Hexapod Robot Simulator: Advancements in Kinematic Analysis

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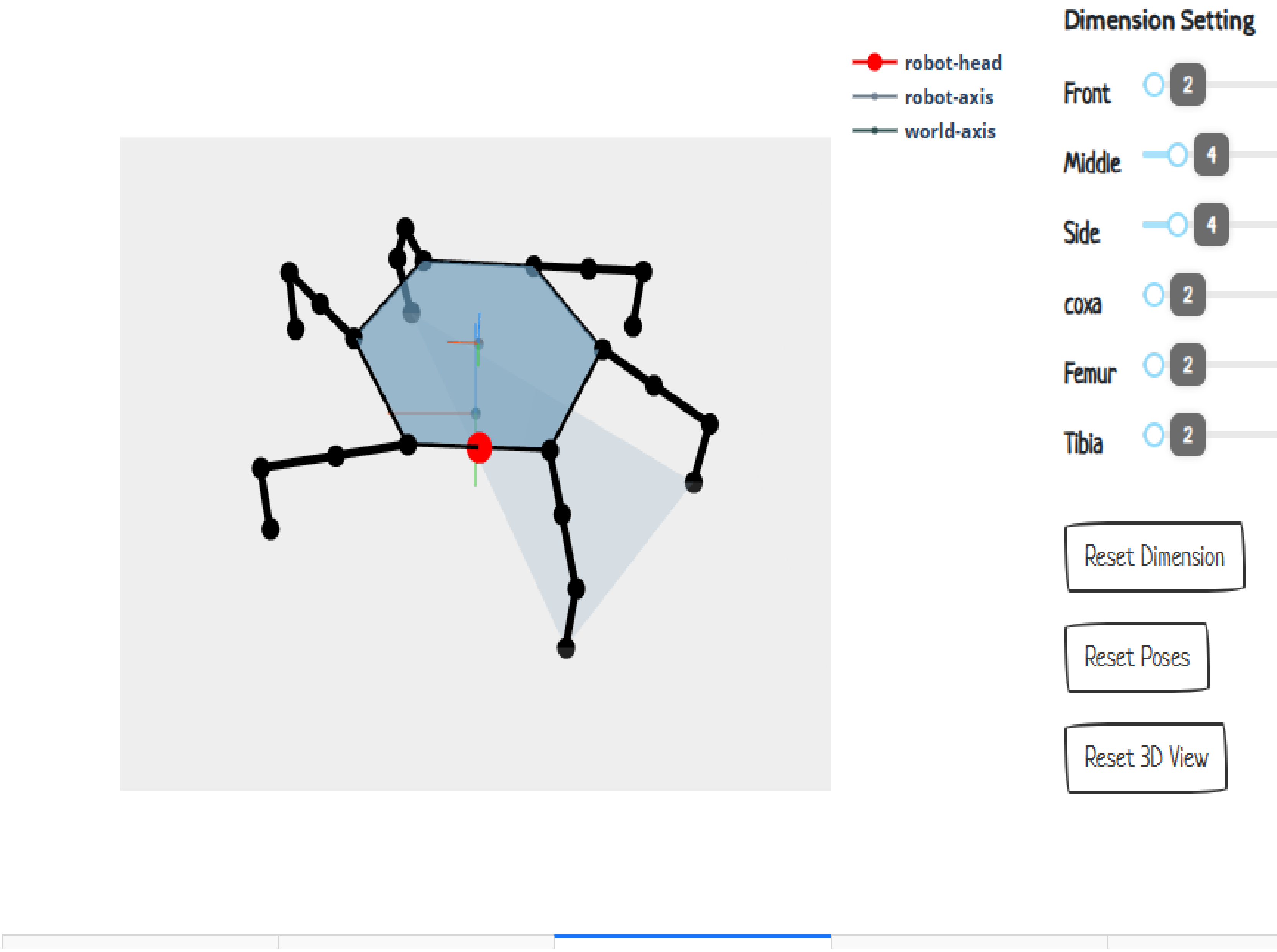


Section 1

Introduction to Robotics Simulation

Importance of Simulation in Robotics

01

Simulation Significance

Robotics simulation plays a pivotal role in testing and validating robot behaviors and functionalities before physical implementation, saving time and resources.

02

Applications

There are diverse applications of robotics simulation in research, development, and real-world scenarios, showcasing its impact on technological advancements.

03

Visualization and Analysis

Simulation aids in visualizing complex robot movements and analyzing performance metrics, fostering innovation and problem-solving.

Section 2

Challenges and Opportunities in Hexapod Simulation

Unique Challenges of Stationary Hexapod Robots

01

Stability and Maneuverability

02

Complex Leg Mechanics

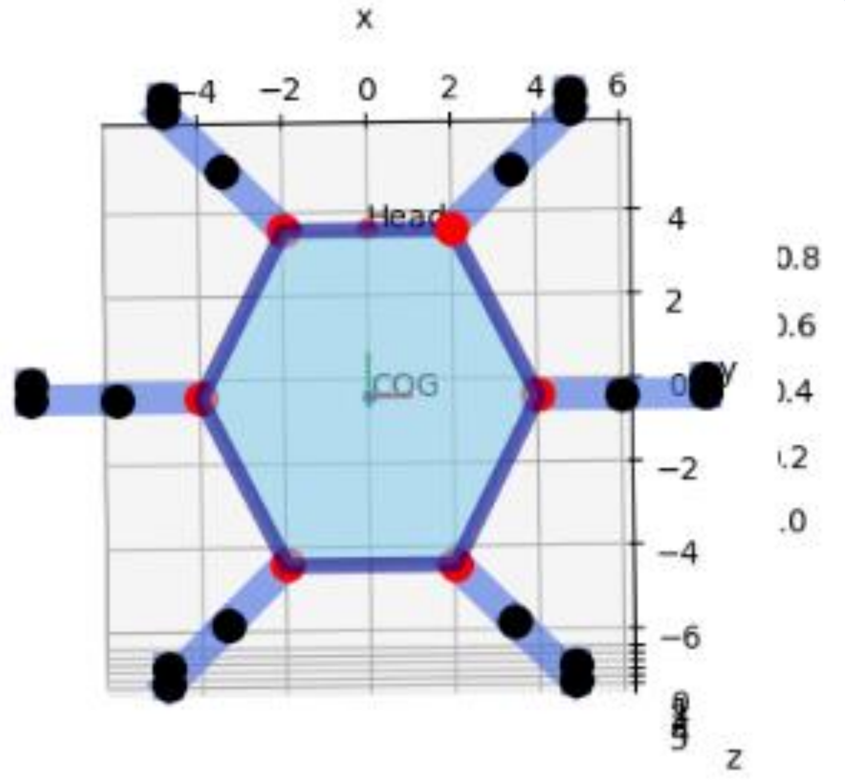
03

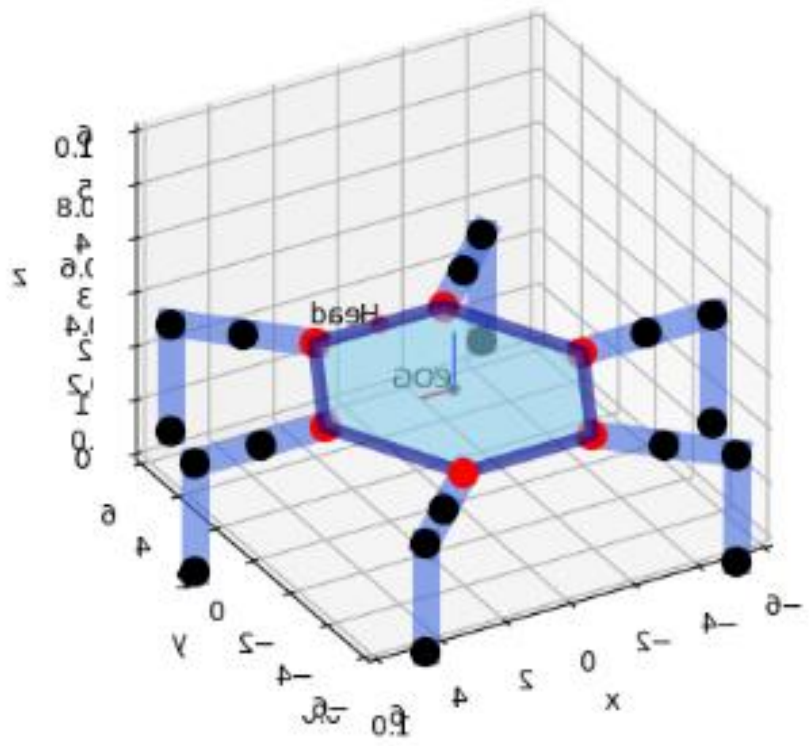
Visualization

Section 3

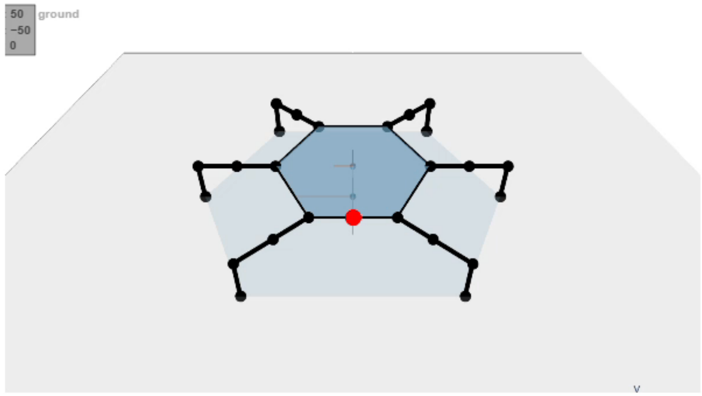
Kinematic Modeling and Visualization

Simulator Overview





Leg Pattern Manipulation



Dimension Setting

Front 2
Middle 4
Side 4
coxa 2
Femur 2
Tibia 2

Reset Dimension

Reset Poses

Reset 3D View

Inverse Kinematics	Leg Pattern	Forward Kinematics	Walking Gaits	Kinematic Phase Diagram

Adjust the angles of the leg joints to define the leg pattern.

Input Parameters:

- Coxa Angle (α): Angle of the coxa joint, which controls the lateral movement of the leg.
- Femur Angle (β): Angle of the femur joint, which controls the forward and backward movement of the leg.
- Tibia Angle (γ): Angle of the tibia joint, which controls the up and down movement of the leg.

Each leg shares the same pose defined by these angles.

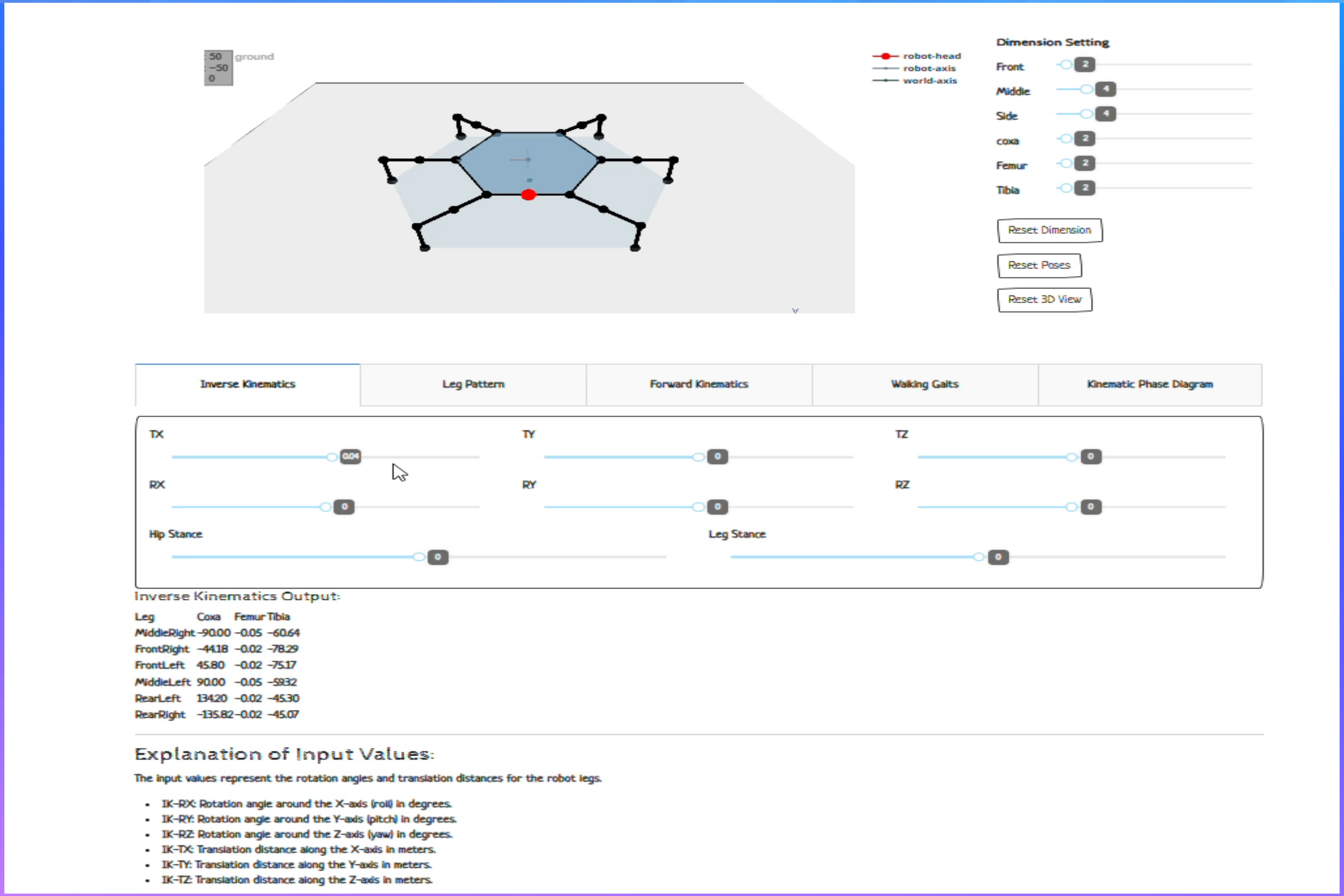
Adjust the sliders for each joint angle and observe the leg pattern visualization.

α (coxa) 0

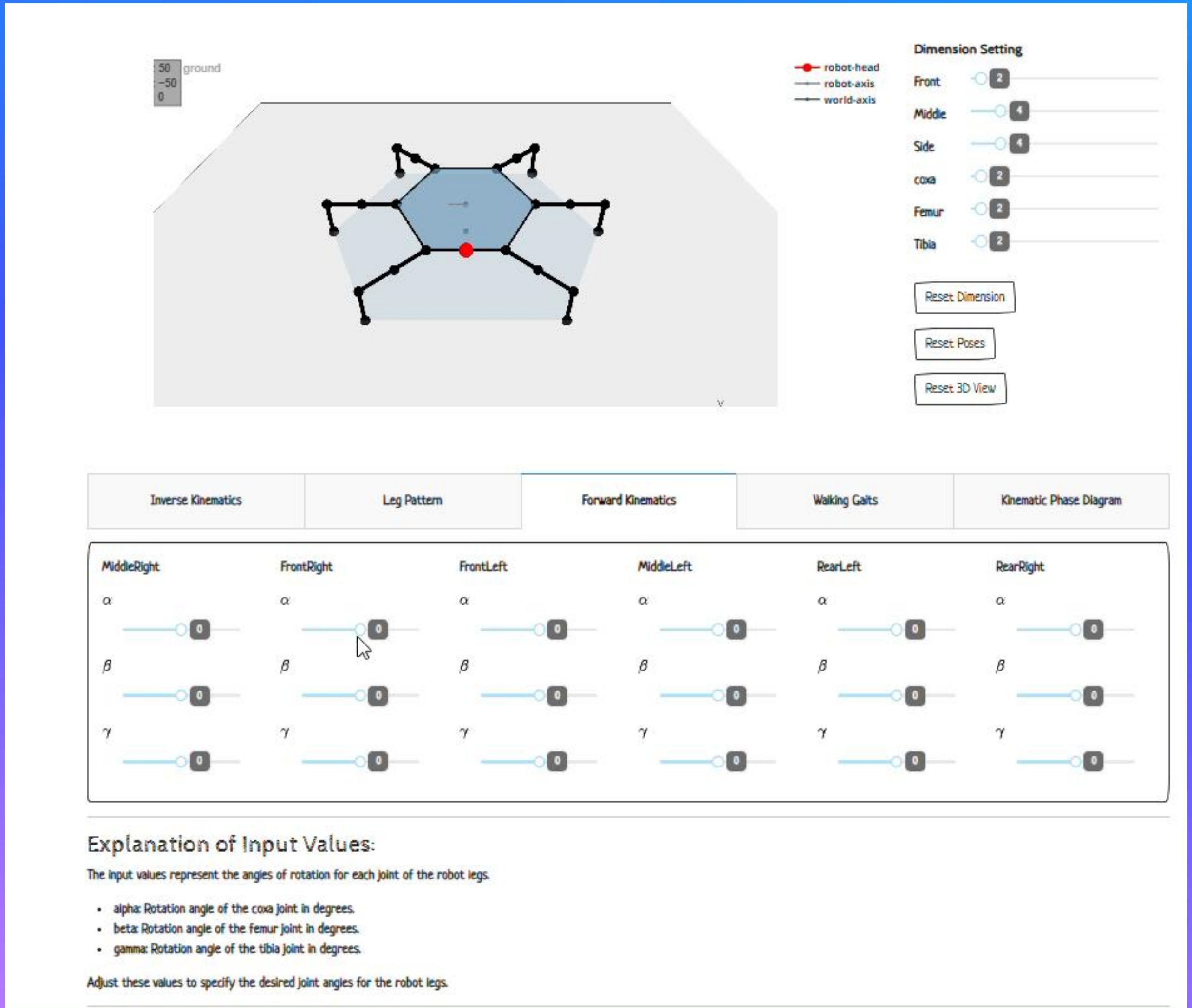
β (femur) 0

γ (tibia) 0

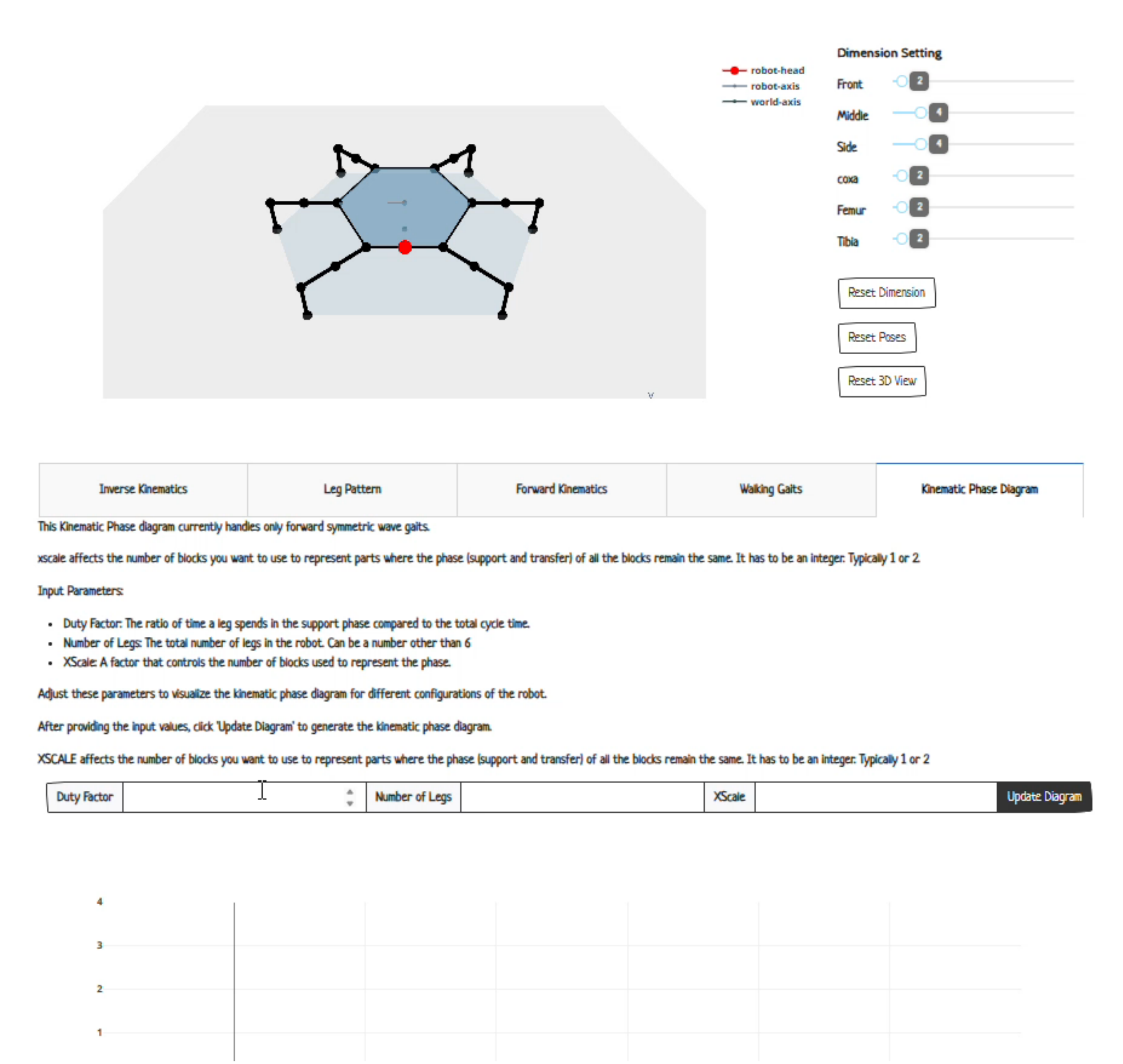
Understanding Inverse Kinematics



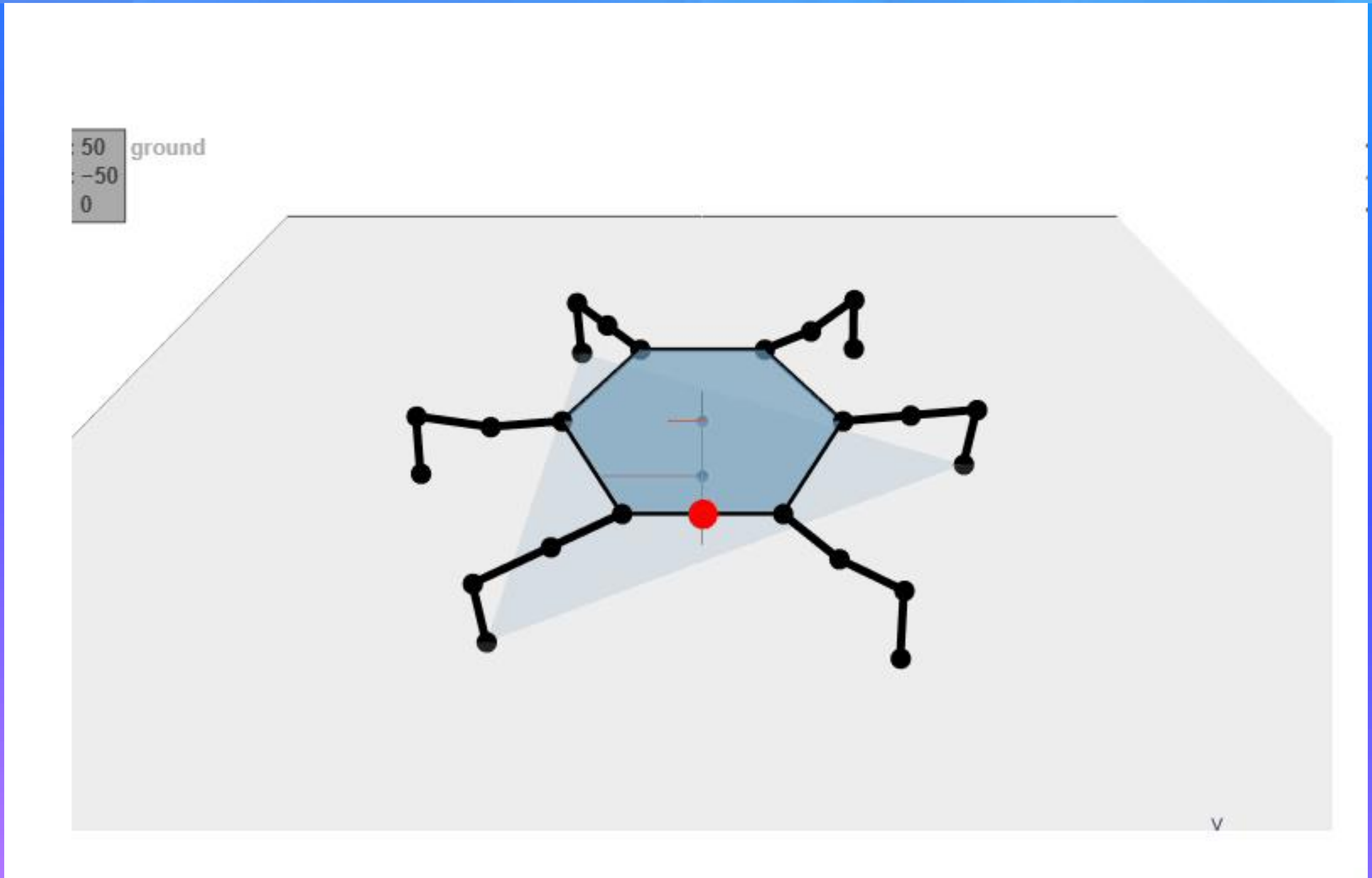
Forward Kinematics



Kinematic Phase Diagram



Walking Gait



Limitations & Next Steps

01

Additional Constraints & Environmental Simulation

02

Kinematic phase diagrams for different Gaits

03

Simulation for different gaits.

Thank You