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Research Article

SURVEYOF CHANNEL CODING TECHNIQUES USED FOR SATELLITE COMMUNICATION

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ABSTRACT

This paper mainly focuses on the performance of the different channel coding techniques used in digital satellite multimedia broadcasting, the several applications which intern deals with services offered to satellite radio (SDR)and handhelds (DVB-SH), this analysis gives bit error rate and gain of the channel coding techniques used. The input compression standard MPEG-7 is chosen with (DVB-RCS), (RC-IRA) as channel coding schemes. And varying channel conditions such as AWGN, RAYLEIGH, RICIAN FADING for this proposed method. By using mat lab/Simulink as simulator for this analysis. These results are compared with previous analysis report as well as compared among these two channel coding schemes and optimal solution is obtained and proposed for the future research applications.

Keywords: Satellite Broad casting, MPEG-7, DVB-RCS, RC-IRA.

INTRODUCTION

This technique offers a smooth transmission scheme and compatible for different multimedia content in future, for fast and secure communication this methodology[1].

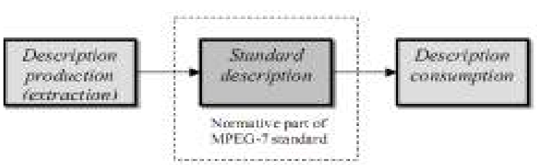

Figure 1: Block diagram of MPEG-7

holds well with high performance in terms of gain and Bit Error Rate. Basically MPEG-7 is a mulimedia content description interface is next ISO/IEC standard under development by MPEG[2]. While prior standards fouces on coding and representation of audio visual content,but MPEG-7 focuses on description of multimedia content, it has addresses with various parameters and modalities such as image,video,audio,speech graphics and their combinations[3] which includes non-MPEG formats and non-compressed formats as well[2].

The AWGN channel is a good model for many satellite and deep space communication links. It is not a reliable model for most terrestrial links due to multipath and terrain blocking, interferences etc. However, for terrestrial path modeling, Additive white Gaussian noise is commonly used to simulate noises which occurs in the background, the channel under study, in addition to multipath, terrain blocking, interference, ground clutter and self interference that modern radio systems encounter in terrestrial operation. Rayleigh fading is a reasonable model when there are many objects in the environment that scatter the radio signal before it arrives at the receiver. The central limit theorem holds that, if there is sufficiently much scatter, the channel impulse response will be well-modeled as a Gaussian process irrespective of the distribution of the individual components. If there is no dominant component to the scatter, then such a process will have zero mean and phase evenly distributed between 0 and 2π radians. The envelope of the channel response will therefore be Rayleigh distributed. It is a stochastic model radio propagation anomaly caused by partial cancellation of a radio signal by itself the signal arrives at the receiver by several different paths hence exhibiting multipath interference and at least one of the paths is changing lengthening or shortening. Rician fading occurs when one of the paths, typically a line of sight signal, is much stronger than the others. In Rician fading, the amplitude gain is characterized by a Rician distribution[3-8].

DIFFERENT CHANNEL CODING TECHNIQUES

DVB-RCS

This standard specifies terminal-to-hub, full IP, asymmetric satellite communications in the form of a return link, It has transmission speeds ranging from 144 kbps to 2 Mbps. It supports flexiable transmission scheme is therefore needed able to support a variety of coding rates and frame sizes for different user service applications. The DVB-RCS turbo code supports twelve frame sizes (ranging from 48 to 864 bit pairs) and seven coding rates, 2/5, 1/2, 2/3, 3/4, 4/5 and 6/7.

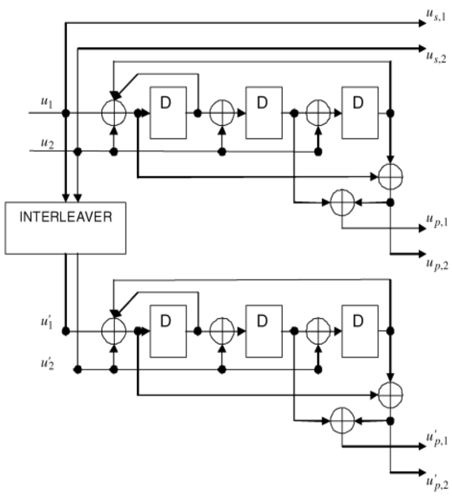

Figure 2: Architecture of DVB-RCS

It consists of two double-binary RSC encoders in parallel concatenation, each having 8-states and DVB-RCS [6] turbo codes are well-suited for mobile satellite broadcasting applications, as they can support a wide range of coding rates, that is from to 6/7. In order to obtain even [10] lower coding rates, the additional two feed forward polynomials have been found to achieve the best performance; 17 and 12 in octal form. S-Random interleaver has been found to achieve the best performance compared to other turbo interleaver's been tested. The intra-symbol interleaving has been left unchanged compared to the DVB-RCS standard [8]. The coding rates from 1/5 to 6/7 have been considered and have shown performance improvements from 0.1 to 0.3 dB, depending on the coding rate in the presence of an AWGN channel and uncorrelated channels such as RAYLEIGH, RICIAN/FADING channels[9].

RC-IRA

It is deployed in communication systems operating under a wide range of Signal-to-Noise Ratios (SNRs) since the 1980s to provide adaptive Forward Error Correction (FEC), in order to maintain a single encoder/decoder architecture RC schemes are well-suited for practical applications as they guarantee [4] high throughputs and reliable transmission. Over the past years of research, LDPC codes have been shown that they can provide error-correcting performance comparable to or even better than that of [7] turbo codes Additional benefits of LDPC decoders compared to turbo decoders, include the use of a more suitable structure for high-speed hardware implementations, allowing parallel decoding architectures, more specifically IRA codes are a special family of LDPC codes.

CCSDS

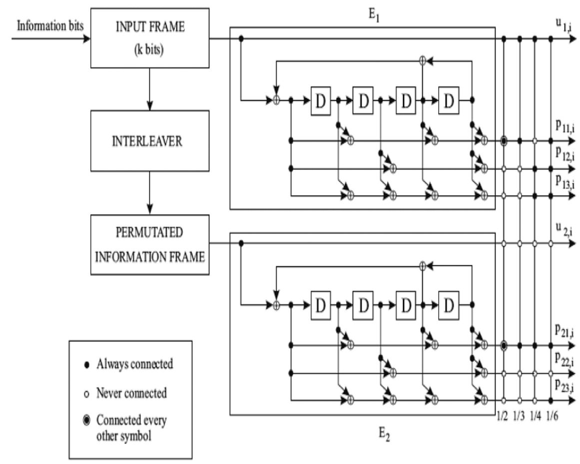

Figure 3: Architecture of DVB-RCS

CCSDS channel code solution, consisting of an outer Reed Solomon (RS) code concatenated with an inner Convolutional Code (CC) through a block bit interleaver depicts the turbo code used by the CCSDS standard. It makes use of two constituent RSC codes, each one having 16-states and coding rate. The different coding rate options in the CCSDS standard, i.e. 1/3, 1/4 and 1/6, are obtained through appropriate interconnections of the parity bits produced by the two RSC encoders. The appropriate interconnections of the parity bits produced by the two RSC encoders, denoted as in Fig. 3.The interleaver permutation law follows a deterministic procedure, in order to reduce as much as possible the memory storage requirements. There are four input frame length options in this standard, i.e. 1784, 3568, 7136, and 8920 bits plus an optional larger frame length of 16384 bits. The CCSDS turbo interleaver can be extended to 12280 bits for mobile satellite broadcasting applications, a new S-random interleaver of size 6140 bits was proposed for DVB-RCS turbo codes, adapted for different applications[10].

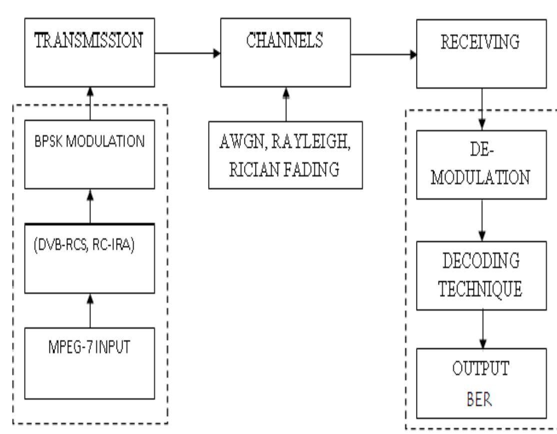

Figure 4: System block diagram

Table I: Bit Error Rate

	E_b / N_O		
CODING	AWGN	RAYLEIGH	RICIAN
DVB-RCS	0.05	0.3	1.6
RC-IRA	-0.005	0.3	1.6
CCSDS	-0.075	0.2	1.6

PROPOSED SCHEME WITH MPEG-7 INPUT

The entire system working process is shown in Fig.4 initially the MPEG-7 standard compression input is applied i.e. a real time image is taken and broken in and broken up in to frames which pretends like a real video and then applying the corresponding channel coding schemes one at a time using one varying channel conditions modulated and transmitted this is done using Mat lab/Simulink, and after all the process over the same procedure will be repeated for the rest of the channel coding schemes and other channel conditions. Bit error rate is calculated for each channel coding's as well for different channel conditions also. Graph is plot against some samples of data versus the Bit error rate. Each individual result are compared among themselves and also with these two coding techniques with that the prior available results obtained in previous research work Table I shows the results of DVB-RCS and RC-IRA are compared from that the optimal solution is identified.

CONCLUSION

In this summary comparisons are to be made with respect to the previously discussed coding schemes were results are predicted for the same varying channel conditions. From the present proposed methodology the result is thus compared with previous analysis and so an optimal solution may be obtained within the proposed methodology and also among the above techniques. Also with that still if there is any possible ways to improve little more bit error rate by modifying algorithm level or by applying changes in architecture level is kept for the future research experiment will give a clear cut idea of understanding the working as well trends in communications.

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