

**论文题目：**基于内容图像检索的若干技术研究

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### **论文摘要：**

多媒体数据检索在上个世纪 90 年代成为国内外的一个研究热点。基于内容的图像检索技术是多媒体搜索引擎的一项重要技术，就目前的应用和研究来看，基本上有两种查询方式——基于文本的查询和基于样例的查询（query by example）。基于文本的查询只使用文本信息（即关键字）来进行检索。该方法具有两个缺点：不同的人对于相同的内容的解释存在差异；人工标注的大量劳动使得标注速度不可能与数字媒体的产生速度相匹配，因此难以实现互联网上的多媒体检索。而第二种查询方式不需要用户对检索的内容进行描述，直接把图像本身作为检索条件提交给系统，系统根据用户提交的查询样例提取特征，并与已知的数据进行比较，然后返回给用户查询结果。但其主要问题是：产生了低级图像特征与图像高级语义（即人对图像的理解）之间的差别，通常称之为——Semantic Gap。

本论文对基于内容的图像检索的若干技术问题进行了研究。首先，我们发现作为纹理特征的 SAR（Simultaneous Autoregressive）模型参数的常用估计方法的最小二乘法（LSE —— Least Square Error）并不稳定，本文在对其不稳定性进行分析和论证后，引入了正则化手段来解决这一问题，纹理分类和分析实验证明：正则化方法确实能够在不增加计算复杂度的前提下有效地提高算法的稳定性。然后，本文对基于感兴趣区域的图像检索技术进行了研究，提出了一种基于图像块特征空间约束的图像区域表达方式，进而在此基础上设计了一种图像区域的匹配算法，并通过实验验证了该方法的有效性。另外，本文对基于内容的图像检索的检索方式进行了探索，提出了一种新型的查询方式——基于概念的图像查询，并在此基础上提出了能够提供基于概念查询功能的图像检索系统的系统框架。概念的形成主要依靠机器学习方法通过一些标注的样本得到，也可以通过先验知识来形成规则式的判断。概念形成以后，在与用户的不断交互中可以通过相关反馈技术来提高系统对概念的检测准确率。最后，我们介绍了自动视频分析和索引工具包 AVAIL。

**关键词：**基于内容的图像检索； SAR； 图像区域检索

### **English Abstract:**

In 1990's, multimedia data retrieval became a hot research topic. And content-based image retrieval (CBIR) is a key technology of multimedia search engine. Currently, there are two main query modes in common use. One is query by text (QBT), the other is query by example (QBE). Query by text depends on manual labeled image. It has two distinct shortcomings: different people has different perception on the same image content, and manual labeling leads to that it is impossible to work with the large amount image data in the Internet. Query by example uses the image itself instead of any description of the image as the query condition. The retrieval system extracts the query example's features, and searches in system data sets. The main problem of QBE is that it leads to "Semantic Gap". The Semantic Gap is defined as the lack of coincidence between the information that one can extract from the visual data and the interpretation that the same data have for a user in a given situation. It is the key obstacle of CBIR.

In the dissertation, we study on some technologies of CBIR. First, we notice that the Least Square Error method, which is used for estimating Simultaneous Autoregressive (SAR) modal's parameters, is unstable in practical applications. The regularization technique is used to overcome this problem in the dissertation. We have done some experiments on texture classification and analysis. The experimental results demonstrate that our methods do increase the stability and not increase the computing cost. Second, we study on the image retrieval based on region of interest. A region characterization based on image blocks' spatial interactions is proposed. And we also design an image region retrieval algorithm. Experimental results show that our method is effective. Third, we present a new query mode—query by concept. Concepts can be built by machine learning method through some labeled samples. And concepts also can be built by using some prior knowledge. And system can increase the detection precision by interactions with system user. Finally, we present an automatic video analysis and indexing toolkit—AVAIL.

**Keywords: Content-Based Image Retrieval, SAR, Image Region Retrieval**