A10-002

作品名稱

次世代之多媒體系統設計、演算法與應用
System Design, Algorithm and Application of Next Generation Multimedia

隊伍名稱

法網揮揮 Play Play Tennis

隊長

賴瑞欣 台灣大學電子工程學研究所

隊員

陳潔立 台灣大學電子工程學研究所

高介其．吳柏辰 台灣大學電機工程學系

作品摘要

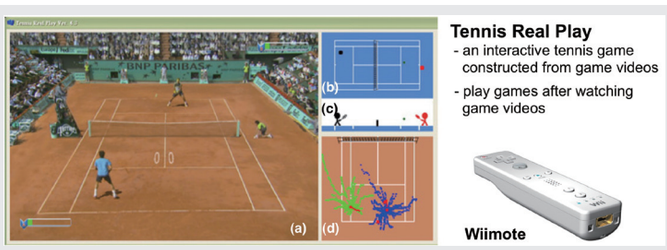
在電視畫質不斷提升的當下，消費者所需要的不再只是單純的單向接收視覺資訊，更重要的是能夠身歷其境的參與其中。現今的傳輸架構，觀賞者所看到的內容皆為一張張由廣播公司傳播過來的畫面，這種方式嚴重限制了多媒體內容的互動性。我們提出了嶄新的多媒體播放系統，在影片中的畫面其前景和背景物體的資訊是被分開傳送的，之後在接收端再根據其需求將這些內容重組，達到客製化的效果。

影片中的前景背景分層傳輸，第一個好處是可以大幅降低所需的傳輸頻寬，而且具有頻寬的可調適性。第二個好處則可以為觀賞者帶來更多的互動，讓多媒體內容產生更大的娛樂效果。

我們並將展示三個基於利用影像分層傳送的實際應用，分別為Tennis Real Play (TRP)、Tennis Video 2.0 (TV2.0)和3D Visual Effect。為了能夠達到即時互動的特性，我們以運動賽事中的網球比賽作為例子，透過演算法的開發及對影片內容的分析處理，影片中的前景物體與背景畫面成功的分離，並且萃取影片內容資訊。之後在用戶端，依據使用者的喜好即時合成畫面，來完成互動式多媒體系統。

如圖1所示，在TRP系統中，我們利用Wii遊戲手把，可讓使用者在觀賞完一場網球比賽之後，立即親自體驗成為網球選手的感覺，大大增添了觀賞網球賽事的互動性。如圖2所示，TV2.0系統將可用頻寬分為四個等級，在網路順暢時可以觀賞到整場比賽的所有轉播，而在網路出現問題導致頻寬不足時，也仍能接收到比賽中球員位置和擊球路徑等重要資訊。此外，擁有前景物體與背景畫面的資訊之後，可以輕易的估算出立體視覺中的景深圖。藉由估算出來的景深圖，使用者可立即欣賞具有立體視覺的網球賽事。

要實現影片內容分層傳輸的概念， 在服務提供者的發送端(例如電視轉播台)，先對影像的內容做處理、分析，最後再將處理好的資訊傳遞至用戶者端，進行影像合成的動作。然而，當今的電視機只具有播放影片的功能，並不具有即時生成影像的能力。因此我們設計了一個影像生成的處理晶片，該晶片具有即時生成影像的能力，讓影片內容與使用者作更深入的互動，此外，該晶片能相容在目前電視機的播放系統內。只要在一般的電視播放系統的流程中加入該晶片，就可以達成互動式多媒體的願景。



圖一 Fig.1
Tennis Real Play讓觀賞者操控影片中的球員作互動
Tennis Real Play is an interactive game constructed from game videos. Users can play the games after watching game videos.

指導教授

簡韶逸　台灣大學電子工程學研究所

- 1999年畢業於臺大電機系，之後於臺大電機研究所ICS組直攻博士，並於2003年得到博士學位。
- 畢業後，簡教授前往廣達電腦研究中心進行研究工作，並帶領同仁完成數項影像處理及電腦繪圖技術之研究。由於簡教授對於學術研究的濃厚興趣，故於2004年7月返回臺大電子所擔任助理教授，並於2008年升為副教授迄今。
- 研究領域：多媒體演算法及晶片系統設計，包含影像處理、智慧型視訊處理、電腦繪圖晶片皆為研究的方向。

Abstract

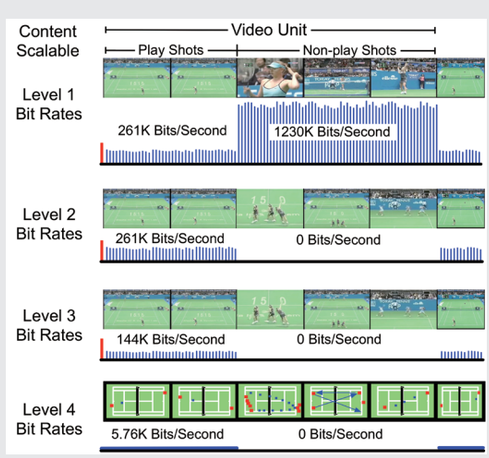
Nowadays, what consumers want are not only perceives multimedia contents but also has the participation and interaction with them. Under the current transmission structure, what consumers see are the frames broadcasted by the provider. The interactivity of multimedia contents is strictly constrained by this transmission framework. To improve this situation, we propose a brand-new system design, algorithm and application of next generation multimedia. In the multimedia contents, the information of the foreground and background objects is transmitted separately. Depending on the desire of consumers, the customized multimedia contents can be rendered by using the separated information at the user-end.

There are two main advantages in the proposed structure of transmitting the layer-separated video contents. First, the needed transmission bandwidth can be dramatically decreased. Second, the system can bring more fun to users through the interaction with multimedia contents.

In the following, we are going to present three different applications based on transmitting layer-separated video contents, which are Tennis Real Play (TRP), Tennis Video 2.0 (TV2.0) and 3D Visual Effect. To show real-time interactivity, we take Tennis Video 2.0 as an example. The well functioned interactive tennis system can be rendered immediately by the algorithms and methods of content analysis.

As shown in Figure 1, in the TRP system, user can control the player whom they like and feel the excitement of the game right after they watched it. In this way, the interactivity of watching a tennis game is greatly increased. As shown in Figure 2, there are 4 different video quality levels in the TV2.0 system. According to the available bandwidth on the instant, the system will provide different information about the game. Furthermore, the disparity map in 3D rendering can be generated by foreground objects and background scene in the game videos for the rendering of vivid 3D visual effect of the tennis game video.

In order to accomplish the concept of transmitting layer-separated video contents, the television or monitor needs to have the ability of real-time rendering. First, the proposed system analyzes the video contents at the supplier-end (like the broadcasting server), and then transmits the processed information to the user-client. However, the current television only decodes the video bit stream and displays the video. To render the customized video contents, another processing engine is needed. Thus, we propose a video rendering engine, which can immediately render the video contents according to the users' requests. Moreover, the proposed rendering engine can be integrated in the current television system. That is to say, the interactive multimedia system can be accomplished by the proposed video rendering engine.



圖二 Fig.2
Tennis Video 2.0提供影片分層傳送的技術，如此大幅降低傳送頻寬並維持良好的觀賞畫質。
Tennis Video 2.0 provides the methods to transmit the video contents individually, which can reduce the transmission bandwidth and maintain the high video quality.