Decoding Algorithm of Superposition Modulation in Cooperative Network without SIC

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***Abstract* - In this paper, we propose a new decoding strategy for in cooperative communication method using SM(superposition modulation) without SIC. The new decoding scheme can outperform conventional cooperative diversity base on DF by about 2dB in the SNR rage of interest.**

1. INTRODUCTION

Recently, as IoT is applied to various fields, there is a need for research on high reliability communication systems. Several strategies have been developed to overcome fading channel in wireless communication environments. In the IoT communication system, it is difficult to install a plurality of antennas in order to obtain a diversity effect in a low-cost small device. Therefore, cooperative communication technique obtaining a space diversity effect is a proper alternative.[1] As far as we surveyed, various algorithms have been developed for cooperative communication techniques. There is a method AF, in which a relay node decides whether to receive (Amplify and Forward), or DF (Decode and Forward), a packet of a source node and retransmits the packet of the source node. At this time, a method of lowering the BER by setting an optimal threshold value of the signal noise noise value has also been proposed.[2] - [4] Also, when using multiple relay nodes, a relay node selection algorithm with the best channel state based on signal noise has also been introduced.[5] However, in the conventional SM scheme, SIC decoding can be applied

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depending on the information bit having a large power

ratio. In this paper, a method of independently decoding information of each node is introduced.[6]-[8] This solves the bottleneck of the existing SM scheme.

1. SYSTEM MODEL

In this paper, we consider a system consisting of one source node (S), one relay node (R), and one destination (D) as shown in Fig.1. we assume all nodes have a single antenna. The channel coefficients between nodes, denoted byand , are random variables having a complex Gaussian distribution with an average of 0 and a variance per dimension of 0.5. For simplicity, we assume channel information all known. Also and  are the complex Additive White Gaussian Noises with an average of 0 and a variance per dimension. The information of the source node and the relay node are denoted by  and .

1. PROPOSED DECODING ALGORITHM

1st phase : The source node transmits a packet including its own information. (Relay node) and  (Destination) attempt to decode received signal.

. (1)

. (2)

2nd phase : If decoding fails,  sends a NACK to request retransmission. At this time,  retransmits power by superposing power ratio  on  and  on . The received retransmitted signal and LLR of each node are as follows.

 (3)

 (4)

 (5)

 (6)



Fig.1 Cooperative network phase diagram



Fig.2 SM Constellation Point Index

1. SIMULATION RESULT

We set log MAP method to generate LLR with Turbo Code(13, 11) and Equal Gain Bit Level Combining. The BER for the proposed algorithm is measured by varying the SNR between  and . Fig.3 shows SNR gain of 1 ~ 3dB over conventional SM decoding method in BER  region.

1. CONCLUSIONS

In this paper, we propose a method for decoding information of each node without using SIC which is used in SM transmission. The proposed method obtains SNR gain by decoding information of each node regardless of whether it is decoding conventional large 

Fig.3 Comparison of BER between Conventional SM and Proposed SM decoding scheme

power information.

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