A System on Hand Gestures Recognition Interface Using Hippocampal Neural Networks of Brain Model Based on Kinect Data

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Abstract. In this paper, we propose a hand region detection algorithm and hippocampal neuron networks algorithm for hand gesture recognition. To obtain the color information and depth information from the input hand image by the infrared camera. Then detect the hand through the labeling and binary. Then using the distance transform vector to save the coordinates of the center point of the hand. And it detects only the palm region other than the wrist through the center point. After by using color information and depth information to identify the number of the value changed edge, and calculate the number of fingers. Using the information obtained by the preprocessing and inputs a gesture according to the hand movement. It classifies the gesture thought proposed hippocampal neuron networks algorithm. Finally, to implement the gesture recognition interface. It recognizes hand gestures. We proved that our hippocampal neuron networks learning method takes advantage of the gesture recognition time and rate.

Keywords: Hand recognition, DTV (Distance Transform Vector), Kinect, Depth image, RGB image, HNN(Hippocampal Neuron Networks)

1 Introduction

Today, research and development and interest in the interaction between humans and machines are being continued. It was recently improved processing speed of your computer and mobile. So, gesture recognition in different environments is essential. The future, using the recognition techniques to create a variety of industrial IoT. It is expected to be utilized in many places. In this paper, we propose a hand gesture recognition algorithm. It extracts a feature point from the obtained hand image through the camera. Then applied to the hippocampus algorithm using a different information obtained. The rest of the paper is organized as follows. In section2, the proposed method is introduced. And experimental results and conclusions are shown in section 3.
2 Proposed Algorithm

The proposed method is shown in Figure 1. A first infrared camera, the kinect was used to obtain the color information and the distance information via the video information. The easiest and most effective way to detect the hand to use the color information. In the paper, detecting the hand using the RGB color information. The color model detects a hand. And it was using Depth (depth) information specifying the recognition range of the hand detection. (detecting Range: 65 ~ 80cm)[1]. Copies the acquired image and the binarization performed. And double labeling the inside and the outside of the hand. The reason for the Labeling is performed because a prompt all the image generated in the inside and outside with a loaf of all words in the hand region can remove the noise[2]. Next, to detect a center point of the hand. In order to detect the center point of the hand is used to convert the distance vector. Using the distance transformation vector can be obtained the value of the center coordinates of the hand[3]. Using the obtained center coordinates hand it is possible to remove the palm region. It can determine the number of fingers to the edge of changing the value from the palm of your hand. In this paper, we used a 3x3 matrix mask. This mask represents the amount of operations to reduce the size mathematically simple.

![Proposed Algorithm Diagram](image-url)

Fig. 1. The proposed algorithm
3 Experimental Results

Some examples are illustrated to show the validity of our proposed method. The Hand gestured databases were tested by the designed hand detector, as shown in Fig. 2.

![Image](image_url)

**Fig. 2.** Detection results of our method in hand gesture

In Fig. 2 is the result of the RGB and the Depth image of the detected hand region. And the result of the hand detected center point using a distance transform vector. After then, thought the center point coordinates of hand find the edge of the value changes from the palm of hand. After that obtain the number of fingers.

The following Table 1 shows the detection time and the recognition rate for each gesture, according to the BP algorithm and the neural network learning the hippocampus.

**Table 1.** The result of gesture recognition time and rate BP algorithm and hippocampus neuron networks algorithm

<table>
<thead>
<tr>
<th>Gesture</th>
<th>BP Algorithm</th>
<th>The proposed hippocampal neural network learning algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>detection time</td>
<td>Recognition</td>
</tr>
<tr>
<td>Left mouse click</td>
<td>0.89sec</td>
<td>88%</td>
</tr>
<tr>
<td>Right mouse click</td>
<td>0.85sec</td>
<td>89%</td>
</tr>
<tr>
<td>Raising screen</td>
<td>0.92sec</td>
<td>87%</td>
</tr>
<tr>
<td>Reduce screen</td>
<td>0.94sec</td>
<td>87%</td>
</tr>
</tbody>
</table>
4 Conclusions

This paper uses an infrared camera for hand gesture recognition. The preconditioning process for a hand gesture recognition. After that removes noise. And it created the environment for detecting image clean hands. Removes noise through the distance transform vector and find the coordinates of the center hands. For gesture recognition, stores the information on the hand region. Then using the stored information of the RGB values, Depth values, and the center point coordinates to remove unnecessary parts in a hand gesture recognition. It finds the edges of varying value in the palm of your hand. Then it is possible to detect the number of fingers. And In this paper, we use the method proposed multi-information and hippocampal learning algorithms applied. In this way to give a higher recognition rate and fast detection time than the existing BP algorithms.

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References