ABSTRAK

OPTIMALISASI DESAIN *OMNI-WHEELED ROBOT BASE* DENGAN VARIASI KONFIGURASI RODA DAN PROFIL RANGKA MENGGUNAKAN *FINITE ELEMENT METHOD*

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(2025: xvi + 47 Halaman, 57 Gambar, 6 Tabel, 4 Lampiran)

Penelitian ini bertujuan untuk mengoptimalkan desain *omni-wheeled robot base* dengan memvariasi konfigurasi roda dan profil rangka menggunakan metode *Finite element method* (*FEM*). Tiga konfigurasi roda yang diteliti meliputi konfigurasi X-Drive (4 roda dengan sudut 45°), konfigurasi 4 roda di sisi, dan konfigurasi 4 roda melingkar. Setiap konfigurasi diuji dengan dua variasi material rangka, yaitu aluminium hollow 6061 dan aluminium *extrusion profile* 6063. Simulasi *FEM* dilakukan untuk menganalisis *von mises stress*, deformasi, dan *safety factor* pada setiap desain. Hasil penelitian menunjukkan bahwa desain dengan material aluminium hollow 6061 memiliki performa lebih baik dibandingkan aluminium *extrusion profile* 6063, dengan nilai *stress* lebih rendah, deformasi minimal, dan *safety factor* lebih tinggi. Desain M2 (konfigurasi 4 roda di sisi) dengan material aluminium hollow 6061 mencatat nilai *stress* terendah (14,163 MPa) dan *safety factor* tertinggi (15). Dan desain M1 dengan material aluminium hollow 6061 dan aluminium *extrusion profile* 6063 memiliki deformasi paling rendah (0,01). Penelitian ini memberikan rekomendasi desain yang optimal untuk aplikasi seperti pada robot KRAI dan juga robot tipe lain yg menggunakan roda omni.
(171 kata)

Kata Kunci: Robot Omni Wheel, Metode Element Hingga, Desain *Base*, Konvergensi *mesh, Autodesk fusion 360.*

ABSTRACT

OPTIMIZATION OF OMNI-WHEELED ROBOT BASE DESIGN WITH VARIATIONS IN WHEEL CONFIGURATION AND FRAME PROFILE USING THE *FINITE ELEMENT METHOD*

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This research aims to optimize the design of omni-wheeled robot base by varying the wheel configuration and frame profile using Finite element method (FEM). The three-wheel configurations studied include the X-Drive configuration (4 wheels with a 45° angle), the 4-wheel configuration on the side, and the circular 4-wheel configuration. Each configuration was tested with two frame material variations, namely aluminum hollow 6061 and aluminum extrusion profile 6063. FEM simulations were performed to analyze von mises stress, deformation, and safety factor for each design. The results show that the design with aluminum hollow 6061 material has better performance than aluminum extrusion profile 6063, with lower stress values, minimal deformation, and higher safety factor. The M2 design (4-wheel configuration on the side) with 6061 aluminum hollow material recorded the lowest stress value (14.163 MPa) and the highest safety factor (15). And the M1 design with 6061 aluminum hollow and 6063 aluminum extrusion profile had the lowest deformation (0.01). This research provides optimal design recommendations for applications such as the KRAI robot and also other types of robots that use omni wheels.
(179 words)

Keywords: Omni-wheeled robot, *Finite element method*, Base Design, Mesh Convergence, *Autodesk fusion 360*.