ANALISIS KOMPARASI METODE *BASELINE REDUCTION* PADA MOTOR IMAGERY BERBASIS SINYAL ELECTROENCEPHALOGRAM

Oleh

Desak Putu Eka Komala Dewi, NIM 2015091014

Jurusan Teknik Informatika

Program Studi Sistem Informasi

ABSTRAK

Dengan pesatnya perkembangan teknologi dalam era *Internet of Things* (IoT), salah satu manfaat signifikan adalah pengembangan *Brain-Computer Interface* (BCI) berbasis sinyal *Electroencephalogram* (EEG) untuk membantu komunikasi pasien dengan gangguan *neuromotor*. Penelitian ini berfokus pada komparasi tiga metode *Baseline Reduction* (*Difference*, *Relative Difference*, dan *Fractional Difference*) dalam pengenalan *motor imagery* menggunakan *machine learning* dengan metode klasifikasi *Decision Tree*. Dalam perekaman sinyal EEG, dilakukan sebanyak empat kali dengan durasi 10 menit pada masing-masing perekaman. *Dataset* yang diperoleh dibagi menjadi enam kelas sesuai skenario: mengangkat tangan kiri, menurunkan tangan kiri, mengangkat tangan kanan, menurunkan tangan kanan, berdiri, dan duduk. Penelitian menunjukkan bahwa *Baseline Reduction* meningkatkan akurasi karakterisasi pola sinyal EEG. Metode *Relative Difference* dan *Fractional Difference* menunjukkan peningkatan signifikan dibandingkan metode *Difference*. Berdasarkan evaluasi menggunakan parameter *Accuracy*, *Error*, *Precision*, *Recall*, dan *F1 Score*, metode *Relative Difference* mencapai akurasi tertinggi sebesar 73%. Meskipun hasil *Relative Difference* dan *Fractional Difference* serupa, *Relative Difference* terbukti sebagai metode terbaik untuk karakterisasi pola sinyal EEG, menunjukkan peningkatan akurasi yang signifikan tanpa perlu kombinasi kompleks.

Kata-kata kunci: *Baseline Reduction*, *Motor Imagery*, *Electroencephalogram*, *Machine Learning*

COMPARATIVE ANALYSIS OF BASELINE REDUCTION METHODS FOR MOTOR IMAGERY BASED ON ELECTROENCEPHALOGRAM SIGNALS

By

Desak Putu Eka Komala Dewi, NIM 2015091014

Informatic Engineering

Information Systems Study Program

ABSTRACT

With the rapid development of technology in the Internet of Things (IoT) era, one of the significant benefits is the development of Brain-Computer Interface (BCI) based on Electroencephalogram (EEG) signals to help communication of patients with neuromotor disorders. This study focuses on the comparison of three Baseline Reduction methods (Difference, Relative Difference, and Fractional Difference) in motor imagery recognition using machine learning with the Decision Tree classification method. In recording EEG signals, it was done four times with a duration of 10 minutes for each recording. The dataset obtained was divided into six classes according to the scenario: raising the left hand, lowering the left hand, raising the right hand, lowering the right hand, standing, and sitting. The study showed that Baseline Reduction improves the accuracy of EEG signal pattern characterization. The Relative Difference and Fractional Difference methods showed significant improvements compared to the Difference method. Based on the evaluation using the Accuracy, Error, Precision, Recall, and F1 Score parameters, the Relative Difference method achieved the highest accuracy of 73%. Although the results of Relative Difference and Fractional Difference were similar, Relative Difference proved to be the best method for EEG signal pattern characterization, showing a significant increase in accuracy without the need for complex combinations.

Keywords: Baseline Reduction, *Motor Imagery*, *Electroencephalogram*, *Machine Learning*