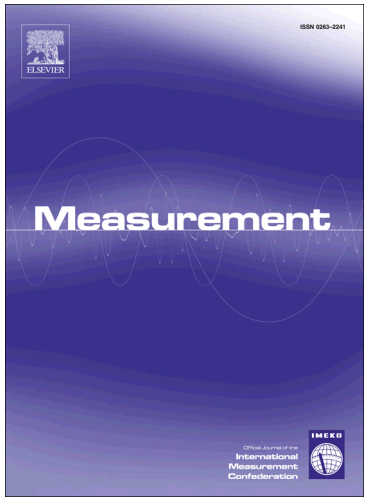

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Hand gesture recognition using valley circle feature and Hu's moments technique for robot movement control

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Abstract: Hand gesture recognition is a simpler and more natural way of human computer interaction. The goal of this paper is to detect the continuous gestures and use them to convey information for the robot movement control. So the hand gesture recognition requires fast and extremely robust. In this paper, three strategies were used to realize the hand gesture recognition: (1) The valley circle (VC) was created for the first stage of 6 fingertip numbers classification; (2) The hybrid feature vector of Hu's moments, convexity and compactness (HCC) were constructed for the second stage of gesture recognition of the remainder unknown gesture classes; (3) A new template matching recognition (NTMR) algorithm was proposed to realize 10 gesture classes recognition. To test the hand gesture recognition method, the robot movement control system was built. It is experimental proved that the NTMR algorithm is effective and corrective for the hand gesture recognition. It increased the recognition accuracy by 4% and decreased the recognition duration by 112ms compared with Hu's moment method. It had good performances of the real-time hand gesture acquisition and information conveyance, and it had the invariant properties when the gesture was rotated and shifted and scaled.

Keyword: hand gesture recognition; valley circle; hybrid feature vector; template matching; robot movement control

1. Introduction

The common human computer interface is centered on machine. Human is required to fit the interface of machine, so human has little active access to control whole system. With the rapid developments of computer science, image processing, artificial intelligence and the virtual reality technology, the human computer interface based on gesture recognition become the hot research area **[1,2]**. Hand gestures are very important in daily life because they have strong meanings. Especially, they are very intuitive and clear **[3]**. In recent years, hand gesture recognition attracts many attentions. Based on computer vision, hand gesture recognition technology is a simpler and more natural way for user to control device **[4,5]**.

For hand gesture recognition, scientists used machine learning algorithm, such as SVM multiclass classification algorithm, to establish the generic hand gesture recognition systems for Portuguese Sign language recognition **[6]**. In addition, the maximum cosine similarity and fast nearest neighbor techniques were used for the