R&D showcase 2025
Tech for Sustainable Futures
INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY HYDERABAD

Bipedal Robot

Robotics
Research center

ABSTRACT

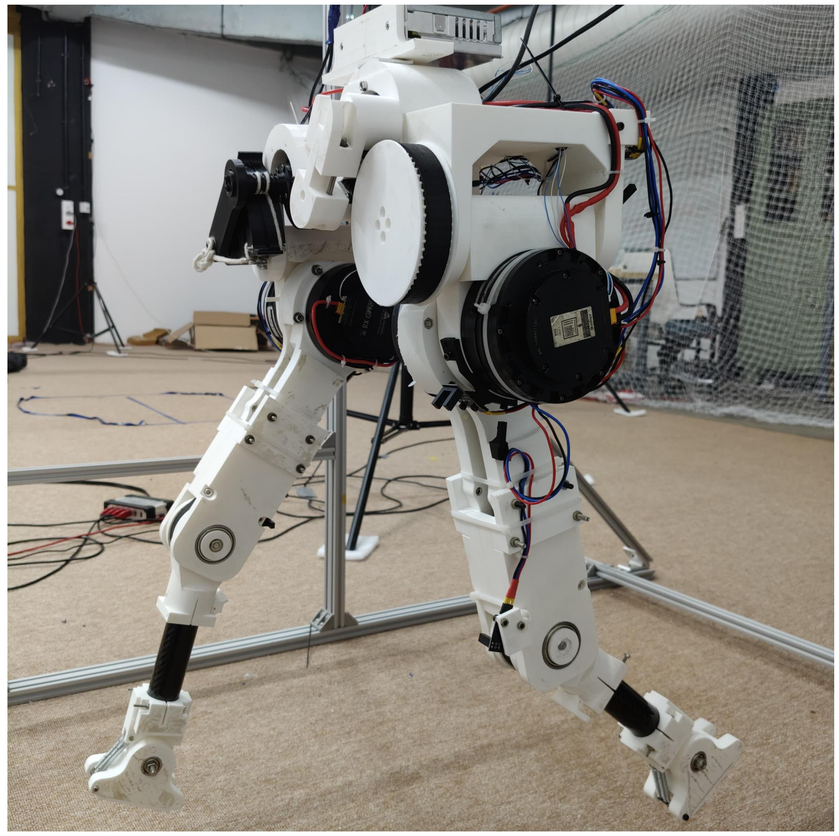
This project presents the development of a 6DOF (3DOF each leg) bipedal robot designed to achieve efficient and stable locomotion. The robot incorporates capstan reducers in the hip joints, allowing for high torque transmission with minimal backlash while maintaining a lightweight structure. The use of 3D-printed components significantly reduces weight, making the design suitable for research in dynamic walking.

METHODOLOGY

The design process began with the development of a lightweight and structurally optimized frame using 3D printing, ensuring durability while keeping the total system weight low. The robot's joints are driven by Cubemars T-motors, which were selected for their high torque-to-weight ratio. An adaptive control system is being implemented to process sensor feedback and execute precise joint movements.

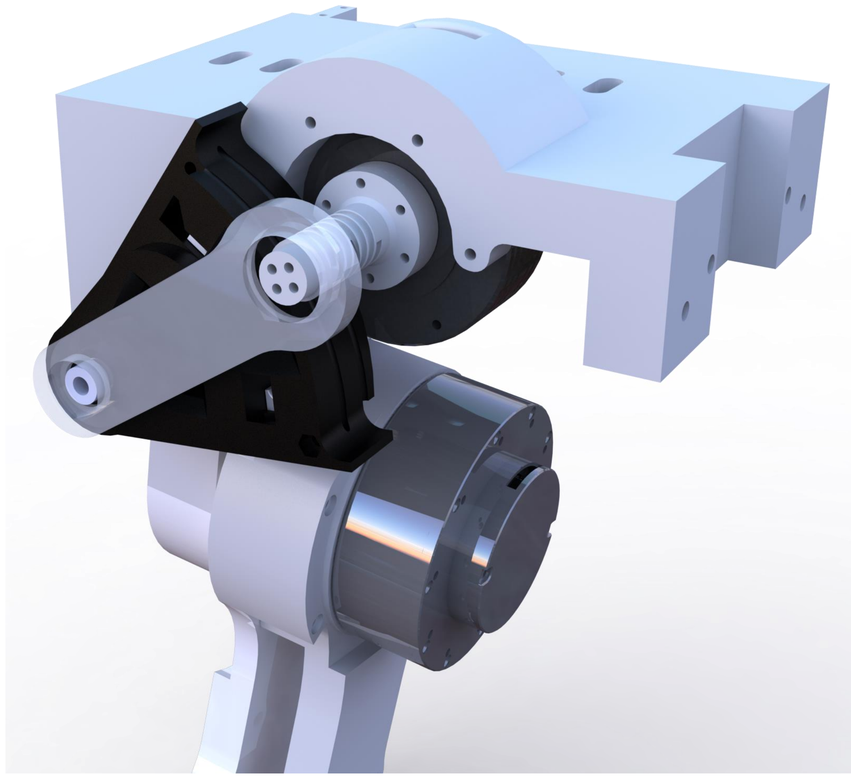
RESULTS

Initial experiments demonstrated smooth joint actuation with the capstan-based drive system, confirming its ability to transmit torque efficiently while minimizing backlash. The lightweight structure, combined with high-torque motors, enabled controlled motion and balance during early gait trials. Simulated walking sequences showed promising stability and energy efficiency, validating the feasibility of the design. Physical testing is ongoing to refine the gait parameters and assess the system's adaptability to uneven surfaces.



CONCLUSION FUTURE WORKS

Future efforts will focus on improving walking stability through advanced control strategies incorporating adaptive gait planning. Further refinements in mechanical design and actuation will also be considered to enhance overall performance.



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