ABSTRAK

Sloshing pada tangki *drone sprayer* dapat menyebabkan *error* pembacaan sensor *Internal Measurement Unit* (IMU) yang berdampak terhadap kestabilan *drone* sprayer. Penelitian ini bertujuan untuk menganalisis pengaruh variasi level cairan dalam tangki terhadap *error* pembacaan IMU akibat efek *sloshing*, dan menganalisis pengaruh metode *wavelet transform* dalam mengurangi *noise* pada data sensor IMU guna meningkatkan akurasi pembacaan. Metode *denoising* dilakukan menggunakan *Discrete Wavelet Transform* (DWT) dengan basis *wavelet* Daubechies 4 (db4) dan level dekomposisi 3. Dalam proses ini, komponen detail pertama (D1) dihilangkan, detail kedua (D2) dikenakan *soft thresholding*, sementara aproksimasi ketiga (A3) dan detail ketiga (D3) dipertahankan. Data diperoleh dari pembacaan sensor IMU pada *drone* dengan variasi level cairan 1 hingga 5 liter, masing-masing dilakukan tiga kali pengulangan. Hasil penelitian menunjukkan bahwa *error* tertinggi terjadi pada level 1 liter dan 2 liter, dengan nilai *Root Mean Square Error* (RMSE) yang lebih besar akibat efek *sloshing* dari ruang kosong dalam tangki. Setelah dilakukan *denoising*, terjadi penurunan RMSE yang signifikan; sumbu y-*acceleration* pada level 1 liter menunjukkan penurunan tertinggi sebesar 65,90%, sedangkan penurunan terkecil sebesar 0,19% terjadi pada sumbu x-*vibration* di level 5 liter. Hasil ini menunjukkan bahwa metode DWT tidak hanya memperbaiki bentuk sinyal secara visual, tetapi juga meningkatkan akurasi pembacaan sensor, sehingga mendukung kestabilan sistem kendali *drone* dalam kondisi dinamis.

Kata Kunci: *drone sprayer*, *Internal Measurement Unit* (IMU), *sloshing*, *wavelet transform*, *Discrete Wavelet Transform* (DWT), *denoising*

ABSTRACT

Sloshing in the drone sprayer tank can cause errors in the Internal Measurement Unit (IMU) sensor readings, which affect the stability of the drone sprayer. This study aims to analyze the effect of liquid level variations in the tank on IMU reading errors due to sloshing, and to analyze the effect of the wavelet transform method in reducing noise in IMU sensor data to improve reading accuracy. The denoising method was performed using the Discrete Wavelet Transform (DWT) with the Daubechies 4 (db4) wavelet basis and a decomposition level of 3. In this process, the first detail component (D1) was removed, the second detail (D2) was subjected to soft thresholding, while the third approximation (A3) and the third detail (D3) were retained. Data were obtained from IMU sensor readings on a drone with liquid levels varying from 1 to 5 liter, each performed three times. The results showed that the highest error occurred at levels 1 liter and 2 liter, with a larger Root Mean Square Error (RMSE) value due to the sloshing effect from the empty space in the tank. After denoising, there was a significant decrease in RMSE; the y-acceleration axis at level 1 liter showed the highest decrease of 65.90%, while the smallest decrease of 0.19% occurred on the x-vibration axis at level 5 liter. These results indicate that the DWT method not only improves the visual form of the signal but also enhances sensor reading accuracy, thereby supporting the stability of the drone control system under dynamic conditions.

Keywords*: drone sprayer, Internal Measurement Unit* (IMU)*, sloshing, wavelet transform, Discrete Wavelet Transform* (DWT)*, denoising*