

Fast and Effective Bag-of-Visual-Word Model to Pornographic Images Recognition Using the FREAK Descriptor

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Abstract

Recently, the Bag of Visual Word (BoVW) has gained enormous popularity between researchers to object recognition. Pornographic image recognition with respect to computational complexity, appropriate accuracy, and memory consumption is a major challenge in the applications with time constraints such as the internet pornography filtering. Most of the existing researches based on the Bow, using the very popular SIFT and SURF algorithms to description and match detected keypoints in the image. The main problem of these methods is high computational complexity due to constructing the high dimensional feature vectors. This research proposed a BoVW based model by adopting very fast and simple binary descriptor FREAK to speed-up pornographic recognition process. Meanwhile, the keypoints are detected in the ROI of images which improves the recognition speed due to eliminating many noise keypoints placed in the image background. Finally, in order to find the most representational visual-vocabulary, different vocabularies are generated from size 150 to 500 for BoVW. Compared with the similar works, the experimental results show that the proposed model has gained remarkable improvement in the terms of computational complexity.

Keywords: Bag of Visual-Words (BoVW), Pornographic image recognition, Fast descriptor, ROI selection

1. Introduction

In the modern world, the Internet plays an increasingly important role, not only at the level of infrastructure but also in business, culture and society. However, the spread of pornographic images and videos which are planned to absorb user's attention, unfortunately have great side effects to people's mental and physical health, especially for children and teenagers. Therefore, there is a crucial need for detect and filter pornographic images and videos in the Internet (Wang et al., 2012; Wang et al., 2012; Kherfi et al., 2004).

The content-based illicit image recognition has attracted much attention between researchers in the recent years. These techniques rely on extraction features such as color, skin color, texture, shape, face and the human body gesture. Based on the study in (Zhang et al., 2013) generally the existing methods can be grouped into four categories such as: (1) Body structure (2) Content Based Image retrieval (CIBR) (3) Features of skin color region (4) Bag of Visual Words (BoVW).

In the pornographic image recognition method based on body structure, which early proposed by Fleck and Forsyth (Forsyth and Fleck, 1996; Fleck et al., 1996), the skin color

regions are, firstly, detected in the image. Then, the detected regions are fed to a predefined grouper, which using geometric constraints on human body structure attempts to group a human figure. Thus, the pornographic image can be recognized, if the grouper finds a predefined structure.

The CIBR technique for recognition is using the visual information by retrieving pools of digital images. The process of retrieval is performed by measuring the similarity between the image in the pre-classified database and query image through similarity measure. If the number of the matched illicit images from the database exceeds a predefined threshold, the query image will be recognized as pornographic (Herwindiati et al., 2010; Wang et al., 1998).

In the pornographic image detection based on skin features, firstly the features on skin color regions are extracted. The features can be texture, color, the area of skin region and etc. Then, the pattern classifier is utilized to classify target image as illicit or benign (Zheng et al., 2004).

It is not easy to find the effective features for the explained methods in the literature somehow distinguish the pornographic image from benign one. Recently the BOVW models, which are inspired by the bag-of-words