

Title: Gesture Recognition Technology

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Abstract:

Gesture recognition is an important way of human-computer interaction. With time going on, people are no longer satisfied with gesture recognition based on wearable devices, but hope to perform gesture recognition in a more natural way. Computer vision-based gesture recognition can transfer human feelings and instructions to computers conveniently and efficiently, and improve the efficiency of human-computer interaction significantly.

The gesture recognition based on computer vision is mainly based on hidden Markov, dynamic time rounding algorithm and neural network algorithm.

The process is roughly divided into three steps: image collection, hand segmentation, gesture recognition and classification.

This paper reviews the computer vision-based gesture recognition methods in the past 20 years, analyses the research and summarizes its current development, the advantages and disadvantages of different gesture recognition methods, and looks forward to the development trend of gesture recognition technology in the next stage.

Keywords:

Hand posture, Eye Detection, Hand gesture, Human computer interaction(HCI).

Introduction

The airplane host and hostess use gestures to explain the safety guide for the passengers before the airplane takes off, since most of the passengers might be unable to understand their languages especially for aged or hear-impaired passengers. Gestures used for communication between people and machines as well. Building natural interaction between human and computer required accurate hand gesture recognition system as an interface for easily human computer interaction (HCI), where the recognized gestures can be used for controlling a robot or conveying meaningful information.

Gestures can be static (posture) or dynamic (sequence of postures). Static gestures require less computational complexity rather than dynamic gestures which are complex and for that it is suitable for real time environments.

Recently a lot of reviews discussed gesture recognition systems and applications using different tools .This work demonstrates the advancement of the gesture recognition system.

The process of gesture recognition:

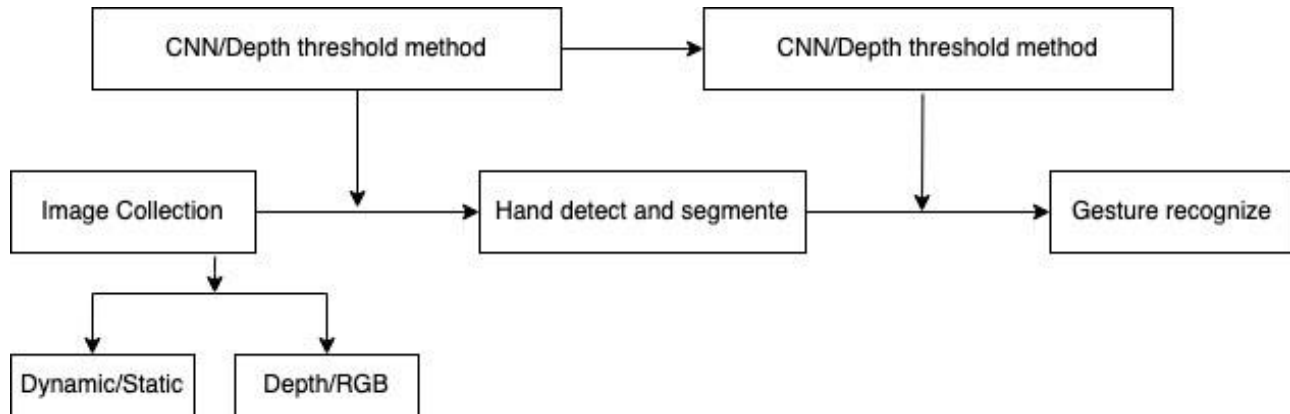


Fig 1. The process of gesture recognition

Algorithms:

Depending on the type of input data, the approach for interpreting a gesture could be done in different ways. However, most of the techniques rely on key pointers represented in a 3D coordinate system. Based on the relative motion of these, the gesture can be detected with high accuracy, depending on the quality of the input and the algorithm's approach.

In order to interpret movements of the body, one has to classify them according to common properties and the message the movements may express. For example, in sign language, each gesture represents a word or phrase.

Methodology:

Gesture recognition based on the computer vision obtains the picture containing the human hand by cameras, and then utilizes the image processing and the machine learning to contribute to the judgment and recognition of the gesture comprehensively.

At present, The steps of gesture recognition based on computer graphics are split into three stages: Image collection, Hand detection and Segmentation, Gesture recognition and classification.

Challenges :

There are many challenges associated with the accuracy and usefulness of gesture recognition software. For image-based gesture recognition there are limitations on the equipment used and image noise. Images or video may not be under consistent lighting, or in the same location. Items in the background or distinct features of the users may make recognition more difficult.

The variety of implementations for image-based gesture recognition may also cause issue for viability of the technology to general usage.

In order to capture human gestures by visual sensors, robust computer vision methods are also required, for example for hand tracking and hand posture recognition or for capturing movements of the head, facial expressions or gaze direction.

Conclusion

Gesture recognition technology is relatively robust and accurate. Trade off can be maintained between speed and accuracy. Non-touch based interaction can certainly be adjudged as the ray of hope for disabled people or people busy with multitasking. This paper reviews the gesture recognition based on computer vision. After nearly 20 years of development, gesture recognition has broken through the wearable constraints. But there are still problems such as poor universality, sensitivity to illumination changes and occlusion, and poor real-time performance.

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