ABSTRAK

PENENTUAN KOREKSI SUDUT *ATTITUDE* DAN *HEADING QUADROTOR* DENGAN BERDASARKAN PERUBAHAN VARIAN PERCEPATAN

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Hasil perhitungan orientasi sensor magnetometer memiliki kelemahan saat menunjukkan arah medan magnet bumi, karena hasil orientasi dari sensor magnetometer memiliki derau yang cukup besar pada hasil rekaman data sensornya, sehingga hasil orientasi dari gabungan sensor akselerometer, giroskop, dan magnetometer menggunakan IMU sangat perlu untuk mengkoreksi sudut *Attitude* dan *Heading* pada UAV baik saat kondisi statis ataupun dinamis.

Untuk mengurangi galat orientasi, ditambahkan algoritma mengubah nilai matriks kovarian derau pengukuran (R) dengan mengunakan metode varian percepatan guna memberikan bobot yang berbeda pada sensor akselerometer dan sensor giroskop. Pada saat kondisi dinamis nilai matriks kovarian derau pengukuran (R) akan dinaikkan, hal ini bertujuan agar Kalman filter memberikan bobot yang lebih besar pada data hasil proses prediksi ($X̂k-$). Saat kondisi statis, nilai matriks derau pengukuran (R) kembali ke nilai semula. Hal ini bertujuan agar Kalman filter lebih menggunakan data hasil pengukuran $z̄k$. Dengan begitu, kekurangan sensor akselerometer dan sensor giroskop dapat diminimalisir.

Hasil penelitian ini berupa nilai sudut orientasi *quadrotor* dan keluaran grafik dari penggabungan data sensor akselerometer, sensor giroskop dan sensor magnetometer menggunakan Kalman filter serta perubahan nilai matriks kovarian derau pengukuran (R). Hasil sudut pada penelitian ini menghasilkan galat *persentase* pada sikap *roll* sebesar 7,0763% pada sikap *pitch* sebesar 0,1562% dan pada sikap *yaw* sebesar 26,4235%.

Kata Kunci : Matriks Kovarian, IMU, Kalman Filter, *Quadrotor*, Sudut.

ABSTRACT

DETERMINATION OF QUADROTOR ATTITUDE AND HEADING ANGLE CORRECTIONS BASED ON ACCELERATION VARIANT CHANGES

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The results of the calculation of the orientation of the magnetometer sensor have a weakness when it shows the direction of the earth's magnetic field, because the orientation results of the magnetometer sensor have a large enough noise in the recorded sensor data, so that the orientation results from a combination of accelerometer, gyroscope and magnetometer sensors using IMU are very necessary to correct the Attitude and Heading angles on the UAV both in static and dynamic conditions.

To reduce the orientation error, an algorithm is added to change the value of the measurement noise covariance matrix (R) by using the acceleration variant method to give different weights to the accelerometer sensor and gyroscope sensor. During dynamic conditions the value of the measurement noise covariance matrix (R) will be lowered, this is intended so that the Kalman filter gives greater weight to the measured data $\mathbf{Z}k$. When the condition is static the value of the measurement noise matrix (R) returns to its original value. It is intended that the Kalman filter uses more data from the prediction process ($Xk-$). That way the lack of accelerometer sensors and gyroscope sensors can be minimized.

The results of this study are quadrotor orientation angle values and graphical outputs from combining data from accelerometer sensors, gyroscope sensors, and magnetometer sensors using Kalman filters and changes in the value of the measurement noise covariance matrix (R). The results of the angle in this study resulted in an average error in the roll attitude of 7,0763% in the pitch attitude of 0,1562% and in the yaw attitude of 26,4235%.

Keywords: *Covariance Matrix, IMU, Kalman Filter, Quadrotor, Angle.*