

## Performance Evaluation of Turbo Code System under Jamming Environment

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### Abstract

This paper evaluates the effect of Frame- size, Code rate and Decoding iteration as efficient parameters on turbo code system performance. For this study, first a turbo code system was simulated by MATLAB software to study the effect of mentioned factors in different ranges of value on performance of turbo code system and then the performance of turbo code under the effect of jamming signal was evaluated to investigate the effect of jamming signal on bit error rate (BER) performance. The results show increasing the Frame- size, Code rate and decoding iteration, better BER performance of turbo code system is achieved and also it is deduced from the results that turbo code system can act as good anti-jamming code with acceptable code rate.

Keywords: Turbo code system, Jamming signal, Frame-size, Bit error rate, Decoding iteration, Code rate

### 1. Introduction

Channel coding is a technique which can protect the transmitting information against noise and interference that cause Bit Errors. Using error-correcting channel codes, the number of bit errors will be reduced and also it will allow Shannon limit which is maximum rate of transmitting Signal over a channel (Claude et al., 1993). According to the channel coding, redundant bits are added to information sequence due to assisting in detection and correction of bit Errors. Channel codes are divided in to two important groups, block codes and convolutional Code. Due to the importance of Shannon limit that has been achieved by Error – correcting channel codes with large length, the required power for decoding such large codes make this process impractical so new class of convolutional codes called turbo code which transmit information through the noisy channel with low bit error rate is introduced to overcome this problem by utilizing its recursive encoders and iterative decoders. Turbo code uses parallel concatenation of two recursive systematic convolutional codes fed by two information sequences which are separated by an interleaver. Decoding this class of codes is based on iteratively decoding process and passing the so-called extrinsic information to the next decoding stage (Sergio and Guido, 1996).

Jamming is one of the most important communication problems that prevents receiver from estimating many unknown parameters of signal. Jammer sends its power in to the same frequency band with signal

and causes signal becomes disrupted (Pierre and Ralf, 2005). Furthermore, for more accurate estimation of signal, receiver has to characterize jamming signal and distinguish between jammed and un-jammed symbols (Jang Wook et al., 2006). According to the direct relationship between BER performance of turbo code system and effective parameters of code rate, frame size and decoding iteration, turbo code system is a useful method to decrease bit error rate in the presence of jamming signal. In better word, turbo code can be used as a method to decrease the effect of jamming signal, so it can be a good anti-jammer with acceptable code rate. Although the effect of mentioned parameters on turbo code performance was considered, in this paper performance is evaluated for different ranges of code rate, frame size and decoding iteration which can be summarized as 1/2 and 1/3 for code rate, 500,1000,1200 and 1500 for frame size and 1 to 5 for decoding iteration. Besides, to show turbo code system acts as good anti – jammer different percentage of total bandwidth is jammed and amount of BER for 25%,50%,70% and 100% bandwidth jammed is compared and conclusion is made based on the results.

### 2. Components of an Anti-Jamming System Based on Turbo Code

In digital communication systems, sometimes signal becomes disrupted due to the presence of a jammer (interference) because jammer sends its power in to the same frequency band with signal (Pierre and Ralf, 2005).