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KINEMATIC ANALYSIS AND TRAJECTORY PLANNING OF BIPED ROBOTS

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A bipedal robot is a human-inspired self-balancing mechanism with two limbs. Our study is confined to a 6DOF spatial mechanism that mirrors the walking style of humans to carry out complex tasks. In the development of the walking trajectory of the biped, forward and inverse kinematics of the biped's links become crucial to maintain balance and an optimal gait. There can be random errors introduced to the physical system due to mechanical inaccuracies such as joint clearance and link tolerance.

This work presents an approach to estimate and quantify the errors due to the inaccuracy. This study is followed by the mathematical formulation of the position and analysis of the 6R bidpedal robot, and in doing so, we attempt to compensate for the errors. A study of the links' kinematics is done with and without clearances in the joint to understand its effects on the trajectory followed. Position error at various input and out psoition is estimated. A simulated model is used to work out the position analysis of the prosposed manipulators.

The present work attempts to derive the dynamical nature of the biped. In doing so, we can understand and relate the joint torques to the overall acceleration and velocity of the robot, making it extremely useful for autonomous control. This understanding of the Biped allows us to program it to complete complicated human-like tasks such as walking or climbing.

To simplify the act of walking, in terms of control. An approach called inverted pendulum is carried out to estimate the position and its derivatives instead of computing the entire body dynamics. This estimate has a linear characteristic allowing simple and effective control.