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Design and Implementation of a Wireless Video Transmission System Using Adaptive Channel Coding Techniques

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ABSTRACT: This paper includes application of channel coding techniques that are capable of correcting and detecting the errors in the wireless video transmission system by measuring Signal to Noise Ratio (SNR) and Bit Error Rate (BER) of the AWGN channel which is lossy in nature. The R-S coding has a coding gain about 2.5 dB hence it can correct errors for 2.5 dB decrease in SNR. Further decrease in SNR beyond 2.5 dB, the errors is introduced in the system which cannot be removed from RS coding hence combination of RS coding and convolution coding is used. This combined effect can withstand 7.5 dB decrease in the SNR value. Beyond 7.5 dB decrease, the errors are further controlled by Interleaving techniques which can hold the error free transmission till 8.5 dB decrease in SNR. In this way the errors can be eliminated with help of three channel coding techniques adaptively as per user requirements.

KEYWORDS: RS coding, Interleaving, Convolution coding, Concealment**.**

I. INTRODUCTION

The usage of mobile networks has been increasing day by day and the need for convenient communication has become the most essential aspect in this digital world. The video data explains the information more precisely than any text or audio signal. Video signal or video data plays a vital role in various applications like video conferencing,e-learning, and on-demand video streaming, is getting the attention of most of the users at the present and in the future. The network protocol and video coding techniques point souts the necessity or importance and approaches on Resource allocation [1]. The requirement of making the limited bandwidth more efficient, many coding algorithms are followed to compress the raw video signal. As the compression of video signal is done the risk of losing the information in the transmission medium is also increasing. It is important that the video encoder needs to have less sensitive errors in the video signals transmitted by the user to protect the data. Various error control techniques like error resilient source coding, Forward Error Correction (FEC), power adjustment and network QoS support are used. An effective method to increase source error effect can be achieved by using rate-distortion optimized mode selection and synchronization marker insertion algorithm. However, at the application layer all possible error control values are not considered simultaneously. The channel coding and error concealment is the combined benefit optimization framework. Here the quantizer reduces the compression ratio with macroblocks prediction technique. Due to semi reliable nature of real time video signal which possess the strict delay demands, the Forward Error correction technique is employed [2]. The errors manipulate the transmitted packets present in sub channels during the transmission of video channel.The SNR= Eb/No which increase the channel capacity on the whole different modulation schemes are adaptively used [3].

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II. PROBLEM DEFINITION

The whole information data of the video signal may get damaged due to the presence of a single error in the channel. To overcome this problem, the video coding techniques with the scalability has been proposed for the emergent removal of drawback is done by the Scalable Video Codec (SVC).

III. BLOCK DIAGRAM

The information signal is converted into digital format when it has to be transmitted in the digital communication system. It is important to have the high code rate and accuracy when the symbol gets transmitted from source to the destination point is the overall purpose of the project.The videocommunication systems is divided into small portion called sub systems. The video encoder is used to convert the input video signal into stream of bits with specific codes assigned for each symbol. The figure1 shows the basic block diagram of video communication system.When the video data is compressed further the video data is fed into a block called packetization. Here, the H.246 will transfer the signal in the transport layer and divide the signal of each 188 bytes long.The RS coding used in the project is the (204,188) where the input (n) to the encoder is the 188 Byte of data and the output (k) of the encoder is 204 Bytes of data.

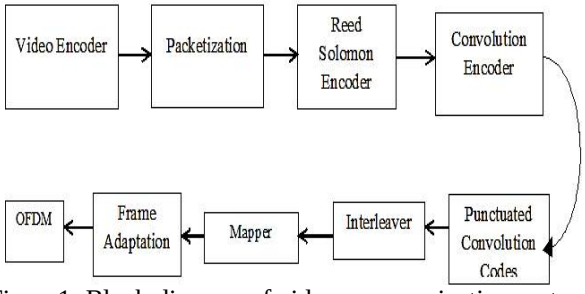

Figure1: Block diagram of video communication system.

The extra redundant Byte (2t) of the encoder is 16 Byte of data is used to detect the data and 8 Byte of data can be corrected using RS coding.The input to the Convolution Interleaver is 204 Bytes and the output will 1632 bits. It converts Bytes to bits by shuffling the incoming data sequence by rearranging it. Thereby the errors can be detected and corrected, by analysing the adjacent frame the lost data can be easily predicted. Convolution Interleaver is used to correct long sequence errors. If there is any error even after interleaving then we make use of punctuated Convolution encoding. It is the third level of protection for the loss of data in the communication channel. It is used to alter the code rate of the data there are different m/n code rate of the encoder. The code rate used in this project is ¾.Second level interleaver will shuffle data bitwise.The output of block interleaver is mapped into the constellation, each symbols consisting of bits is mapped over the space using 64 QAM. The data is transmitted over OFDM.

IV.SYSTEM IMPLEMENTATION

The transmission of video signal in a bad communication channel causes poor quality of video signal at the receiver. Thus the information that is meant to be useful gets blundered, many channel coding techniques are been used to remove such errors in the data.The use of compression standards removes extra bits from the original data because it is difficult to transmit bulk information over the communication channel. The Matlab and Simulink software in order to implement the requirements of the project. Matlab is well suited to program the channel coding because it is very

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simple, it has the built in functions which motives the easy way of getting the expected requirements. Simulink is use to simulate the design using block diagrams, its very easy to set the input and specification for the design with default library functions.

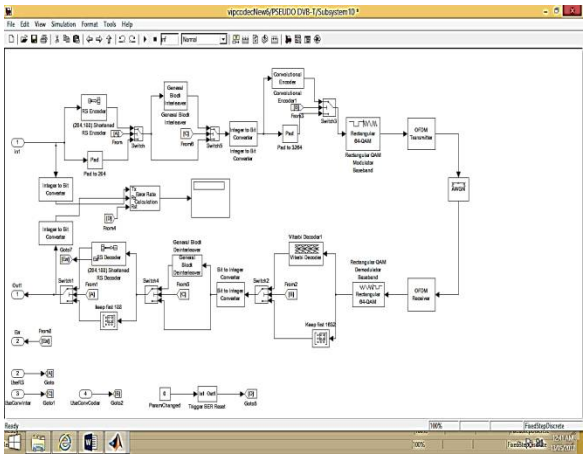
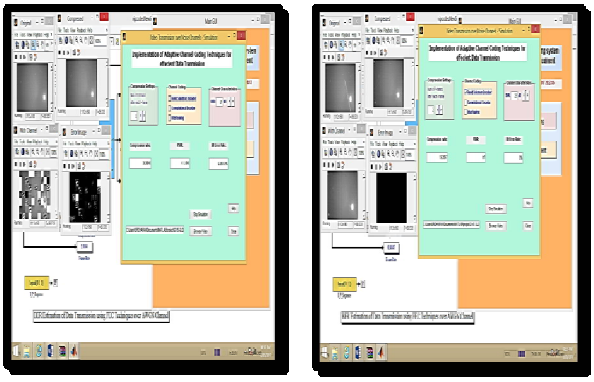


Figure2: block diagram of channel coding.

The Simulink software helps to provide functionality of the required blocks just by selecting the wanted blocked. There by the different blocks are used to implement the project for error free wireless video transmission is made using Simulink software.

V.EXPERIMENTAL RESULTS

Based on the SNR value ans BER value the error free system is designed at each levels of the SNR value distinct coding techniques are used. The coding is written in Matlab and Simulink is designed both of them are linked together and by running the code we get the following results.



(a) (b)

Figure 3:(a) Error pattern for SNR= 25dB (without channel coding) (b)With RS coding technique.

The SNR is set to 25 dB and video input is given at the source, the received data gets defect with the introduction of the error during transmission. The BER percentage is more and Peak signal to noise ratio is nothing but the maximum signal power to error introduced power which is indicated in negative value because the project deals with elimination of noise. Since the noise is tending to zero the PSNR becomes infinity. PSNR is the maximum

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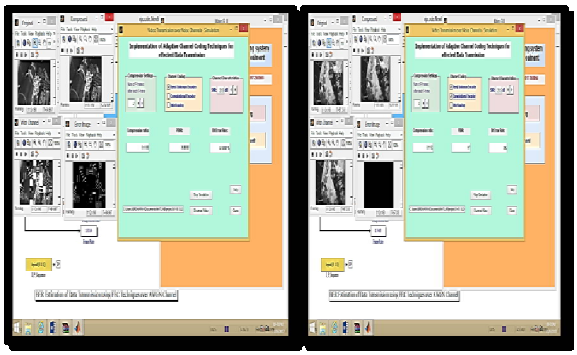
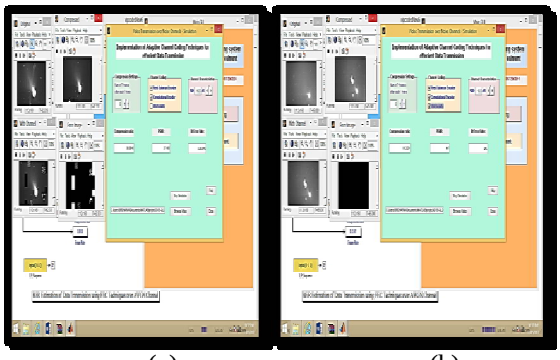
amplitude is the noise signal. These errors are corrected by RS coding upto 21.5 dB decrease in SNR as shown in figure 3.



(a) (b)

Figure 4(a) Error pattern for SNR= 21.5.5dB (without channel coding) (b)With Convolution coding technique.

Now if the SNR is decreased further, the errors is introduced in the system. Consider the SNR= 21.5 dB, the BER starts to increase and the PSNR shows negative values.Now to remove this error the convolution encoder choose the convolution encoder manages to remove the data at very better way. The convolution coding has the gain about 5 dB. So the convolution codes can control the errors upto 17.5 dB decreasing in SNR value. As shown in Figure 4.



(a) (b)

Figure 5(a) Error pattern for SNR= 17.5 dB (without channel coding) (b)With Interleaving technique.

If the SNR value is decreased below 17.5 dB the BER gets increased further, the PSNR value becomes more negative. The BER can be controlled using interleaver, the interleaver has the gain about 0.5 dB. The interleaver can tolerate the error upto 17 dB decrease in the SNR value as shown in Figure 4.

Now if there is decrease in SNR further, the BER gets increased and becomes more negatives to handle this situation a new efficient technique is used called as concealment technique. It is the technique where the errors are removed by interpolation of received pixel with the neighbouring pixel.By using concealment procedure the errors can be completely neglected upto 5 dB decrease in the SNR value. It is represented in Figure6. The error can be reduced till the SNR becomes 3 dB.

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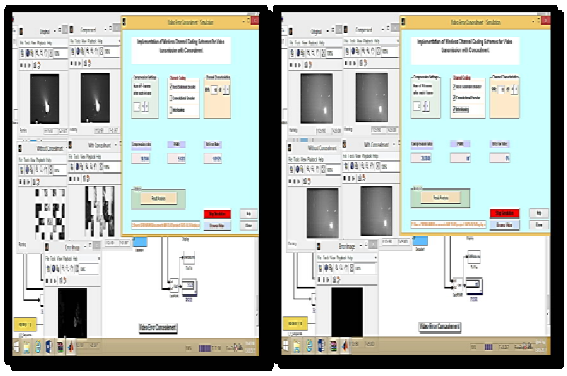

(a) (b)

Figure 6(a) Error pattern for SNR= 10 dB (without channel coding) (b)With Concealment technique.

The plot in Figure 7, represents the power spectral density of the video signal when transmitted in the channel, the points represents the power of the data points. It is seen that the power of the signal is more when frequency ranges from -1 to 1 Mhz and decreases with increase in frequency the power drops as the noise gets added in the system.

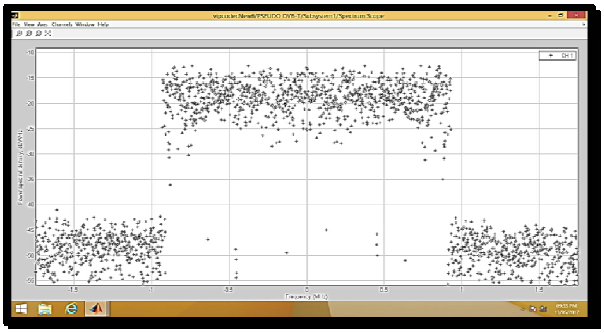

Figure 7: Plot of Frequency vs power spectral density.

VI. CONCLUSION

The errors established during transfer of video signals in lossy medium causes very poor quality of received information data. To eradicate this loss of information due to lossy channel certain channel coding technique as adopted to eliminate the errors established during transferring of data in the channel. There are different channel coding techniques which is utilized collectively at different stages of the data transfer, so that the errors introduced at different places vanished using different techniques. The different coding gains achieved for different coding technique is adapted

VII. FUTURE WORK

The channel coding is implemented using Matlab and Simulink, this project works on gray scale components. In future same concept can be implemented using RGB components using three separate channels for each colour. Further this concept can be implemented by utilizing other conditions and consideration of different medium of wireless communication.

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REFERENCES

[1] A. K. Katsaggelos, Y. Eisenberg, F. Zhai, R. Berry, and T. N. Pappas, "Advances in efficient resource allocation for packet based real-time video transmission," Proc.IEEE, vol. 93, no. 1, Jan. 2005.
[2] F. Zhai, Y. Eisenbergb, T. N. Pappas, R. Berry, and A. K. Katsaggelos, "Rate-distortion optimized hybrid error control for packetized video communications," IEEE Trans. Image Processing, vol. 15, pp. 40–53, Jan. 2006.
[3] J.Hagenauer, "Rate-compatible punctured convolutional codes (RCPC codes) andtheir applications," IEEE Trans. Commun., vol. 36, pp. 389–400, Apr. 1988.
[4] Elsevier and et. al., " Special issue on emerging H.264/AVC Video Coding Standard"visual communication and imaging representation, vol 17, april.
[5] Ye- Kui Wang "Motion estimation techniques for digital tv" proceedings of IEEE,vol 63,june 2007.
[6] Jain Jaswant et,al., "Displacement measurement and its applications in interframeimaging Coding" IEEE transction communication, volume 29, dec 1998.
[7] Chen, Lie amd Chung-wei et, al. " Multi-level secure video streaming over SRTP"43rd annual south-east region conference, volume 2, Gloria-2005.
[8] Chunbo Zhu et, al. " Error resilient video coding using redundant pictures" IEEEImage processing and magazine, volume 17, pp 61-62.
[9] Marios G and Yutaka Ishibashi et, al. " Error resilient interactive video streamingover wireless networks" volume 677, number 7, sept 2007.
[10] Daniel J., Costello, JR., "Error Control Coding, Fundamentals and Applications", Prentice Hall, Inc. Englewood Cliffs, New Jersey, 1983.
[11] Q. Zhang, W. Zhu, and Y.-Q. Zhang, "Network-adaptive scalable video streaming over 3G wireless network," inProc.IEEE Int. Conf. Image Processing, Thessaloniki, Greece, Oct. 2001, pp. 579–582.
[12] R. Zhang, S. L. Regunathan, and K. Rose, "Video coding with optimal inter/intra-mode switching for packet loss resilience," IEEE Trans. Commun., vol. 18, pp. 966– 976.
[13] Proakis, J. G., "Digital Communications", 3rd ed., New York, McGraw-Hill, 1995.
[14] J. Foerster, J. Liebetreu, "FEC Performance of Concatenated Reed-Solomon and Convolutional coding with Interleaving," IEEE 802.16 Broadband Wireles Access Working Group2000.
[15] Anukur Vora , et,al. "Improved motion compensation temporal jittering (MCIF) for scales video coding "7th survey, engineering and technology, nov 13.
[16] H. Yang and K. Rose, "Advances in recursive per-pixel estimation of end-to-end distortion for application in H.264," in Proc. ICIP, Genova, Sept. 2005.
[17] Y. Wang, M. M. Hannuksela, V. Varsa, A. Hourunranta, and M. Gabbouj, "The error concealment feature in the H.26L test model," in Proc. ICIP, Rochester, NY, 2002, pp. 729– 732.