

KAJIAN SENSITIVITAS PADA GERAKAN MEMUTAR KAPAL DENGAN MENGGUNAKAN MODEL *WHOLESHIP*

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ABSTRAK

Kapal merupakan transportasi utama yang digunakan untuk menghubungkan antar pulau di Indonesia. Dengan itu kapal harus memiliki kemampuan manuver yang baik agar tidak terjadi kecelakaan dan menimbulkan kerugian. Kemampuan manuver kapal dapat diprediksi menggunakan perhitungan numerik berdasarkan gaya hidrodinamika yang terjadi pada kapal. Dengan menganalisis pengaruh setiap *Hydrodynamic derivatives* terhadap gerakan memutar kapal maka dapat diketahui *Hydrodynamic derivatives* mana yang bisa dieliminasi saat dihitung menggunakan perhitungan numerik. Pada penelitian ini *Hydrodynamic derivatives* yang didapatkan menggunakan *wholeship model* akan dianalisis menggunakan *Monte Carlo Simulation*. *Monte Carlo Simulation* digunakan untuk mengetahui pengaruh setiap *Hydrodynamic derivatives* terhadap indikator yang mempengaruhi gerakan memutar kapal yaitu *advance*, *transfer*, dan *tactical diameter*. Nilai dari *Hydrodynamic derivatives* divariasikan dengan standard deviasi 1% - 5%. Hasil dari *Monte Carlo Simulation* akan diketahui *Hydrodynamic derivatives* mana saja yang tidak terlalu berpengaruh saat kapal melakukan gerakan memutar. Pada penelitian ini ditemukan ada tujuh *Hydrodynamic derivatives* yang tidak terlalu berpengaruh terhadap simulasi gerakan memutar kapal yaitu $X_{\eta\eta\eta}$, X_{rrr} , Y_0 , Y_η , $Y_{\eta\eta}$, $N_{\eta\eta}$, dan N_{rrr} . Ketujuh *Hydrodynamic derivatives* tersebut dinyatakan tidak terlalu berpengaruh karena nilai pengaruh *Hydrodynamic derivatives* tersebut terhadap gerakan memutar kapal mendekati 0. Berdasarkan hasil simulasi yang telah dilakukan menunjukkan bahwa pengeliminasian *Hydrodynamic derivatives* $X_{\eta\eta\eta}$, X_{rrr} , Y_0 , Y_η , $Y_{\eta\eta}$, $N_{\eta\eta}$, dan N_{rrr} tidak terlalu berpengaruh terhadap simulasi gerakan memutar kapal.

Kata kunci: Analisis Sensitivitas, *Monte Carlo Simulation*, Manuver Kapal, *Hydrodynamic Derivatives*.

SENSITIVITY STUDY OF TURNING MOTION OF SHIPS USING WHOLESIP MODEL

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ABSTRACT

Ships are the main transportation used to connect between islands in Indonesia. With that the ship must have good maneuverability to avoid accidents and cause losses. The ship's maneuverability can be predicted using numerical calculations based on the hydrodynamic forces that occur on the ship. By analyzing the effect of each Hydrodynamic derivatives on the turning motion of the ship, it can be seen which Hydrodynamic derivatives can be eliminated when calculated using numerical calculations. In this study, the hydrodynamic derivatives obtained using the whole ship model will be analyzed using a Monte Carlo Simulation. Monte Carlo Simulation is used to determine the effect of each Hydrodynamic derivatives on indicators that affect the ship's turning motion, namely advance, transfer, and tactical diameter. The values of Hydrodynamic derivatives are varied with a standard deviation of 1% - 5%. The results of the Monte Carlo Simulation will show which Hydrodynamic derivatives do not have much effect when the ship makes a circular motion. In this study, it was found that there were seven Hydrodynamic derivatives that did not significantly affect the ship's turning motion simulation, namely $X_{\eta\eta\eta}$, X_{rrr} , Y_0 , Y_η , $Y_{\eta\eta}$, $N_{\eta\eta}$, and N_{rrr} . The seven Hydrodynamic derivatives were declared not too influential because the effect values of the Hydrodynamic derivatives the ship's turning motion is close to 0. Based on the simulation results that have been carried out, it shows that the elimination of Hydrodynamic derivatives $X_{\eta\eta\eta}$, X_{rrr} , Y_0 , Y_η , $Y_{\eta\eta}$, $N_{\eta\eta}$, and N_{rrr} does not significantly affect the ship's turning motion simulation.

Keywords: *Sensitivity Analysis, Monte Carlo Simulation, Ship Maneuvering, Hydrodynamic Derivatives.*