使用多淘汰法則之快速編碼字搜尋演算法

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摘 要

近數十年來向量量化(Vector Quantization, VQ)是一種廣泛應用的技術，例如在視訊、語音及影像上。在影像向量量化壓縮技術的編碼過程中，需要在編碼簿C (codebook)裡搜尋最佳編碼字(close codeword)，而在這搜尋的過程中，使用全域搜尋法(Full Search, FS)搜尋最佳編碼字，隨著編碼字之維度K和編碼簿之大小N越大，所需計算量越大。 本文中所提之演算法為了減少全域搜尋法之所需計算量，做為設計演算法之方針，故本論文採用the Mean-distance ordered Partial codebook Search algorithm (MPS)[1]的方法決定初始編碼字與搜尋序列，並使用快速投影演算法，計算輸入待編碼區塊X的四個投影值與編碼字的四個投影值，以四個投影值建立四個淘汰法則，刪除不可能為最佳編碼字之編碼字，對於通過篩選的編碼字再使用the partial distance elimination (PDE)[2]演算法加快搜尋最佳編碼字之速度，達到減少搜尋時間和執行時間的目的。在實驗結果方面，當編碼字之維度K為16，當編碼簿大小N為128時，整體平均時間為11.69ms，佔全域搜尋法(FS)執行時間為5.89% 。當編碼簿大小N為256時，整體平均時間為17.17ms ，佔FS執行時間為4.34%，當編碼簿大小N為512時，整體平均時間為26.73ms，佔FS執行時間為3.39%，當編碼簿大小N為1024時，整體平均時間為43.35ms，佔FS執行時間為2.27%。當編碼字維度之K為64，編碼簿大小N為128時整體平均時間為10.53ms，可計算百分比為5.48%，當編碼簿大小N為256 時，整體平均時間為16.48ms，佔FS執行時間為4.27%，編碼簿大小N為512時，整體平均時間為26.88ms，佔FS執行時間為3.59%，編碼簿大小N為1024時，整體平均時間為44.08ms，佔FS執行時間為3.25%。由此實驗數據可知本論文所提出之方法在編碼字之維度相同下，都有較好的結果。 本文所提出之演算法使用四個淘汰法則，避免掉多餘歐基里德距離計算，節省向量投影轉換消耗之計算量，只需整數運算，達到降低向量轉換與浮點數運算時間，PDE之部分距離運算方式能提早結束歐基里德之運算，並使用提前停止搜尋檢測法，減少時間，達到快速搜尋之效果。

關鍵詞 : 向量量化、快速搜尋、快速編碼、語音、視訊、影像向量量化

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