Mobile Videotelephony

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Summary: Mobile Videotelephony is the mobile visual communication with video sequences and speech transmitted over the telecommunication network. Mobile Videotelephony can also be telecommunication including of video sequences, speech and text. This telecommunication offers the possibility to select the means of communication, which suits the individual best in various situations. A video telephone comprises a video camera pointing at the user and a video screen transmitting pictures taken by the other user's camera. Video sequences, speech and text are instantly transmitted. A video telephone can be a terminal or dedicated equipment, which is developed for just this type of communication. A video telephone can be a computer, which functions as a video telephone through additional hardware and software. A video telephone can be the equipment to which one connects a camera and an ordinary television receiver and screen. Video telephones transmit video sequences and speech and, in certain cases, also text. Mobile Videotelephony with the new technologies, as the cordless telecommunication network Fixed Wireless Access and Universal Mobile Telecommunications System, also called the third generation network, may be used for videotelephony. This new mobile network will make it possible to use mobile video telephones. The third generation network will have a capacity, which can transmit data, speech and video sequences between either mobile or stationary installations.

Mobile telecommunication systems have been making a remarkable evolution in recent years all over the world. The International Mobile Telecommunication 2000 with the worldwide cellular phone system carries about higher data bandwidth, so that a video sequence will be able to be transferred on the wireless telecommunication in addition to speech and text. Utilizing the new environments, new telecommunication services, such as mobile videotelephony, are expected to come into being. The MPEG-4 visual standard is the most expected video coding method for mobile communication, because it has higher coding efficiency and higher error resilience than the conventional video coding methods such as MPEG-1 or MPEG-2. Thus, MPEG-4 is the key technology for the next generation mobile multimedia. Mobile communications might be the advance development with the number of mobile phones in some countries exceeding the number of fixed phones and mobile operators having much greater market value than fixed operators. At the same time, many new technologies are about to be introduced including third generation mobile. Mobile

Videotelephony is technically realistic in the context of the existing second and the forth coming third generation mobile systems.

Mobile Videotelephony data compression based on the wavelet algorithm with four levels of unequal error protection (UEP) codes over wide-band code division multiple access (W-CDMA), additive white Gaussian noise (AWGN) and Rayleigh fading channels are analysed. The utilization of Wavelets has come out to be a powerful method for compress video sequences, speech and text data. The wavelet transform compression technique has shown to be more appropriate to high quality video sequences, speech and text data applications, producing better quality output for the compressed frames of video sequences, speech and text data. Wavelet decomposition is applied to video frames, speech and text data and the coefficients at each level are predicted from the coarser level through backward motion compensation. To remove the aliasing effects caused by downsampling in the transform, a special interpolation filter is designed with the weighted aliasing energy as part of the optimization goal, and motion compensation is carried out with low pass filtering and interpolation in the estimation loop. The proposed algorithms of the 2-D wavelet packet transform (2-D WPT) and the embedded zero-tree wavelet (EZW) coder are investigated.

The early success of wavelets in commercial applications was mainly with efficient compression techniques on signals such as voice and video. The wavelet functions are being utilized for harmonic analysis, signal representation, speech and video bandwidth compression, multiresolution signal processing, and signal design in various coding and communication applications. This was due to the logarithmic-scale decomposition in frequency, which fits naturally in many of the sound and video sequence reconstruction studies. Wavelet theory covers quite a large area. It treats both the continuous and discrete time cases. The introduction of the embedded zero-tree concept for wavelet-based video sequences, speech and text data compression has generated a significant improvement in performance compared to previous video sequences, speech and text data coding methods. A refinement of the EZW approach, called set partitioning into hierarchical trees (SPIHT) by Said and Pearlman, is the most well known EZW derivative. While SPIHT enjoys a good rate-distortion performance for video sequences, speech and text data with comparatively low complexity, it is quite fragile against bit errors in noisy communication channels. Direct sequence signal acquisition in W-CDMA environment is estimated. A digital matched filter is presented and investigated for direct sequence spread-spectrum systems.

The coding scheme presents four levels of error protection for different sets of bits in a transmitted symbol using W-CDMA, AWGN and Rayleigh fading channels. The proposed scheme accomplishes unequal error protection by encoding the data according to the significance of the information and switching between four codes.

The scheme uses the different pseudo-noise codes of digital matched filter synchronizer to make up four levels of unequal error protection codes. The unequal error protection with bits of different significance for data transmission is achieved in this scheme. It was shown that four levels of different error protections were easily accomplished with the digital matched filter pseudo-noise code synchronizer systems over AWGN and Rayleigh fading channels by providing the coded detection at the receiver. The scheme provides the capability of multi-level error protection without complexity as compared to regular digital matched filter pseudo-noise code schemes.

Mobile Videotelephony with the bandwidth of 128 Kbps is considered highly useable. Even at 64 Kbps some users can communicate through Sign language. The QCIF video sequences, speech and text data with compression rate of 0.312 bits/pixel are examined. The W-CDMA system obtains a bandwidth of 5MHz and will also be in many indoor achievements. The various sections of a compressed video sequences, speech and text data obtain different importance and error sensitivity. The W-CDMA, AWGN, and Rayleigh fading channels with unequal error protection codes are considered with four levels of significance for operating with data stream of information. The proposed scheme achieves unequal error protection by encoding the data according to the significance of the information and switching between four codes. The coding scheme introduces four levels of error protection for different sets of bits in a transmitted symbol functioning W-CDMA, AWGN, and Rayleigh fading channels. The proposed scheme applies the different pseudo-noise codes of digital matched filter synchronizer to construct four levels of unequal error protection codes. The functioning estimation of four unequal error protection codes with W-CDMA, AWGN, and Rayleigh fading channels are evaluated.

The Embedded Zero-Tree Wavelet Coding with four significant levels of unequal error protection codes are proposed for this digital matched filter pseudo-noise code synchronizer scheme. The first level or the LL3 is the lowest error protection level with no encoding. The second level or the HL3, LH3, HH3 is the lower error protection level with easiest level of digital matched filter pseudo-noise code synchronizer. The third level or the HL2, LH2, HH2 is the higher error protection level with easier level of digital matched filter pseudo-noise code synchronizer. The fourth level or the HL1, LH1, HH1 is the highest error protection level with harder level of digital matched filter pseudo-noise code synchronizer.

The 2-D Wavelet Packet Transform with four different levels of unequal error protection codes are designed for this digital matched filter pseudo-noise code synchronizer scheme. The first level or the average mobile videotelephony data signal is the lowest error protection level with easiest level of digital matched filter pseudo-noise code synchronizer. The second level or the horizontal mobile videotelephony data features is the lower error protection level with easier level of digital matched

filter pseudo-noise code synchronizer. The third level or the vertical mobile videotelephony data features is the higher error protection level with harder level of digital matched filter pseudo-noise code synchronizer. The fourth level or the diagonal mobile videotelephony data features is the highest error protection level with hardest level of digital matched filter pseudo-noise code synchronizer.

The simulation of the outcomes of the four levels of UEP codes with wavelet mobile videotelephony data over W-CDMA, AWGN and Rayleigh fading channels are investigated. The objective video sequences, speech and text data qualities have been evaluated using peak signal to noise ratio. The proposed scheme accomplishes unequal error protection by encoding the mobile videotelephony data according to the significance of the information and switching between four codes. The coding scheme presents four levels of error protection for different sets of bits in a transmitted symbol using W-CDMA, AWGN and Rayleigh fading channels. The scheme uses the different pseudo-noise codes of digital matched filter synchronizer to make up four levels of unequal error protection codes. The scheme also shows design flexibility so that it is easily modified to accommodate different needs for error protection in various data transmission systems. The detailed design procedure and the performance of four unequal error protection codes are presented.