ABSTRAK

Perkembangan teknologi tangan prostetik terus menunjukkan kemajuan signifikan dalam memenuhi kebutuhan individu yang kehilangan atau mengalami disfungsi pada tangan mereka. Fokus utama pengembangan ini adalah memungkinkan mereka untuk mendapatkan kembali fungsi tangan yang hilang, terutama dalam menggerakkan jari-jari. Penggunaan kontrol elektromiograf (EMG) telah menjadi sorotan dalam meningkatkan kinerja tangan prostetik, memungkinkan pasien untuk mengontrolnya dengan lebih mudah. Namun, kontribusi penelitian dilakukan untuk meningkatkan akurasi kontrol dengan menambahkan berbagai fitur. Beberapa studi telah mengintegrasikan kontrol EMG dengan pengenalan objek, namun masih terdapat kekurangan dalam analisis variasi amplitudo EMG dalam ekstraksi fitur. Penelitian ini bertujuan untuk mengembangkan teknologi tangan prostetik dengan menambahkan tiga variasi gerakan menggenggam, dengan penekanan pada analisis variasi amplitudo dalam ekstraksi fitur (MAV, RMS dan, VAR) menggunakan metode machine learning (Decission tree dan Random forest). Dengan menggunakan Arduino Nano 33 BLE Sense sebagai microcontroller dan dry electrode OYMotion DFrobot untuk pemantauan EMG, penelitian ini menghasilkan persentasi akurasi genggaman 99% dengan menggunakan jenis mechine lerning random forest, penelitian ini bertujuan untuk meningkatkan kinerja kontrol tangan prostetik. Melalui penggunaan klasifikasi machine learning pada Arduino Nano 33 BLE Sense, Penelitian ini berhasil menunjukkan bahwa integrasi metode machine learning, terutama Random Forest, dengan analisis variasi amplitudo EMG dapat meningkatkan akurasi kontrol tangan prostetik hingga 99%. Kesimpulannya adalah penggunaan Arduino Nano 33 BLE Sense sebagai microcontroller, dengan metode ektraksi fitur dan machine lerning dan juga dry electrode OYMotion DFrobot menunjukkan efektivitas dalam pemantauan dan pengolahan sinyal EMG.

Kata Kunci: Tangan Prostetik, Arduino BLE 33, Machine Learning.

ABSTRACT

The development of prosthetic hand technology continues to show significant progress in meeting the needs of individuals who lose or experience dysfunction on their hands. The main focus of this development is enabling them to regain lost hand functions, especially in moving fingers. The use of electromiographic control (EMG) has been a highlight in improving the performance of prosthetic hands, allowing patients to control them more easily. However, research contributions were made to improve control accuracy by adding various features. Several studies have integrated EMG controls with object identification, but there are still shortcomings in the analysis of EMG amplitude variations in feature extraction. The research aims to develop prosthetic hand technology by adding three variations of grip movement, with emphasis on analysis of amplitude variation in feature extraction (MAV, RMS and, VAR) using machine learning methods. (Decission tree dan Random forest). Using the Arduino Nano 33 BLE Sense as a microcontroller and the OYMotion DFrobot dry electrode for EMG monitoring, this study produced a 99% grip accuracy percentage using a kind of random forest lerning mechine, the study aims to improve the performance of prosthetic hand control. Through the use of machine learning classifications on the Arduino Nano 33 BLE Sense, this research has successfully demonstrated that integrating machine learning methods, especially Random Forest, with EMG amplitude variation analysis can improve the accuracy of prosthetic hand control up to 99%. The use of Arduinos 33 Nano BLE sense as microcontroller and dry electrode OYMotion DFrobot demonstrates efficiency in monitoring and processing EMG signals.

Keywords: Prosthetic Hand, Arduino BLE 33, Machine Learning.