

Design and Structural Analysis of a Basketball Robot Using Autodesk

Inventor in the 2025 Indonesian ABU Robot

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ABSTRACT

The Indonesian Robot Contest (KRI) is a robotics competition aimed at enhancing students' capabilities in robot design, development, and technology implementation. In the 2025 Indonesian ABU Robot Contest (KRAI), the competition theme is basketball, requiring robots to perform movement, ball collection, dribbling, and shooting functions effectively. This study aims to design and develop a strong, lightweight, and reliable frame structure for the ABU Indonesia 2025 Basketball Robot to support the overall robot system during the competition. The research methodology includes literature review, requirements analysis, design using Autodesk Inventor software, stress analysis simulation, frame implementation, and performance evaluation. The analysis results indicate that the robot base frame experiences a maximum Von Mises Stress of 1.392 MPa, which is significantly lower than the yield strength of Aluminum 6061 material at 275 MPa, with a safety factor ranging from 3 to 15. For the shooting mechanism frame, the maximum Von Mises Stress obtained is 7.35378 MPa, with a safety factor ranging from 12 to 15. The implementation results demonstrate that the frame is capable of supporting all mechanical, electronic, and pneumatic components effectively while maintaining stability during robot operation. Based on the analysis and implementation results, the designed frame structure is considered safe and suitable for use in the 2025 Indonesian ABU Robot Contest.

Keywords: Basketball Robot, KRAI 2025, Autodesk Inventor, Stress Analysis, Von Mises Stress, Safety Factor.