based on the theory of Vietnamese traditional medicine has many uses in recovering patients and helps not sick people relax and help the body get stronger. To determine acupressure points on a person's head, the system needs to determine the robot's home point so that from the home point, it can calculate other acupressure points by the distance of the cuns. The robot

is not constrained to the initial position of the head's patient, so a pre-specified point cannot be used as the robot's home point. In this study, we propose a CNN to acupressure points.

The convolutional neural network (CNN) is a type of deep learning that uses convolution with kernels of different sizes. The basic structure of CNN includes convolution layers, nonlinear activation function, pooling layers, fully connected layers [13]. The input is an RGB image collected from a camera located inside the robot. In this study, we use a CNN to detect landmarks on the face, and the robot recognizes that point as the original home point. The CNN network configuration used consists of 6 convolutional layers, 3 max-pooling layers (1), 2 fully connected and the activation function is rectified linear unit (ReLu) (2), the last layer is a softmax layer. The Adam optimizer with learning rates of 0.01 over 100 epochs is utilized. All kernels are used with size 3x3 to reduce the weight of the model, increase the computational speed of the robot.

3. RESULT AND DISCUSSION

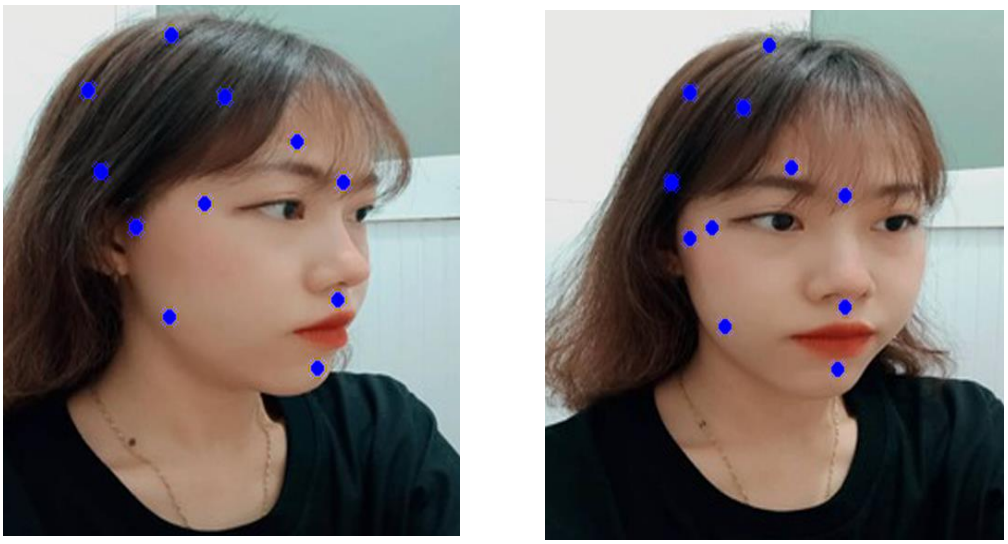
Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 250, 250, 32)	864
leaky_re_lu (LeakyReLU)	(None, 250, 250, 32)	0
batch_normalization (BatchNormalization)	(None, 250, 250, 32)	128
conv2d_1 (Conv2D)	(None, 250, 250, 64)	18432
leaky_re_lu_1 (LeakyReLU)	(None, 250, 250, 64)	0
batch_normalization_1 (BatchNormalization)	(None, 250, 250, 64)	256
max_pooling2d (MaxPooling2D)	(None, 125, 125, 64)	0
conv2d_2 (Conv2D)	(None, 125, 125, 128)	73728
leaky_re_lu_2 (LeakyReLU)	(None, 125, 125, 128)	0
batch_normalization_2 (BatchNormalization)	(None, 125, 125, 128)	512
conv2d_3 (Conv2D)	(None, 125, 125, 128)	147456
leaky_re_lu_3 (LeakyReLU)	(None, 125, 125, 128)	0
batch_normalization_3 (BatchNormalization)	(None, 125, 125, 128)	512
max_pooling2d_1 (MaxPooling2D)	(None, 62, 62, 128)	0
flatten (Flatten)	(None, 492032)	0
dense (Dense)	(None, 512)	251920896
dense_1 (Dense)	(None, 22)	11286

Total params: 252,174,070
Trainable params: 252,173,366
Non-trainable params: 704

Figure 1: The parameters of the CNN model

The CNN network structure is used with the parameters as in **Fig.1** with total params is 252,174,070, Trainable params is 252,173,366, Non – trainable params is 704, epochs of 1000 and batch_size of 4. The model was trained with an RBG image with the size of 250x250x3, we only use kernels with size 3x3 in order to reduce the number of weights to speed up the computation of the robot. The square of error of the CNN model is 1.5542. All processing software is written in Python programming language with the support of available libraries such as Cv2, NumPy, Math, Keras, etc.

The results of the test process are shown in Fig.2a, the acupressure points of the head is predicted by the robot based on the input values, each person has different face angle based on Vietnamese traditional medicine, the acupressure points of the head is presented in Fig.2b.



(a) *(b)*

Figure 2: The result of the test

4. CONCLUSION

This study proposes to combine CNN to identify acupressure points on the head and predict the massage trajectory applied in a shampoo massage robot for patients. The proposed CNN network with the square of error of the CNN model is 1.5542. The future development direction can identify and identify acupuncture points on the entire human body, Predict the trajectory of difficult-to-identify acupressure points, and Upgrade models, inputs and algorithms to be able to produce results. pass more precisely.

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