使用在 **DSL** 之全通道等化器分群法之分析

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中文摘要

　　離散多通道系統(DMT)使用在很多需高速傳輸的系統中。在離散多通道系統中，如果通道長度大於循環前置(CP)長度，則系統不會受到符號內干擾(ISI)的影響。當通道長度過長時，我們通常會使用時域等化器(TEQ)加上一個點的時域等化器(FEQ)來縮短通道長度。

　　最近全通道等化器被嘗試來應用在離散多通道系統中，在硬體複雜度粗略相同下使傳輸率變高，但在初始設定及記憶體使用量上依然偏高。所以在這篇論文中，我們研究分群通道(Tone Grouping)這個分法。在每一群通道中，我們只計算中心通道的最佳等化器的權重值，並使用在同一群中的其它通道中。在適當的選擇每一群的數量下，此方法並不會降低許多傳輸率卻可以使得計算初始設定所需的運算和記憶體減少許多。

　　而從模擬的結果得知，在 CSA 的八種迴路中，分 8~16 個通道為一群，還是能幾乎保持原本的傳輸率。

Analysis of Tone Grouping in Per-tone Equalizer design in DSL system

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Abstract

Discrete multi-tone system (DMT) systems have found many applications in high speed data transmission. It is known that when the length of channel impulse response (CIR) is no longer than that of cyclic prefix (CP), the DMT system is ISI free. For channel with long impulse responses, a time-domain equalizer (TEQ) is typically added at the receiver combined with 1-taps frequency domain equalization to shorten the effective impulse response.

Per tone equalization for DMT-receivers has recently been proposed as an alternative structure for time domain equalization. The result is a larger bit rate while complexity during data transmission is kept at the same level. In this thesis, the influence of grouping tones is studied. For each group, the optimal per-tone equalizer is computed only for the center tone and then reused for the whole group. It does not reduce the capacity significantly while this means a significant complexity saving during modem initialization.

In this thesis, the influence of grouping tones is studied. It is shown that in the all 8 loop of CSA, combining 8~16 tones into one group does not reduce the capacity substantially.