Pongpisut Noradee 2010: List Viterbi Decoder as an Inner Decoder for Convolutional Vector Symbol Outer Decoder. Master of Engineering (Electrical Engineering), Major Field: Electrical Engineering, Department of Electrical Engineering. Thesis Advisor: Assistant Professor Usana Tuntoolavest, Ph.D. 160 pages.

This research is divided into two parts: 1. Designing and implementing a lab prototype of a list-of-2 Viterbi decoder on an FPGA electronic board. The lab prototype was designed to be a suitable inner decoder of a concatenated code, in which the vector symbol decoder is the outer decoder and 2. Finding the suitable channels and their suitable parameter for this concatenated code. For the first part, the lab prototype was implemented on an FPGA board. The test results showed that the outputs from the VHDL program were the same as those from the C++ simulation. It can be concluded from the results that the lab prototype worked properly. For the second part, this concatenated code is suitable for the channel with burst errors. Therefore, it was tested in the wireless channels with Rayleigh and Ricean fading. The additive white Gaussian noise channel was shown for comparison purpose. For this research, the probability that the first output is wrong in consideration is between 0.01 and 0.1, which is higher than the one that is generally used. This is because the remaining error symbols will be corrected again by the outer decoder. The results showed that the suitable SNR of various channels for this decoder was as follows: from 2 to 3.5 dB for the additive white Gaussian noise channel, from 6.5 to 8.1 dB for the SNR of the Ricean fading channel with the speed of 60 km/h and Ricean factor equal to 10, from 8.1 to 9.3 dB for the Rayleigh fading channel with the speed of 120 km/h. These ranges of SNR correspond to low quality channels. Moreover, in these ranges of SNR, the corresponding values of the probability that the second output is wrong given that the first output is wrong are very useful to the outer decoder.

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