

美術影像中顏色風格探勘之研究

摘要

資料探勘技術的研究，隨著資料庫系統的普遍建置而日益重要。但是尚沒有研究針對美術繪畫影像的風格探勘。本研究的目的也就是發展資料探勘的技術，從繪畫的低階影像特徵中探勘出繪畫風格，並以分類規則的方式來表示繪畫風格。畫家的畫風是指表現在大部分畫作裡的繪畫風格，也是與其他畫家相比，在畫作的共同特徵上之獨特性與差異性。基於以上的兩個特性，我們把畫風探勘分為三個議題：一、feature extraction，從美術影像中萃取低階影像特徵，我們使用的有主要顏色與相鄰顏色。為了因應 MPEG-7 標準即將統一描述多媒體資料的內容表示方式，所以我們也針對 MPEG-7 規格的低階影像特徵。二、mining frequent patterns，從所有該畫家畫作的低階影像特徵找出共同的個人畫作特徵，我們利用 association rule 中 mining frequent itemset 的方法找出畫風中顏色的搭配，而且我們也發展了一個新的規則，frequent 2D sequential pattern，用來表示畫風中顏色的佈局。三、classification，找出每個畫家與別人不一樣的個人畫作特徵，就是定量描述的繪畫影像風格。我們分別利用 C4.5 與修改過的 associative classification。我們提出了二個改進 associative classification 的分類演算法，single-feature variant support (SFVS) classification，容許各個 class 進行不同 minimum support 的 mining 以及與 multi-feature variant support (MFVS) classification，同時用不同低階影像特徵進行分類。有關實驗的進行，我們有兩組測試畫家，一組是西方印象派畫家，另一組則是受西方印象派影響的臺灣本土畫家。每組畫家都進行兩人配對，分別建出 2-way 的 associative classifier、SFVS classifier 與 MFVS classifier，並評估畫風探勘演算法的效果。最後，本論文實作了一個「影像風格查詢系統」。查詢系統的基本功能提供使用者以風格查詢藝術影像的功能。例如，使用者可以查詢具有梵谷畫風的畫作或是查詢融合雷諾瓦與莫內畫風的畫作。

Mining Painting Color Style from Fine Arts

Abstract

The data mining researches become more and more important. However, no studies have investigated on painting style mining of fine arts images. The purpose of this paper is to develop a new approach for mining painting style from low level image features of fine art images and represent painting style as the classification rules. The painting style of an artist is characterized not only by the frequent pattern appears in most works but also by the discrimination patterns from others. According to these two characteristics, we identified three design issues for painting style mining: *feature extraction*, *mining frequent patterns* and *classification*. *Feature extraction* extracts low level image features from fine arts images. In this thesis, we extract dominant color and adjacency color relationship as low level image features. Besides, we also extract MPEG-7 descriptors. *Mining frequent patterns* finds the frequent patterns appear in all works by one artist. We apply the technique of frequent itemset mining in association rule mining to find which colors are likely be used together in artist's painting style. Moreover, we proposed a new pattern, frequent 2D subsequence, to represent painting style in terms of color layout. *Classification* finds the artist's discriminating patterns from others and presents those patterns as painting style in quantitative manner. We utilize C4.5 and modified associative classification as classification methods. We developed two association classification algorithm, single-feature variant support (SFVS) classification and multi-feature variant support (MFVS) classification. The

experiment is conducted by two groups of painting work. One is the work of impressionism artists and the other is the work of Taiwan artists that were influenced by impressionism. The 2-way associative classifier, SFVS classifier and MFVS classifier are constructed for each group of painting work and evaluate the performance. Finally, we implemented a “Painting Style Query System” which provides users to query fine arts images by painting style. For example, user can query those images that matches VanGogh’s style or query those images that matches integration style with Renoir and Monet.