ADVANCEMENTS IN HEXAPOD ROBOT DESIGN: OVERCOMING CHALLENGES AND EXPLORING APPLICATIONS.

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This paper introduces a new hexapod robot's design methodology and control strategy. The main goal is to develop a versatile and stable hexapod system with advanced locomotion capabilities by using state-of-the-art robotics technology and bio-inspired design principles. The robot is designed to be adaptable to various real-world environments. The research examines multiple hexapod designs, each with unique advantages. The research's significant focus is creating a sensor system that provides the robot with environmental perception and internal state monitoring. Critical components such as the Pimoroni Servo 2040 and Pololu Maestro are utilized to precisely control the robot's movement servos. Structural parameters are optimized to enhance dexterity, and a foot-force distribution and compensation model ensures posture control. The paper also explores the challenges encountered during the development and testing phases and detailed discussions of solutions to these challenges, particularly in control algorithms managing locomotion. Additionally, the design and control mechanisms are analyzed to propose advancements in the field. By consulting experts and reviewing current research, the study identifies future areas for innovation, aiming to empower researchers and engineers to enhance the capabilities of hexapod robots.

Keywords: *Bio-Inspired Design, Capabilities, Design Methodology, Hexapod Robot, Locomotion Control Strategy.*