

## 摘要

信息社会，每天都有数以万计视频借助互联网平台创造、再生、存储和传播。海量视频及其各种副本的迅速增长对视频的版权保护和内容管理提出了严峻考验。不同于传统密码学方法和数字水印，视频指纹技术直接抽取视频内容的有效特征以表征视频的“身份”，是解决网络视频管理和版权保护的一种有效的新手段。

视频指纹技术需要处理海量视频数据。过去的视纹研究倾向于紧凑且易于提取的全局特征。这些全局特征能够鲁棒抵抗模糊、噪声等全局变形，但对内容插入局部变形往往失效。究其原因，在于内容局部改变会引起全局特征随之改变。局部特征能更好地把握局部的细节信息，最大程度上描述视频的不变属性。计算机技术的发展，使得硬件处理速度和能力得以大幅度提升，而局部特征就因其能更好表征细节不变属性的特点，重新受到视频指纹研究者的关注。

本文研究工作基于局部特征的视纹技术展开，工作分为三个方面：

1 针对文字或图标叠加这种视频变形，提出一种基于区域显著一致性分析的指纹局部比对方法。该方法利用插入内容显著区别于原始内容的特点，选择显著性一致的区域作为指纹比对的有效区域；以 DCT 视纹为例，验证了这一方法的有效性。

2 为了选择用于视频指纹的有效局部特征，设计并实现了比较不同局部特征表征视纹性能的比较方案。对三种典型的局部特征（Speed-up Robust Feature(SURF), Efficient and Effective Feature(EFF2), Geometric Blur feature(GB)）进行验证和比较分析，结论是 Speed-up Robust Feature 性能最佳。

3 针对 TRECVID CD 数据，建立了基于局部特征的视频指纹实验平台，能够处理多种变形，实现了大数据量特征索引和快速比对。

**关键词：**视频指纹，显著度，局部特征，索引



## **Research on Key Technologies of Video Fingerprinting and System**

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In information society, thousands of digital videos are produced, stored and broadcasted on the Internet every day. The large amount of videos and copies bring a serious challenge to video copy detection and video content management. Different from the traditional cryptography methods and digital watermarking, video fingerprinting technology extracts the effective feature from the video content to represent the identification of the video. It is a new way to solve the web video management and copy detection effectively.

There are always a vast amount of videos to handle in the video fingerprinting technology. Past researches are more concentrated on the global feature which is compact and easy to extract. The global feature can handle global distortions like blur, noise and etc very well. However, if the video suffers a partial distortion, it always fails. The reason relies on that as the content is changed partially, the global feature is changed too. Meanwhile, the partial feature can catch the partial information with more details and represent its stable quality. The development of computer hardware results in a faster processing speed and more powerful capability. And the partial feature, which represents the stable quality with details, is receiving more and more attention in the video fingerprinting technology.

This thesis focuses on the fingerprinting technology based on the partial feature, mainly including 3 parts as follows:

- 1 Considering the video distortion of text/logo insertion, we propose a video fingerprinting method named “a partial comparison method for video fingerprinting based on analysis of regions’ saliency consistence”. The method relies on the fact that the inserted contents are always different from the original video evidently. Regions,

which are saliency consistent, are first selected as valid regions for fingerprinting evaluation. We take the DCT fingerprints as an example, to check the efficiency of the proposed partial comparison method.

2 To select the effective partial features applied to video fingerprinting, we design and build a comparison scheme which can evaluate the performance of different partial feature for video fingerprinting. Also we test 3 typical partial features (Speed-up Robust Feature (SURF), Efficient and Effective Feature (EFF2), and Geometric Blur Feature (GB)). The experiment shows that SURF is the best.

3 Against the TRECVID Copy Detection database, we build an effective and efficient system based on partial features for video fingerprinting. The system can handle various distortions and do speed-up matching on large amount of data.

**Key words:** video fingerprinting, saliency, partial feature, indexing