

TITLE :	Principal Component Analysis Based Hand Gesture Recognition for Android Phone Using Area Features	YEAR
		2017
KEY CONTRIBUTION		THEORY
A novel method of hand gesture recognition using Principal Component Analysis (PCA) implemented in Android phone		Area features are adopted to do the gesture recognition to solve different size of gesture image captured, different angle of gesture's rotation and flipped gesture
DEPENDENT VARIABLES		
<ul style="list-style-type: none"><li>• 3 steps: training samples, gesture pre-recognition, PCA based gesture recognition</li><li>• each kind of gesture has ten standard gesture images</li><li>• Each standard gesture image in training samples have own the farthest point distribution</li></ul>		
INDEPENDENT (AND HYPOTHESES)		
<ul style="list-style-type: none"><li>• nine kinds of gesture needed to recognize</li><li>• Samsung S5 Android phone which has a rear camera with sixteen million pixel resolution.</li><li>• The distances between the camera and the user's hands are fixed in 30cm and 60cm</li><li>• Adopt skin color model based on RGB and YCbCr color space to segment the original image</li><li>• eight neighborhood method to eliminate noise during the segmentation process</li><li>• map the gesture image to standard gesture image whose size is 100 * 100</li><li>• The centroid of standard gesture image is calculated by calculating the center of gravity of standard gesture image</li><li>• The distribution of the farthest point of standard gesture image is used to gesture pre-recognition in order to improve the accuracy of gesture recognition</li><li>• twelve sector regions with a circle which consist twelve central angle of 30 degrees sector and the center of the circle is the centroid is used to gesture recognition</li></ul>		
METHODS		ANALYSIS
To train samples before recognizing and the result of hand gesture recognition is obtained in real time		<ul style="list-style-type: none"><li>• the distribution of area feature of gesture image is used for gesture recognition</li><li>• the distribution of the farthest point of gesture image is used for pre-recognition</li></ul>
FINDINGS		

- no obviously correlation between the recognition rate and the gesture image resolution
- Proven by statistical results when recognizing the same gestures but rotated.
- The recognition rate of PCA gesture recognition by using area feature is the highest compared to contour feature and hausdorff-like distance.
- The average time of gesture recognition is 89ms and it is real-time.
- average recognition rate of the proposed method is 93.95% for the test gestures

FUTURE RECOMMENDATION/GAP	R E M A R K S	PCA method is vision based gestures recognition method.
to improve the algorithm and improve the recognition rate in similar hand gestures		