ABSTRAK

Perkembangan teknologi yang begitu pesat menuntut pengiriman data dengan kecepatan tinggi dan kinerja yang handal. Data yang dikirim dapat berupa data analog atau data digital, seperti audio, video, karakter atau teks. Sebagai contohnya adalah data rekam medis *Electrocardiogram* (ECG). Pemasalahan yang sering terjadi ketika komunikasi data adalah gangguan saluran. Gangguan saluran berupa derau (*noise*), pelemahan sinyal (*fading*), dan perusakan sinyal oleh sinyal lain (*jamming*) [**1**]. Jika data yang dikirim mengalami gangguan saluran, maka di sisi penerima data dipastikan mengalami kesalahan (*error*). Jika data yang dikirim berupa data ECG, maka akan menyebabkan salah diagnosa yang akan menimbulkan runtutan kesalahan, sehingga akan berakibat fatal terhadap pasien. Dari permasalahan tersebut, suatu metode dibutuhkan agar kesalahan dapat dideteksi dan dikoreksi [**2**]. Dengan menggunakan metode penyandian digital, kesalahan dapat dideteksi dan dikoreksi. Salah satu metode penyandian dalam *error control coding*, ialah dengan *turbo codes*.

Turbo codes encoder yang dikembangkan untuk penelitian menggunakan *Recursive Systematic Convolutional* (RSC) dengan *rate* 1/3 dan menggunan *random interleaver*. *Decoder turbo codes* menggunakan algoritma *Maximum A-Posteriori Probability* (MAP). Pengujian menggunakan data rekam medis dengan panjang data 300, 600, 900, 1200, dan 1500 titik. Modulasi yang diggunakan adalah *Quadrature amplitude modulation* (QAM) dengan ukuran QAM 4, 16, 32, dan 64. *Signal to Noise Ratio* (SNR) yang digunakan adalah 0 sampai dengan 20.

Data ECG dapat dikoreksi dengan baik ketika menggunakan modulasi QAM 4 dengan SNR lebih besar dari 11 dan modulasi QAM 16 dengan SNR lebih besar dari 19. Pada penelitian ini, panjang data dan iterasi tidak mempengaruhi BER *turbo codes*. SNR mempengaruhi kinerja BER. Selain itu, ukuran modulasi mempengaruhi kinerja BER. Semakin kecil ukuran modulasi, nilai BER semakin baik.

ABSTRACT

The fast development of technology required that data should be transmitted in a high speed way and in a meticulous performance. The data which was sent could be in the form of an analog or digital data such as audio, video, character, or text. Examples are electrocardiogram (ECG) medical records. The problems which usually occur during a communication is on the way is channel disturbance. Channel disturbance could be in the form of hissing sound (noise), fading signals, and disturbed signals because of other signals which are called jamming [1]. Others from the mentioned problems, very often it happened that the data being sent is broken before it is transmitted. When the data being sent undergo channel disturbance or data break down, then there certainly be some errors on the receiver side and the data received is not valid. When the data being sent is in the form of an ECG, then it would cause false diagnosis which would raise a series of deceptions that it would end in a serious and fatal result on the patients. From this point of view, an application or a method is needed that the errors could detected and corrected [2]. By using a digital coding method, any error could be certainly detected and corrected. One of the coding methods in error control coding is the turbo codes.

Turbo codes encoder which was developed for research used the Recursive Systematic Convolutional (RSC) with a rate of 1/3 and used a random inter-leaver. The Decoder turbo codes used the Maximum A-Posteriori Probability (MAP) algorithm. The test used a medical record data of 300, 600, 900, and 1,500 niche in length. The modulation which was applied was the Quadrature amplitude modulation (QAM) in QAM 4, 16, 32, and 64 sizes whereas the Signal to Noise Ratio (SNR) was 0 to 20.

ECG data could be corrected well when using a QAM 4 modulation with an SNR more than 11 and a QAM 16 modulation with an SNR more than 19. In this research, the length and iteration of data had no influence on the BER turbo codes whereas the SNR did. If the size of modulation is smaller, value of BER will be better.