

Data hiding for secure and high-quality speech and audio communications

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Along with the rapid spread of the internet, personal computers and mobile phones, communications via the Internet are now widely and commonly used for daily life. For speech communications, VoIP (voice over IP) is now very widely used worldwide. Moreover, for audio world, it is now common to download music via the Internet. This naturally results in strong and increasing demand to realize secureness and high-quality with the internet communications. In this keynote, our recent research results relating to data hiding, in a broad sense, to realize secure and high-quality speech and audio communications are introduced.

Digital watermarking to protect copyrights is the most promising application of data hiding. Here, audio watermarking methods based on time-spread echo hiding and phase-rotation are introduced. These methods provide good inaudibility and high detection rate.

In IP-based audio transmission, packet loss is inevitable. For on-demand audio transmission, retransmission and stream buffering are effective but not for multicast-based application. Therefore, a new packet loss concealment method on the multiple description, where one audio stream is split into two independent audio streams based on spectrum stripe coding for MP3 coded audio signal.

In voice communications over the Internet, prevention of interception is becoming a crucial concern. Secret sharing seems effective to solve this problem. By sharing the original data into shared data sets to transmit through different paths, it becomes impossible actually for a malicious person to decipher the conversation unless they can access all the relevant data synchronously by wiretapping of all the paths. Our attempts for standardized codings such as CELP and ADPCM are introduced.

Data hiding is useful to add new and extended features to the host signal by using the data hidden behind the host. A new low-bit substitution method for G.711 speech code is introduced. A novel idea of the proposed method is to employ a low-bitrate encoder as a reference to decide how many bits can be embedded. With this method, 10-kbit/s embedding with only a little subjective degradation of speech quality is achieved.

These results clearly show that data-hiding technologies are promising and effective to realize secure and highly value-added communications.

Short CV of Lecturer, Prof. Dr. SUZUKI Yôiti

Educational Background:

1981 Dr. Engineering (Tohoku University) for Electrical and Communication Engineering

Main Professional Experience:

2008- Director, Information Synergy Organization, Tohoku University
2007- Deputy Director, Research Institute of Electrical Communication, Tohoku University
1999- Professor, Research Institute of Electrical Communication and Graduate School of Information Sciences, Tohoku University

Main Prizes/Awards

Funai Best Paper Award, FIT2005, 2005

The Sato Prize, the best paper award of the Acoustical Society of Japan, 1994 & 1992

Main Academic Activities

2009- Member, Telecommunication Council, Ministry of Internal Affairs and Communications
2007- Chairperson, Publication Committee. Acoustical Society of Japan
2006- Member, Council Board, Virtual Reality Society of Japan
2005-2007 President, the Acoustical Society of Japan

