使用分享方法的漸進式影像顯現技術

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摘　　要

本論文提出使用分享方法的漸進式影像顯現技術。我們共提出四個主題。首先，在第一主題，我們從一張影像產生出 n 個相同重要性的分存，而收集 r_k 份分存即可無失真地顯現原來的影像。因此在傳輸的過程中，不需要擔心那一份需要先傳，或者那一份分存遺失了；只要收到的分存數目不小於 r_k 份即可。而值得注意的是，當原始影像是一份機密影像時，則在 n 條不同的通道上進行傳輸工作(一份分存使用一個通道)，敵人或不法者即使攔截 r_1- 1 條通道仍無法窺知機密影像的內容 (其中 $r_1 \le r_2 \le \ldots \le r_k$ 是可以預先設置的常數)。在第二個主題中，我們利用分享方法做向量量化影像漸進式的顯現。所顯現的最佳影像品質為向量量化解碼過後的品質。然而由於每份分存僅為向量量化索引檔的 $k / (r_1 + r_2 + \ldots + r_k)$ 倍，因此所提出的方法需要的儲存空間是很小的。在第三個主題中，針對一張二元機密影像的漸進式顯現，我們設計出一種分享技術來產生出 n 張帶有權重的投影片(仍稱為分存)，當疊合至少兩張分存，機密影像的內容可以約略被顯現出來。而所顯現出影像的對比值為 $\frac{\sum_{t_i \in S} w_i - \operatorname{Max}_{t_i \in S} w_i}{p \times q}$。 ($\{w_i\}$為預設的權重，$S \subseteq \{t_1, t_2, \ldots, t_n\}$ 為欲疊合的分存集合， $p \times q$ 表示每張分存為原始二元機密影像的 $p \times q$ 倍。) 因此，本方法隨著疊合分存的增加，能漸進地增加對比值。最後，在第四個主題，本論文提出一種分享方法，可用於多機密影像的漸進式顯現。每一張具有權重的分存皆為二元的雜訊投影片。疊合分存所能看到的影像由相對最高權重的投影片所決定。本方法的特性

有: 1. 解碼不需計算； 2. 還原出多機密影像； 3. 相對最高權重投影片決定所還原的機密影像。因此第四個主題所提出的方法可以漸進式的顯現一系列越來越重要的機密影像。

Progressive viewing of images: a sharing approach

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ABSTRACT

In this dissertation, by using sharing, progressive viewing of images is achieved. There are four topics. In the first topic, each image is divided into n shares of equal importance; and collecting r_k of the n shares can provide a lossless recovery of the image. Therefore, we need not worry about which share is transmitted first or lost as long as the received shares is at least r_k. Notably, when the original image is a secret image, the transmission can use n distinct channels (one share per channel) and the interception of up to $r_1 - 1$ channels by the enemy ($r_1 \le r_2 \le \ldots \le r_k \le n$ are all preset constants) will not reveal the secret. In the second topic, a progressive viewing method for vector-quantized images is proposed. The best quality of the recovery, which occurs when at least r_k shares are received, is just of VQ-quality. However, the approach in Topic 2 only needs storage space much smaller than that needed in Topic 1, because each share here is $k/(r_1 + r_2 + \ldots + r_k)$ times smaller than the index

file, which is a file much smaller than the image. In the third topic, for the progressive viewing of a binary secret image, a VC-style sharing method is designed to generate n weighted transparencies $\{t_1, t_2,\ldots, t_n\}$. When at least two transparencies are stacked, the secret image is revealed to an extent; and the revealed contrast level is $\frac{\sum_{t_i \in S} w_i - \operatorname{Max}_{t_i \in S} w_i}{p \times q}$. (Here, $\{w_i\}$ are the weights, $S \subseteq \{t_1, t_2,\ldots, t_n\}$ is the set of the transparencies being stacked, and $p \times q$ means each transparency is $p \times q$ times larger than the secret image in size.) Therefore, the method progressively increases the contrast via increasing the number of stacked shares. Finally, in the fourth topic, we propose a VC-style sharing method to share multiple secret images simultaneously. Several weighted transparencies are generated, and each is a noisy binary transparency. The revealing of multi-secret images is by stacking some transparencies together. Among the stacked transparencies, the one whose weight is relatively maximal decides which secret image is revealed. The characteristics of the proposed method are (1) decoding without computation; (2) multiple secret image revealing; (3) the transparency of relatively maximal weight will decide which secret image is revealed. Therefore, according to the importance of the images, the method in the fourth topic can be used to reveal progressively a sequence of images.

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