

# 數位影像檢索與層次式媒體保護

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## 摘要

隨著多媒體、通訊、以及消費性電子技術的進展，幾乎每個人每天都可製作出大量的數位內容。在本論文裡，我們對數位內容管理領域中兩個相當有挑戰性的主題進行研究。其一是基於影像內容的檢索方法，另一個則是層次式內容保護方式。

基於內容的影像檢索方法長久以來就被視為一個困難的課題。在這個問題的處理過程中，關鍵之一為如何利用使用者提供的檢索影像，猜測使用者於此次搜尋的意向為何。我們提出的第一個處理概念是關於如何從使用者提供的多張照片中，歸納出此次搜尋時，各低階影像特徵的重要程度。第二個處理概念則是處理使用者提供的負面影像，使其成為修正檢索結果用的刪除條件。第三個處理方法用於使用者提供的檢索影像數量太少時，我們從有限的影像產生與原始影像特徵相容的『虛擬影像』。這個過程主要是利用影像特徵的穩定度代表使用者的意向。將前述三者整合於同一架構下後，即為我們提出的低階影像特徵檢索方法。在這個部份的最後，我們進行多項實驗，並以客觀數據檢視我們的方法，以驗證其效能。

論文的第二個主題為內容保護。在今日的傳輸與遞送系統中，智慧財產的保護已成為重要的考量。傳統上，多媒體智慧財產保護技術可分為密碼方法與浮水印兩大類。在本論文中，我們結合密碼方法與強韌浮水印方法，並將其應用於層次

式多媒體編碼架構中，使系統能提供多層次保護機制。此外，我們並對提出的方法以實例驗證其可行性。因為結合了密碼與浮水印兩項技術，層次式多媒體內容的版權也將以多等級服務的型式展現出來。論文中實驗用的兩個應用方法，皆是假設多媒體是經由廣播傳送，並依此模擬並驗證我們提出的架構。當傳輸錯誤對取出強韌浮水印的影響低於某個程度時，我們可以順利從中取得解密下一層次資料的金鑰。應用此一特性，多媒體內容不僅可依層次重建，且在此同時可以限制重建的合法性以保護版權。



# Digital Image Retrieval and Scalable Media Protection

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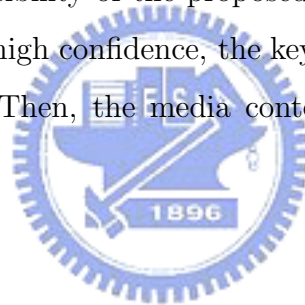


With the advances in multimedia, communication, and consumer electronics technologies, a vast amount of digital contents are produced by almost everyone every day. In this study, we investigate two challenging topics in the digital content management area. The first one is the content-based image search, and the second is the layered content protection.

The content-based image search has long been considered a difficult task. Making correct conjectures on the user intention (perception) based on the query images is a critical step in the content-based search. One key concept of our proposed algorithm is how we find the user preferred low-level image characteristics from the multiple positive samples provided by the user. The second key concept is how we use negative images as a pruning criterion. The third key concept is how we generate a set of consistent “pseudo images” when the user-provided samples are insufficient. The notion of image feature stability is thus introduced. In realizing the preceding concepts, an image search scheme is developed using the weighted

low-level image features. At the end, quantitative simulation results are used to show the effectiveness of these concepts.

The second topic in this thesis is content protection. Intellectual Property (IP) protection is a critical element in multimedia transmission and delivery systems. Conventional IP protection on multimedia data can be categorized into encryption and watermarking. In this study, by combining encryption and robust watermarking, a structure that performs layered access control on scalable media is proposed, implemented, and verified. Taking the advantages of both encryption and watermarking, we can securely protect copyrights of multimedia contents and provide multiple-grade services at the same time. In the summated examples, we simulate two scalable transmission schemes over a broadcasting environment and use them to test the effectiveness and feasibility of the proposed method. When the embedded watermark is extracted with high confidence, the key to used decrypt the next layer can be perfectly recovered. Then, the media contents are reconstructed and the copyrights are assured.



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— *in memory of my father's love* —

