

手勢寫字中文實虛筆擷取

連俊宇¹ 陳映濃^{2,*} 范國清³

¹國立中央大學資訊工程學系研究生

²國立中央大學資訊工程學系研究員

³國立中央大學資訊工程學系教授



摘要

近年來，由於智慧型手機和3C產品的普及，手寫輸入變得越來越重要。手寫輸入功能使3C產品的操作變得容易。然而，現今的輸入設備大多為接觸式，必須使用觸控筆或者是手指直接寫在輸入裝置上。雖然已有以攝影機來擷取手指的移動軌跡的手寫輸入法，但此系統在使用上仍受限於環境光源。本論文提出一個使用者可以在不穿戴任何體感設備，不需使用接觸式裝置的情況下，直接在空中寫字，並基於Leap Motion感測設備，擷取出輸入中文字的特徵，並區分出實筆與虛筆，在1,000個中文字中，實虛筆判斷的正確率為87.5%。在此系統中，由於Leap Motion的紅外線感測技術，讓系統即使在昏暗的環境中，也可正常使用。系統利用Leap Motion所擷取到的基本資訊，包括每一個frame手指的空間座標，移動速度，以及輸入的時間，進而分析出所輸入的中文字的實筆及虛筆。這些從中所擷取到的實筆和虛筆及基礎資訊，對於中文字的辨識以及簽名認證均有很大的幫助。實驗結果顯示，透過本論文的方法，能正確且有效地擷取出三維手寫中文的文字特徵。

關鍵詞：手寫輸入、Leap Motion、實虛筆、中文字辨識、簽名認證

* 通訊作者：陳映濃

電子郵件：yingnong1218@gmail.com

Feature Extraction of 3D Handwritten Chinese Characters

Chun-Yu Lien¹, Ying-Nong Chen^{2,*}, Kuo-Chin Fan³

¹Master Student, Institute of Computer Science and Information Engineering,
National Central University

²Postdoctoral Fellow, Institute of Computer Science and Information Engineering,
National Central University

³Chair Professor, Institute of Computer Science and Information Engineering,
National Central University

Abstract

Recently, the demand of handwriting input becomes more and more important due to the popularity of smartphones and 3C products. Handwriting input makes 3C products operations becomes easy. However, most of the input devices nowadays are generally not contactless so that user has to write directly on the device with a pen or finger. Although there are some video based air-finger-writing systems using a camera to capture hand/finger trajectory motions while handwriting. However, they are easily affected by illuminations. In this paper, we propose a novel feature extraction method of 3D handwritten Chinese characters based on Leap Motion which can extract the features from air-fingerwriting Chinese characters without carrying or contacting any device. In the proposed system, the moving fingers and hands can be captured clearly even in the dusky environments because Leap Motion uses infrared sensor in capturing moving trajectories. With the trajectories being captured, all embedded features including coordinate, velocity, and total writing time of each input character captured from Leap Motion are applied to extract the real and virtual strokes of the input Chinese character. In the experiments, 1000 Chinese characters were applied to evaluate the proposed real and

* Corresponding Author: Ying-Nong Chen
E-mail: yingnong1218@gmail.com

virtual strokes extraction method, the correction rate is 87.5%. The extracted real strokes, virtual strokes, and embedded features provide significant discriminative information for later 3D signature verification and 3D Chinese character recognition. Experimental results verify the validity and effectiveness of our proposed method in extracting features of 3D handwriting Chinese characters.

Keywords: handwriting, Leap Motion, real and virtual strokes, OCR, signature verification