ENHANCEMENT OF CHANNEL CODING TECHNIQUE FOR MOBILE SYSTEM IN 5G NETWORK

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ABSTRACT

5G technology is the future of wireless communication due to the growth of wireless technology today. This is because the current 4G technology is lack of capabilities such as unstable latency, average speed data transmission and low voice quality. The capabilities of 5G technology which offer higher-speed user capacity, good voice quality, super-fast data transmission, ultra-low latency and tolerance to the noise make this technology more compatible to support millions of devices at ultrafast speed. The usher in the fourth industrial revolution also can be realized with this 5G technology that will affect to increase a country economy. This technology also benefits the community by having much useful technology such as autonomous vehicle and object tracking. The system model comprising digital modulator with block coding technique to maintain its reliability and operability. Thus, the objective of this project is to invent an enhancement coding technique, that is Asymmetric Arithmetic Coding (AAC) added to the existing model to further improve the signal reliability and reduce probability of error for the application of mobile communications to visualize the proof concept of using enhancement coder will support the stability of 5G network. Furthermore, the system is applying mathematical formulation for the error correction coding technique at the receiver, to enhance the computational complexity and finally measure the performance of the complete system. It is said that the enhancement of the channel coding technique, can support the uninterruptible services for mobile communications in 5G network. Overall, the communication system model will lead to the mutual harmonization among society with new parameters of mobile system.

Keywords: 5G technology, latency, asymmetric arithmetic coding, modulator, computational complexity

1. INTRODUCTION

Current wireless communication standard for cellular network, launched in 2020 has widely deployed smart antenna configurations with block coding techniques in the transmitter system to increase the speed of data transmission, enhanced error minimization and lower out-of-band radiation for spectral efficiency and reliability of the signal [1, 2]. Frequency signals that propagate through wireless channel is a technical challenge in combating the multipath fading and overcome the problem that arises from the conventional MIMO-OFDM system [2, 3]. At present, many research and development for fifth generation cellular network (5G) are focusing on mitigating the error that occur during high-speed data transmission. Thus, the project is focusing on developing an enhancement of channel coding technique, namely Enhancement Asymmetric Arithmetic Coding (EAAC) that is expected to provide reliable connectivity, supporting

millions of devices at ultrafast speed, and improving the system capacity [6]. The current work stated only using traditional block coding technique such as Quasi-Cyclic Low-Density Parity Check (QC-LDPC) and Low Density Parity Check (LDPC) that limits to mitigate the probability of error.

2. SYSTEM MODEL

The mathematical equations of Eq.(1a) and Eq.(1b) algorithm shown that the inputs of transmitted signal have successfully transmitted to the receiver.

$$\text{Transmit Signal} = \text{Coding: } C(X, S) \longrightarrow (X, 0) \qquad \text{Eq (1a)}$$

$$\text{Received Signal} = \text{Decoding: } D(X, 0) \longrightarrow (X, S) \qquad \text{Eq. (1b)}$$

2.1. Methodology

Figure 1 shows the block diagram that deployed EAAC channel coding to overcome the issues of MIMO-OFDM which is the high error in multiple transmission.

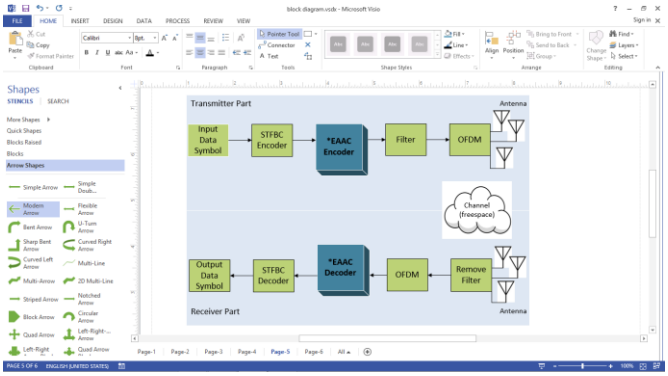

Figure 1.

3. Result and Conclusion

From the simulated result, it is shown that the verification has been made between Quasi-Cyclic Low-Density Parity Check (QC-LDPC) and Low-Density Parity Check (LDPC). Table 1 stated the comparison elements for the block coding methods. The project is concluded that the enhancement of coding channel technique in mobile system has visualize the best received signals that can be used by the users.

Table 1.

Type of Coding Techniques	OFDM(Eb/No)	F-OFDM(Eb/No)
Asymmetric Arithmetic	9.56	9.16
Arithmetic	10	9.6
Huffman	9.6	9.9

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REFERENCES

1. M. D. Rozaini, A. Idris, D. M. Ali, and E. Abdullah, “Performance Evaluation of PAPR in OFDM System Using Median Codeword Shift and Hybrid Median Codeword Shift Method”
2. A. Ghaith, “Filtered Orthogonal Frequency Division Multiplexing : A Waveform Candidate for 5G American Journal of Engineering Research (AJER),” Am. J. Eng. Res., vol. 7, no. 1, pp. 99–107, 2020
3. B. K. Shiragapur, U. Wali, P. Of, and O. Signal, “Peak-To-Average Power Ratio Reduction Using Coding and Hybrid Techniques For OFDM System,” ICTACT J. Commun. Technol., vol. 6948, no. March, pp. 1229–1234, 2016

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