Research on Video Transmission Technology Based on Wireless Network

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Abstract. With the rapid development of wireless mobile communication technology, the multimedia communication service is increasing rapidly in the mobile environment. Analyzing With the rapid development of wireless communication technology and the continuous improvement of wireless network bandwidth, the multimedia communication service is increasing rapidly in the mobile environment. The communication performance of multimedia transmission in wireless networks with limited resources, the video encoding in the main influencing factors of multimedia transmission and application is studied, through the evaluation of video transmission in wireless network quality of service by using simulation tools, such as data packet time delay, PSNR, image difference etc. Experimental results show that, when the video is transmitted over the wireless network, it is necessary to select the appropriate compress quantization parameters and GOP type according to the network condition, so as to obtain a better reconstructed video quality.

Keywords: Wireless network · Multimedia information · Video coding · Network simulation

1 Introduction

With the rapid development of wireless network and multimedia technology, wireless network business forms have become increasingly rich, the main form of traditional voice will gradually change the new wireless multimedia services for mobile video. The transmission of video stream needs stable bandwidth, and the bandwidth fluctuation will seriously affect the quality of video reconstruction. Therefore, it is necessary to solve the contradiction between wireless channel bandwidth fluctuation and high quality video [1]. Video coding can reduce the amount of data transmission and reduce the energy consumption of communication [2]. The data compression ratio is inversely proportional to the quality of video decoding. The higher the data compression ratio is, the lower the quality of video decoding is. How to realize the compression and transmission of multimedia information efficiently and effectively under the condition that the storage, processing power and energy of single node are severely limited [3]. It is a problem that needs to be solved in order to balance the computational complexity and the amount of communication data.

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2 Wireless Channel Model

Generally speaking, there are two reasons for packet loss in packet radio network, such as congestion loss and wireless loss. The reason for the former is that the amount of data transmission on the network is too large, resulting that in the transmission of network equipment is not timely, so that the queue buffer space is insufficient, and the data packet must be lost. For wireless transmission, it can be divided into two types according to the distribution of data loss. When the distribution of packet loss is quite scattered and average, it belongs to the first type. On the contrary, if the loss occurs in the continuity of the majority, it belongs to the continuous loss. However, the G–E model is used as a continuous packet loss model. In the model, because the data is lost in the way of random dispersion, the average loss probability represents the average loss of data in the transmission process. PGB represents the probability that the transmission channel is going bad, and PBG is just the opposite (Fig. 1). In the steady state, the probability of good and bad

$$\Pi G=\frac{\mathrm{PBG}}{\mathrm{PBG}+\mathrm{PGB}},\ \Pi B=\frac{\mathrm{PGB}}{\mathrm{PBG}+\mathrm{PGB}},\ \mathrm{P_{avg}}=\mathrm{P_G}\Pi_\mathrm{G}+\mathrm{P_B}\Pi_\mathrm{B} \tag{1}$$

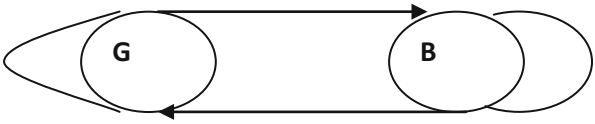

Fig. 1. G–E channel model

3 Video Coding Standard

International Telecommunication Union (ITU-T) has developed a video coding standard including H.261, H.263, H.263+, in the year of 2000 will be the final text through H. 263++.H.26X series standard is a video coding standard for low bit rate video communication, which has a high compression ratio, so it is especially suitable for wireless video transmission. The basic techniques used are DCT transform, motion compensation, quantization, entropy coding, etc. [4].

MPEG-1, MPEG-2 is characterized by the use of digital storage media, high bit rate, they are not suitable for wireless video transmission. People familiar with VCD, DVD is a typical application of MPEG-1, MPEG-2. Subsequently, MPEG organizations have noticed a potential market for low bit rate applications, and began to compete with ITU-T. In the development of MPEG-4, it not only considers the high bit rate applications, but also includes a special low bit rate applications for wireless transmission [5]. The most important feature of MPEG-4 standard is the coding method based on video object [6].

In MPEG encoding, encoding the video stream will be divided into 3 different images respectively: I-frame, P-frame, and B-frame [7]. I-frame is from its own picture data as encoding, which is also not the reference picture, P-frame is a reference to previously encoding I-frame or P-frame and the data itself to do encoding, B-frame is a reference

to previously encoding I-frame or P-frame and their own data encoding, the prediction of common relation as shown in Fig. 2 [8].

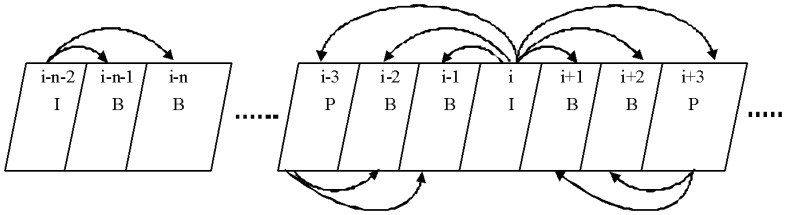

Fig. 2. I, P, B frame relationship

4 Simulation Analysis

The network topology of the simulation experiment is shown in Fig. 3, the connection between the video server and the wireless router is a wired network, and the connection between the Internet and the video receiving computer is 802.11 wireless network. It is assumed that the packet loss occurs in the wireless network, which leads to the poor video quality.

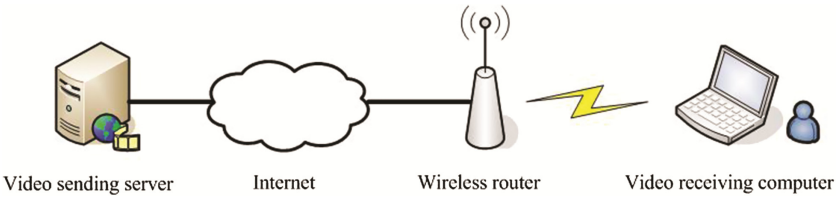

Fig. 3. Network structure

In order to analyze the correlation between image quality and packet loss rate, the quantization parameter is set to 10, the packet length is set to 1024, the length of GOP is set to be 6, 12, 15, and the packet loss rate is set to be 0, 0.02, 0.1. Table 1 is the average value of the PSNR simulation, it can be clearly seen from Table 1. While using the image GOP length is shorter, the mass ratio of image using GOP is long. The quality of the multimedia data transmitted on the network will result in different quality due to

Table 1. Average PSNR value

Packet loss rate	GOP length (6)	GOP length (12)	GOP length (15)
0.0	32.36	32.18	32.09
0.02	29.29	29.09	30.91
0.06	28.65	28.19	28.79
0.1	27.83	26.95	26.13

different compression quantization and network parameters. Figure 4 shows that there is a significant difference in image quality between decoded video images at different PSNR values. Figure 5 shows the packet delay.

(1) Original (2) PSNR(32.18) (3) PSNR(26.13)

Fig. 4. Video image

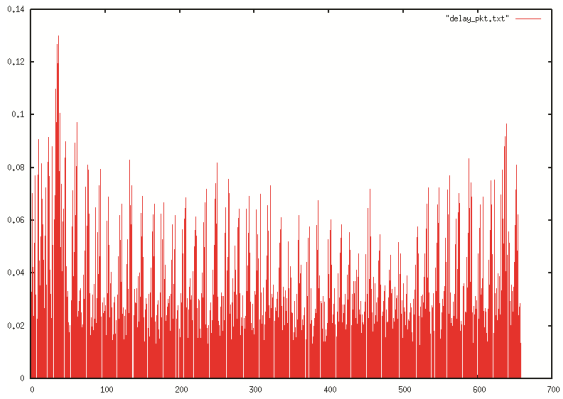

Fig. 5. Packet delay

In order to analyze the relationship between image quality and quantization parameters, the compress quantization parameters are set to be 2, 10, 20, 31. Simulation result the quantization parameter selected value is greater, the compression out of the image quality will be poor, and the choice of quantitative parameters of small will have a better image effect. Because of the unique characteristics of human vision, the imperceptible high frequency signal by using larger quantization parameters, relatively easy to detect low frequency signals with low standards, let video bit stream distribution limited reasonable, so that the quality of the reconstructed video can accept. Figure 6 shows the frame distortion under different Q values.

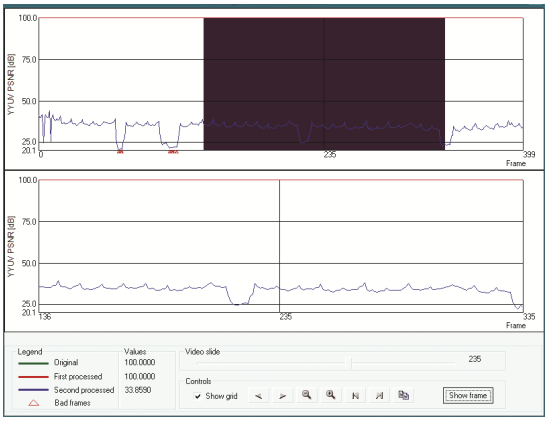

Fig. 6. Frame distortion

5 Conclusion

The error rate of the wireless channel is high, and the encoded video data is relatively small, which is sensitive to the data error, and the single bit error will cause the failure of subsequent data. Reliability and quality assurance of multimedia information transmission is a key factor to be considered in wireless network. Therefore, it is very important to explore the quality of multimedia information transmission in wireless network and analyze the impact of the loss rate of information frame on the multimedia information.

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