

# Author's Accepted Manuscript

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PII: S0925-2312(16)30708-1  
DOI: <http://dx.doi.org/10.1016/j.neucom.2016.03.098>  
Reference: NEUCOM17320

To appear in: *Neurocomputing*

Received date: 23 September 2015  
Revised date: 14 March 2016  
Accepted date: 16 March 2016

Cite this article as: Peng Zhao, GuoQin Wu, Yijuan Lu, XianWen Wu and Sheng Yao, A novel hand-drawn sketch descriptor based on the fusion of multiple features, *Neurocomputing*, <http://dx.doi.org/10.1016/j.neucom.2016.03.098>

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## A novel hand-drawn sketch descriptor based on the fusion of multiple features

Peng Zhao<sup>1,2\*</sup>, GuoQin Wu<sup>1,2</sup>, Yijuan Lu<sup>3</sup>, XianWen Wu<sup>1,2</sup>, Sheng Yao<sup>1,2</sup>

<sup>1</sup>Key Laboratory of Intelligent Computing and Signal Processing of Ministry of Education, Anhui University, Hefei 230039, China

<sup>2</sup>Co-Innovation Center for Information Supply & Assurance Technology, Anhui University, Hefei 230601, China

<sup>3</sup>Dept. of Computer Science, Texas State University San Marcos, TX, 78666, USA

\*Corresponding author.: Key Laboratory of Intelligent Computing and Signal Processing of Ministry of Education, Anhui University, Hefei 230601, China. Tel.:+8613033082994., zhaopeng\_ad@163.com

### Abstract

Constructing a distinctive and robust sketch descriptor is one of the most challenging problems in sketch based applications. In this paper, a new hand-drawn sketch descriptor is proposed. The proposed descriptor utilizes the statistic information of multiple features and bag-of-features representation to achieve translation and scale invariance and rotation robustness. The proposed descriptor also encodes the information entropy distribution of information point located on the contour, which can describe the intrinsic property of sketch better and is more robust to noises. Experimental results demonstrate the validity and efficiency of the proposed sketch descriptor.

Keywords: sketch descriptor; bag-of-features; information entropy; clustering

### 1. Introduction

With the popularity of touch phone, touch pad, hand-drawn sketch based image retrieval shows promising application potential and attracts a lot of attention in recent years. Users can sketch a rough shape of an object or a scene with a mouse or fingers on touch-enabled device and retrieve images with similar objects or scenes back. Different from full color and black-white images, hand-drawn sketch is a more abstract binary image with simple contour/shape information only. Moreover, hand-drawn sketch contains more noises since most of users are not professional drawers. When they draw sketches on the touch devices, their shaking hands always generate a lot of noises. How to construct a distinctive and robust sketch descriptor is still a challenging problem in the sketch-based image retrieval and other sketch based applications.

Mathias et al. started the first large scale exploration of human sketches, which analyzed the distribution of non-expert sketches of everyday objects. Many shape description methods have been presented in the past decades [2]. In general, sketch descriptors can be classified into four categories: contour-based descriptor [3-6], region-based descriptor [7-9], skeleton-based descriptor [10], and hybrid-based descriptor [11-13]. Yang Cao et al. [4] described a visual word using a triple  $(x, y, \theta)$  of the position  $(x, y)$  of an edge pixel (edgel) and the edgel orientation  $\theta$  at that position. By converting  $\langle \text{image}, \text{edgels} \rangle$  representation to  $\langle \text{document}, \text{words} \rangle$

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