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Our Service Address:

6/1, 1st Floor, Gokulae Street,
Ramnagar, Coimbatore- 641009.

Mobile: 9894604623

Phone: 0422-4377414

Mai : info@brainrichtech.com

Web : www.brainrichtech.com

6/1, 1st Floor, Gokulae Street, Ramnagar, Coimbatore- 641 009.

Phone : 0422- 4377414 Mobile : 9894604623

Mail: info@brainrichtech.com Web: www.brainrichtech.com

DOMAIN : IEEE MULTIMEDIA

Investigating the Scheduling Sensitivity of P2P Video Streaming

Abstract: Peer-to-peer (P2P) technology has recently been employed to deliver large scale video multicast services on the Internet. Considerable efforts have been made by both academia and industry on P2P streaming design. While academia mostly focus on exploring design space to approach the theoretical performance bounds, our recent measurement study on several commercial P2P streaming systems indicates that they are able to deliver good user quality of experience with seemingly simple designs. One intriguing question remains: *how elaborate should a good P2P video streaming design be?* Towards answering this question, we developed and implemented several representative P2P streaming designs, ranging from theoretically proved optimal designs to straightforward “naive” designs. Through an extensive comparison study on PlanetLab, we unveil several key factors contributing to the successes of simple P2P streaming designs, including system resource index, server capacity and chunk scheduling rule, peer download buffering and peering degree. We also identify regions where naive designs are inadequate and more elaborate designs can improve things considerably. Our study not only brings us better understandings and more insights into the operation of existing systems, it also sheds lights on the design of future systems that can achieve a good balance between the performance and the complexity.

JAVA

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Content-Based Image Retrieval Using Multi resolution Color and Texture Features

Abstract: In this project, we propose a content-based image retrieval method based on an efficient combination of multi-resolution color and texture features. As its color features, color auto-correlograms of the hue and saturation component images in HSV color space are used. As its texture features, BDIP and BVLC moments of the value component image are adopted. The color and texture features are extracted in multi-resolution wavelet domain and combined. The dimension of the combined feature vector is determined at a point where the retrieval accuracy becomes saturated. Experimental results show that the proposed method yields higher retrieval accuracy than some conventional methods even though its feature vector dimension is not higher than those of the latter for six test DBs. Especially, it demonstrates more excellent retrieval accuracy for queries and target images of various resolutions. In addition, the proposed method almost always shows performance gain in precision versus recall and in ANMRR over the other methods.

JAVA

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Digital-Invisible-Ink Data Hiding Based on Spread-Spectrum and Quantization Techniques

Abstract: A novel data-hiding methodology, denoted as digital invisible ink (DII), is proposed to implement secure steganography systems. Like the real-world invisible ink, secret messages will be correctly revealed only after the marked works undergo certain prenegotiated manipulations, such as lossy compression and processing. Different from conventional data-hiding schemes where content processing or compression operations are undesirable, distortions caused by prenegotiated manipulations in DII-based schemes are indispensable steps for revealing genuine secrets. The proposed scheme is carried out based on two important data-hiding schemes: spread-spectrum watermarking and frequency-domain quantization watermarking. In some application scenarios, the DII-based steganography system can provide plausible deniability and enhance the secrecy by taking cover with other messages. We show that DII-based schemes are indeed superior to existing plausibly deniable steganography approaches in many aspects. Moreover, potential security holes caused by deniable steganography systems are discussed.

JAVA

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Dynamic Resource Allocation for Robust Distributed Multi-Point Video Conferencing

Abstract: This project proposes a distributed multi-point video conferencing system over packet erasure channels, where the aggregation of multiple video streams and resource allocation are performed in a distributed manner. Video stream combiners, which are located in different geographical areas and serve as portals for conferees, aggregate incoming streams supplied by local users with other streams aggregated from nearby video stream combiners. A packet-division multiple-access (PDMA)-based error protection scheme is proposed to be performed at each video stream combiner to minimize the maximal expected video distortion among aggregated streams. The proposed error protection scheme for multi-stream aggregation also supports user preference. In order to deliver video streams to end users with different preferred quality, a consensus algorithm is proposed to adaptively perform resource allocation based on user preference. Simulation results show that the proposed multi-stream aggregation and error protection scheme has significant gains over traditional multi-stream error protection schemes for a multi-point video conferencing system.

JAVA

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Improving Robustness of Quantization-Based Image Watermarking via Adaptive Receiver

Abstract: In this project, the watermarking channel is modeled as a generalized channel with fading and *nonzero mean* additive noise. In order to improve the watermark robustness against the generalized channel, we present an optimized watermark extraction scheme by using an adaptive receiver for quantization-based watermarking. In the proposed extraction scheme, we adaptively estimate the decision zone of the binary data bits and the quantization step size. A training sequence is embedded into the original image together with the informative watermark. The estimation of the decision zone takes advantage of the response function of the training sequence. Compared to those watermarking schemes without receiver adaptation, the main improvement is the enhanced robustness against median filtering, image intensity Direct Current (DC) change, histogram equalization, color reduction, image intensity linear scaling, image intensity nonlinear scaling such as Gamma correction etc.

JAVA

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Locality-Awareness in BitTorrent-Like P2P Applications

Abstract: This paper presents the measurement study of locality-aware P2P solutions over real-world Internet autonomous systems (AS) topology. By using the accesses of nodes of PlanetLab testbed, we create a detailed AS-level map including the end-to-end path of all nodes, as well as the relationship of all involved ASes. Based on this map, we evaluate the performance of a set of locality-aware P2P solutions, including an optimal solution guaranteeing the minimum AS hop count, as well as modified BitTorrent system with locality-awareness built into its neighbor selection, peer choking/unchoking, and piece selection processes. Our findings suggest that locality-awareness can help existing P2P solution to significantly decrease load on Internet, and achieve shorter downloading time. By comparing the performance of different kinds of locality-aware and traditional BitTorrent systems, we also point out the necessity to tradeoff between the goals of optimizing AS-related performance and achieving fairness among peers such as intra-AS traffic and peer burden fairness.

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Watermarking Method Based on Significant Difference of Wavelet Coefficient Quantization

Abstract: This project proposes a blind watermarking algorithm based on the significant difference of wavelet coefficient quantization for copyright protection. Every seven non-overlap wavelet coefficients of the host image are grouped into a block. The largest two coefficients in a block are called significant coefficients in this paper and their difference is called significant difference. We quantized the local maximum wavelet coefficient in a block by comparing the significant difference value in a block with the average significant difference value in all blocks. The maximum wavelet coefficients are so quantized that their significant difference between watermark bit 0 and watermark bit 1 exhibits a large energy difference which can be used for watermark extraction. During the extraction, an adaptive threshold value is designed to extract the watermark from the watermarked image under different attacks. We compare the adaptive threshold value to the significant difference which was quantized in a block to determine the watermark bit. The experimental results show that the proposed method is quite effective against JPEG compression, low-pass filtering, and Gaussian noise; the PSNR value of a watermarked image is greater than 40 dB.

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Analyzing Voice Quality in Popular VoIP Applications

Abstract: Voice over IP (VoIP), which provides real-time speech communication between two users in a way that closely resembles a face-to-face conversation, has had a significant impact on the multibillion-dollar telecommunication industry. The promise of less expensive phone calls with comparable quality and better features than public switched telephone networks (PSTNs) has accelerated VoIP's adoption, both in businesses and homes. Its better integration with various forms of collaborative communications, such as instant messaging, email, and voicemail, has made it suitable for future communication solutions, but there remain several issues that are unique to VoIP systems and require further analysis.

One issue is that a VoIP node can reside on any one of several types of hardware interfaces, such as a laptop, PDA, smartphone, or dedicated handset. Another issue is that when a conversation is conducted over the Internet, speech segments can experience delays, jitters, and losses. The quality of a conversation depends on two factors that are directly or indirectly perceived by users: the quality and the latency of the one-way speech segments received. In contrast to face-to-face conversations, the delays incurred in the reception of VoIP speech segments can lead to asymmetry in silence durations in between turns and cause inefficiency in communication. In these cases, each user will experience speech segments that are separated by silence periods of alternating long and short durations. This asymmetry might lead to a perception that the other user is responding slowly to the conversation.

JAVA

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Fragile Watermarking With Error-Free Restoration Capability

Abstract: This paper proposes a novel fragile watermarking scheme capable of perfectly recovering the original image from its tampered version. In the scheme, a tailor-made watermark consisting of reference-bits and check-bits is embedded into the host image using a lossless data hiding method. On the receiver side, by comparing the extracted and calculated check-bits, one can identify the tampered image-blocks. Then, the reliable reference-bits extracted from other blocks are used to exactly reconstruct the original image. Although content replacement may destroy a portion of the embedded watermark data, as long as the tampered area is not too extensive, the original image information can be restored without any error.

JAVA

Image Retrieval With Relevance Feedback Based on Graph-Theoretic Region Correspondence Estimation

Abstract: This paper presents a graph-theoretic approach for interactive region-based image retrieval. When dealing with image matching problems, we use graphs to represent images, transform the region correspondence estimation problem into an inexact graph matching problem, and propose an optimization technique to derive the solution. We then define the image distance in terms of the estimated region correspondence. In the relevance feedback steps, with the estimated region correspondence, we propose to use a maximum likelihood method to re-estimate the ideal query and the image distance measurement. Experimental results show that the proposed graph-theoretic image matching criterion outperforms the other methods incorporating no spatially adjacent relationship within images. Furthermore, our maximum likelihood method combined with the estimated region correspondence improves the retrieval performance in feedback steps.

JAVA

Robust Audio Data Hiding Using Correlated Quantization With Histogram-Based Detector

Abstract: In this paper, two blind audio watermarking methods using correlated quantization for data embedding with histogram-based detector have been proposed. First, a novel mapping called the point-to-point graph (PPG) is introduced. In this mapping, the value of samples is important as well as the correlation among them. As this mapping increases the dimension of the signal, the data embedding procedure (quantization) will be diversified more securely than that of the 1-D domains such as the time or frequency domains. Hence, two watermarking techniques coined as hard and soft quantization methods based on the quantization of the PPG point radii are suggested. The performance of both techniques is analyzed by obtaining the radii distribution of PPG points after watermarking. Experimental results against AWGN attack confirm the validity of theoretical analysis. Moreover, the robustness of the proposed methods against other common attacks such as echo, low pass, resampling, and MP3 are investigated through extensive simulations.

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Collision Attacks With Budget Constraints on Key Management Schemes for Secure Multimedia Multicast

Abstract: We address the problem of distributing a confidentially shared session key to a multimedia multicast group for content protection. In two such schemes proposed by Trappe , the session key is distributed by employing a homogenized rekey message format. We show that their rekey algorithm in itself is vulnerable to specialized collision attacks, in which even a completely passive outer adversary, who never joins the system and thus never knows any secret user keys, can still reveal the session key of the multimedia multicast with an observable probability but only involving a time complexity far lower than an exhaustive search.