以圖場編碼為基礎在 H.264 上之錯誤抵抗與錯誤修補技術

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摘要

在本文中，我們針對 H.264 視訊編碼，以圖場編碼為基礎提出了新的錯誤抵抗與錯誤修補的技術。H.264 是 ITU-T 所制訂的視訊編碼技術標準，它具有高編碼效率的特性，其編碼後之視訊串流亦符合現有網路傳輸協定的資料格式。為了使 H.264 編碼之視訊串流可以適用於無線網路傳輸，在無線網路通道傳輸的頻寬變動、封包遺失兩個主要的問題必須解決。關於頻寬變動的問題，可利用目前既有的可調適性編碼技術來改善; 而針對封包遺失的問題，我們先分析了可調適性 H.264 編碼技術中影響抗錯性的參數，如封包長短，量化參數，再以此為基礎，進一步改善其的抗錯能力。我們發現圖場編碼能有效地增進視訊的抗錯能力；這是因為圖場編碼方式具有將影像中位元交錯編碼的特性，可使錯誤以位元為單位加以分散開來。而相較於 H.264 以巨方塊為單位的形式，圖場編碼更能達到分散效果，且解碼端的後處理也更加容易。基於 H.264 原有的圖場編碼架構，我們進一步歸納出其他三種圖場編碼架構，為了提升其編碼效率，我們採用了其中編碼效率最高的架構；我們並將圖場編碼架構擴充到可調適性 H.264 的加強層中。另外，針對圖場編碼的架構，我們進一步提出了有效率的適應性錯誤修補方法，使視訊在低頻寬且具即時性傳輸環境中仍能具備不錯的抗錯能力。我們所提出的技術可適用於架構在 H.264 上任何種類的可調適性編碼架構，如 RFGS；而在論文的最後一部分中，我們討論在架構了 RFGS 的 H.264 編碼技術中，這種圖場編碼方式可以如何有效地提升其編碼效能。

Field-based Error Resilience and Error Concealment Techniques over H.264

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ABSTRACT

Is this thesis, we propose new error resilience and error concealment techniques based on field coding structure on H.264. H.264 is ITU-T's new video coding standard. It has high coding efficiency and possesses a network adaptation layer (NAL) to adapt bit strings to networks in a network friendly way. In order to make H.264 suitable for wireless networks, two main problems of wireless networks, bandwidth variation and packet losses, should be solved. To improve the performance of video transmission in a bandwidth varying channel, scalable video coding could be an appropriate solution. In this thesis, some crucial parameters in scalable H.264, like quantization parameter and packet length, are discussed. These parameters may influence the performance of error resilience. Based on the scalable H.264 scheme, we find that field coding could enhance the performance of error resilience capability in a very efficient way. Field coding codes video data in an interlaced order and makes data loss distributed in a scattered manner. With this arrangement, the error concealment process becomes much easier and efficient. Based on the default field coding structure in H.264, we further propose three more types of field coding structures. Among these four structures, we choose the most efficient one for base layer coding, with the consideration of coding efficiency. We also expand this field coding structures into the enhancement layer and propose a few efficient adaptive concealment methods to improve the quality of received videos. All these proposed error resilience and error concealment techniques could be applied to any kind of scalable H.264 scheme, like Robust Fine Granularity Scalability (RFGS). At the last part of this thesis, we discuss how these proposed methods improve the performance of H.264+RFGS.