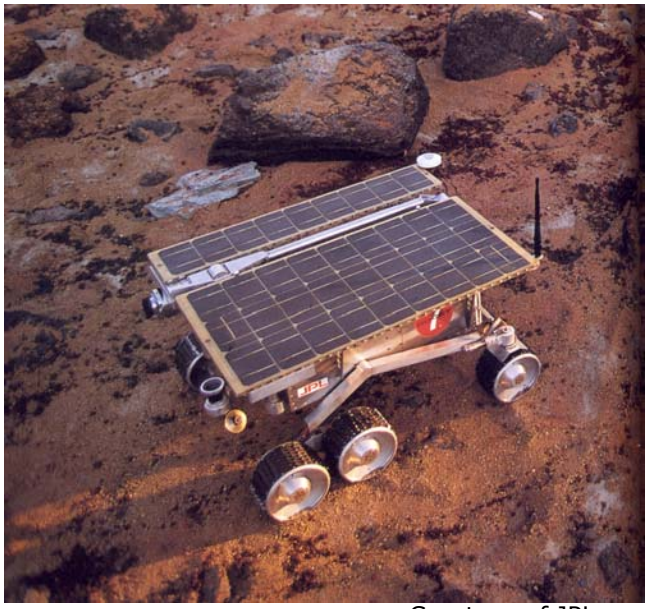
Chapter 3

Robot Mechanisms

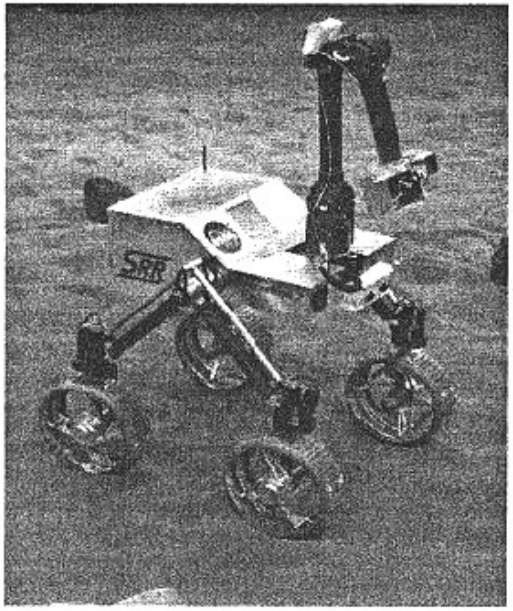
Robot Mechanisms

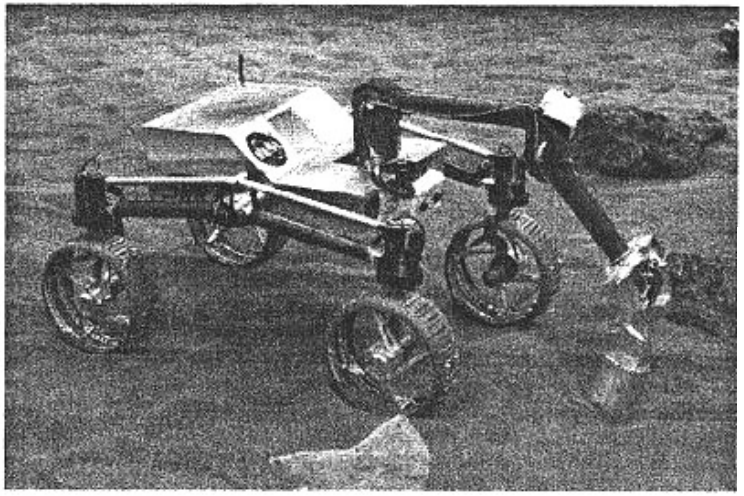
Photos of various robots removed for copyright reasons.
Sony Aibo™, Honda ASIMO, robotic hands, industrial manipulator arm.



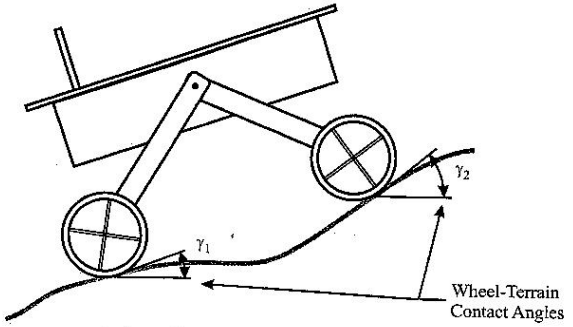
Courtesy of JPL.

Sample Return Rovers with articulated suspension mechanisms



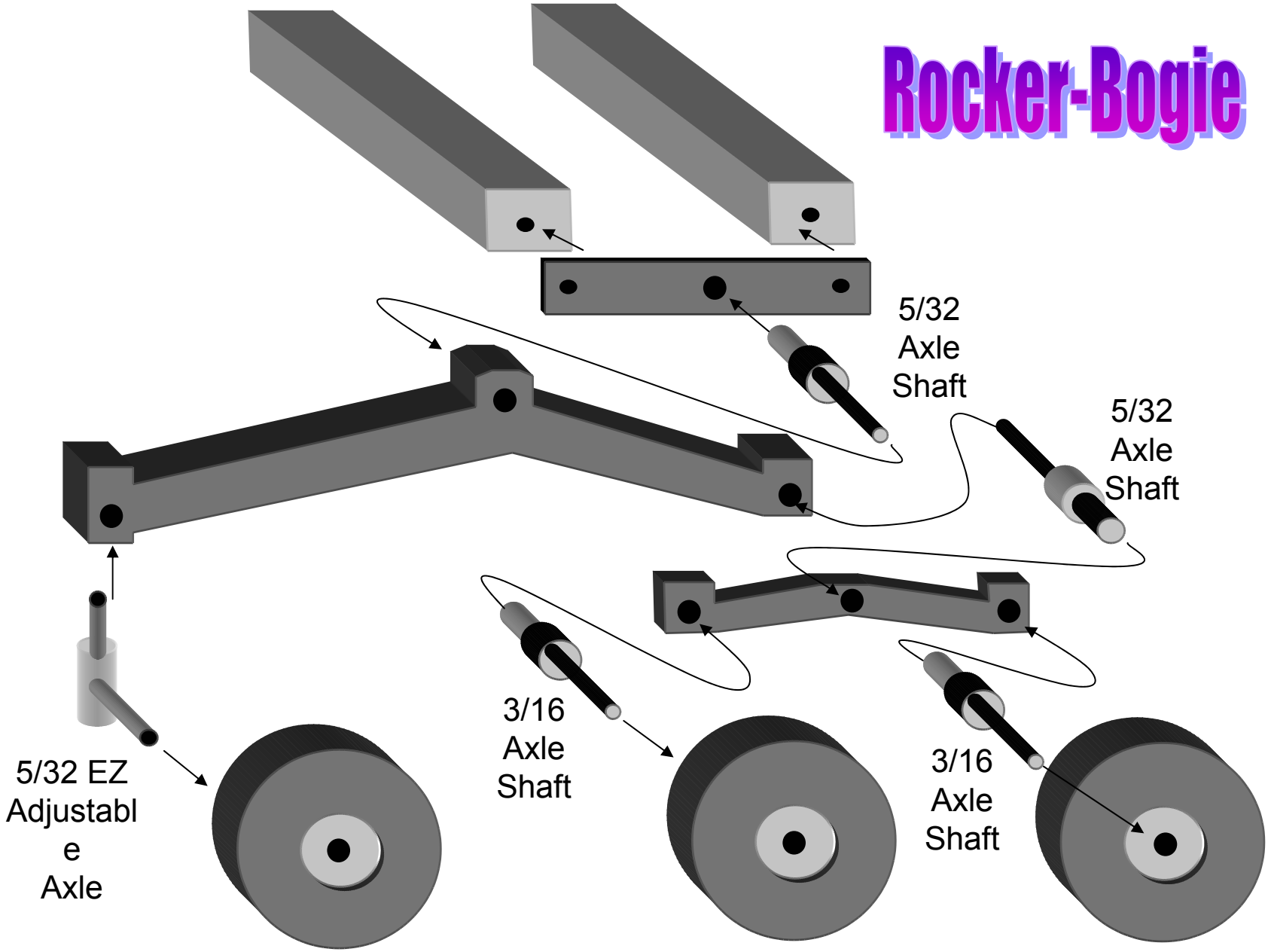


NASA JPL



Images courtesy of JPL.

Rocker-Bogie



Mars Rover Project

Photos of various robots removed for copyright reasons.
Sony Aibo™, Honda ASIMO, robotic hands, industrial manipulator arm.

Open-Loop Kinematic Chains

Serial Linkage

Biped Locomotion

Photo removed for copyright reasons:
ASIMO robot descending stairs.
See http://world.honda.com/ASIMO/.

Two-Branches of Open-Kinematic Chains

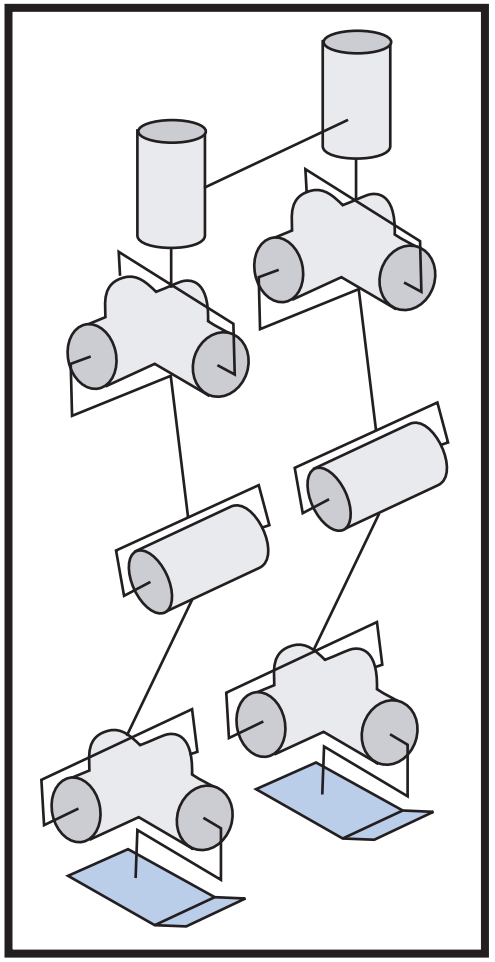
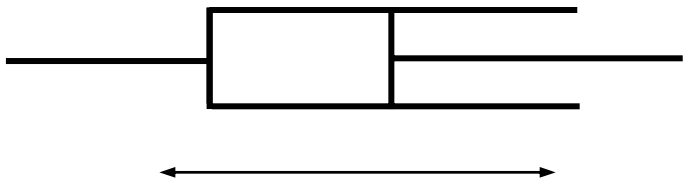
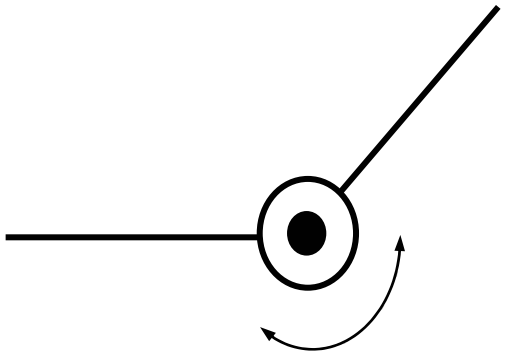


Figure by MIT OCW.

Primitives of Robot Mechanisms
Two Types of Single-Axis Joints

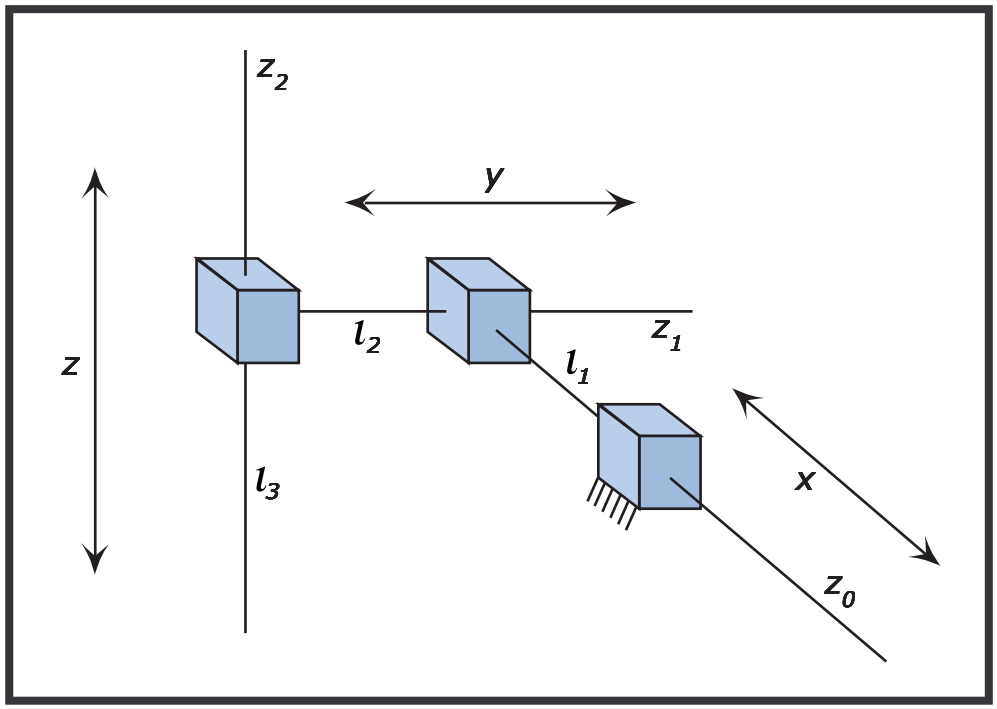


(a) Prismatic joint



(b) Revolute joint

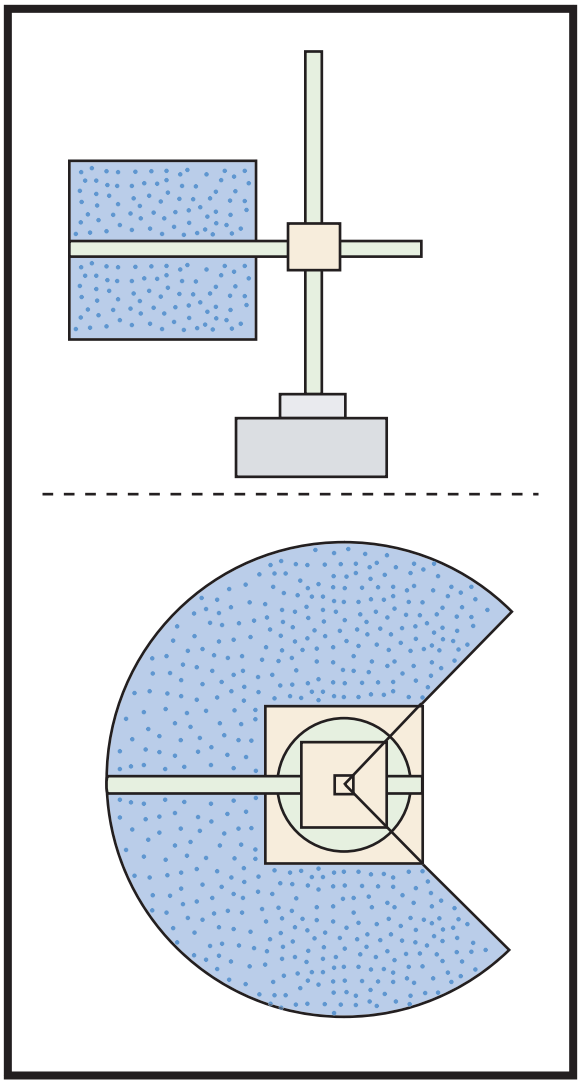
Three Prismatic Joints



Figures by MIT OCW.

Cylindrical Coordinate Robot

Photo removed for copyright reasons.
GMF Robotics M-100 arm.



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Spherical Coordinate Robot

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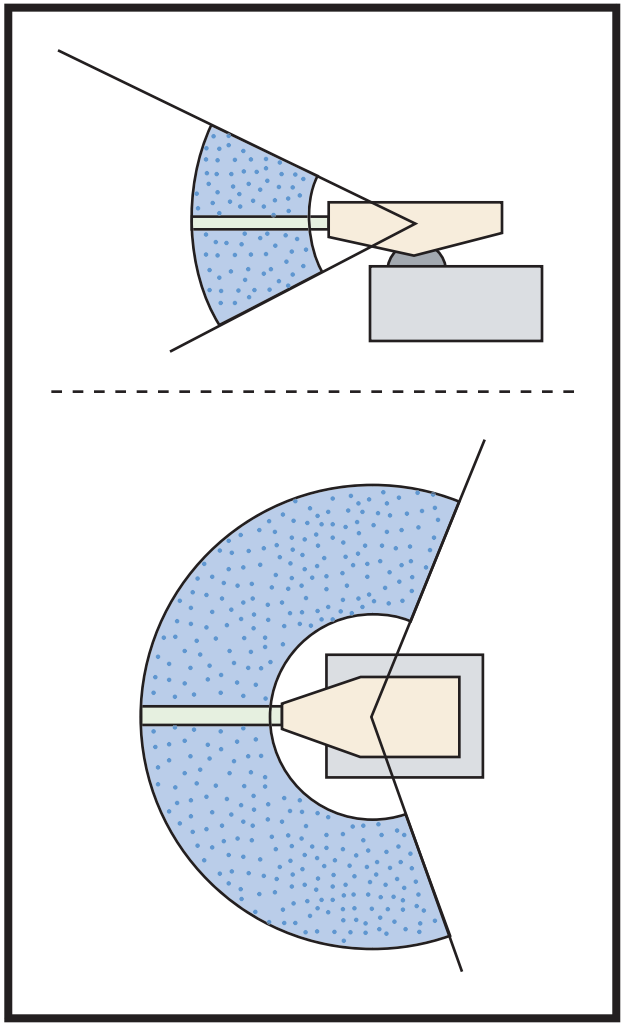

Figures by MIT OCW.

Scala-Type Robot

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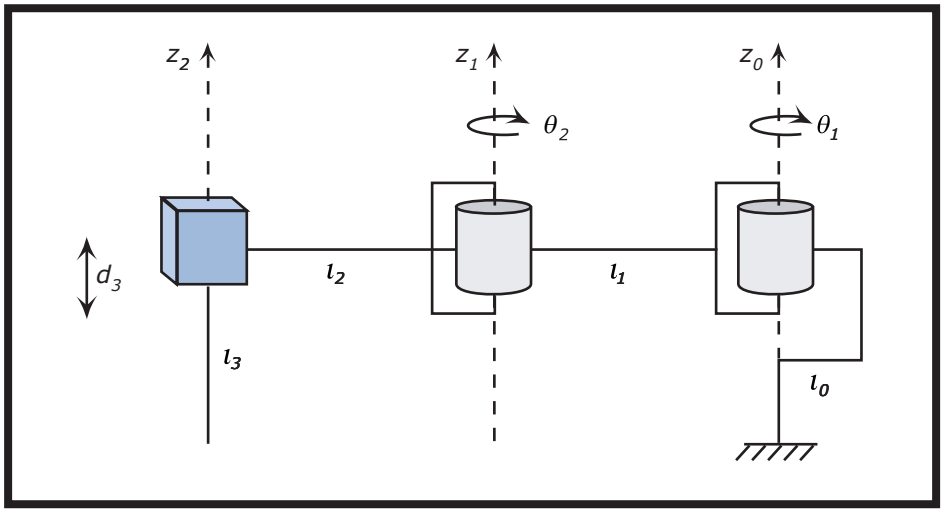

Figure by MIT OCW.

Articulated Robot

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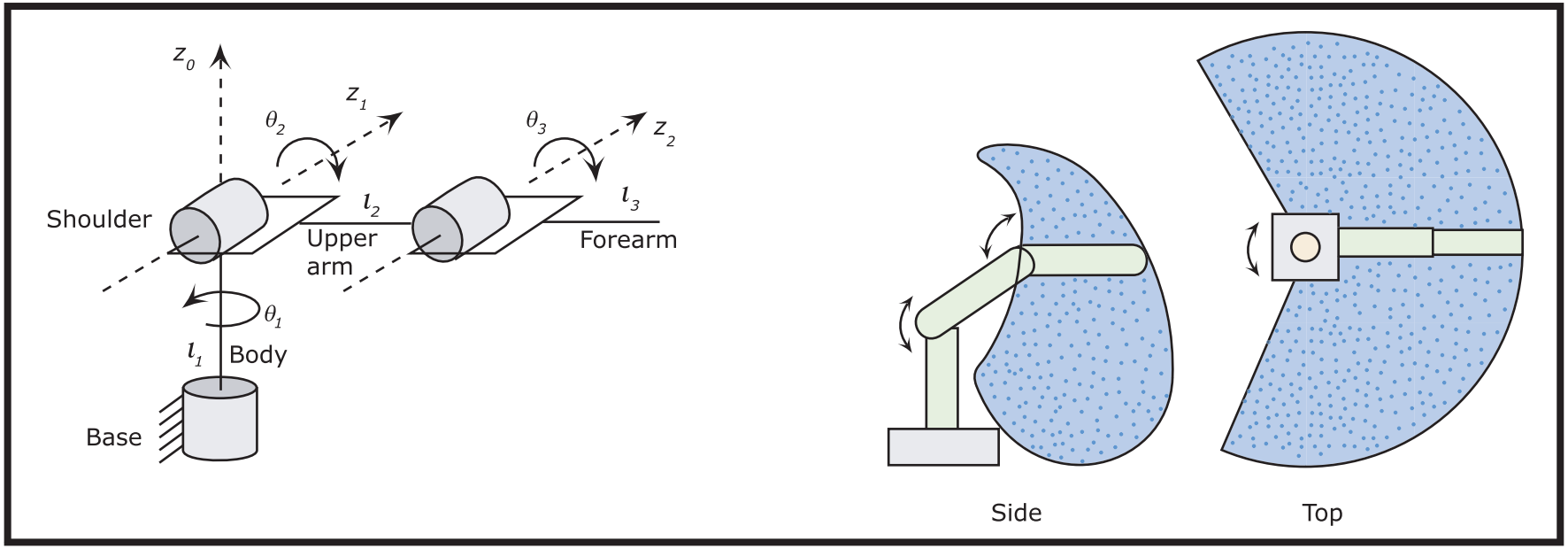


Figure by MIT OCW.

Pros and Cons of Open-Loop Kinematic Chains

Pros

- Large work space
- Dexterity
- (Lower inertia)
- (Lower cost)

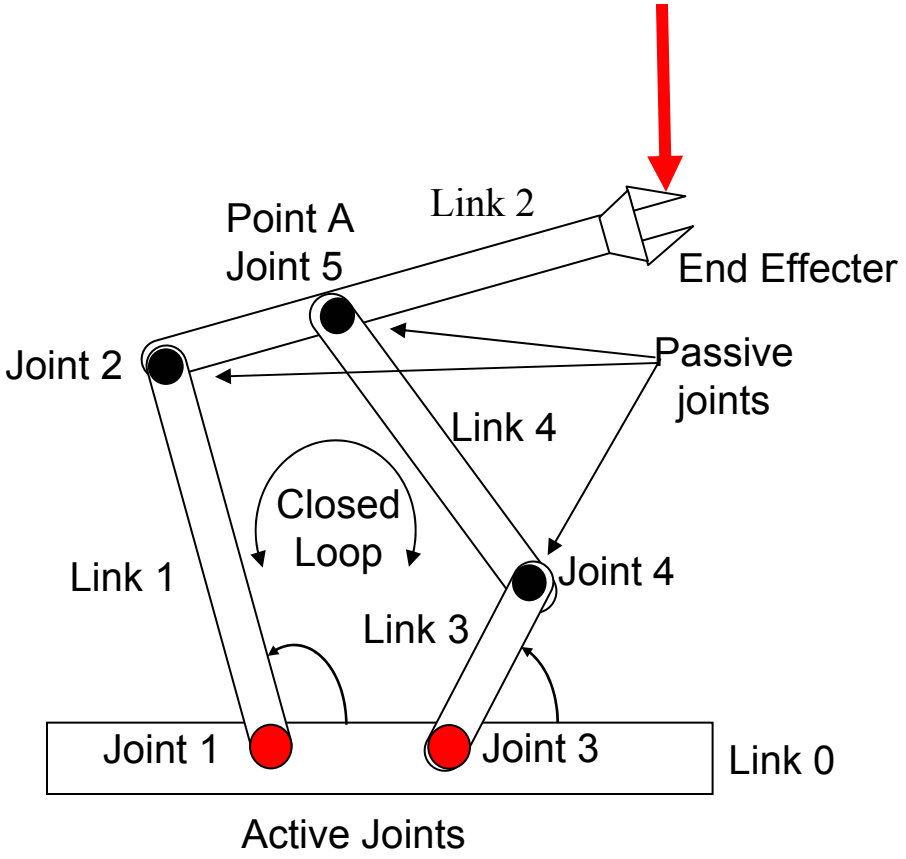
Cons

- Low stiffness
- Low accuracy
- Rapid increase of inertial load along the linkage
- Small load bearing capacity

Serial Linkage

Closed Kinematic Chain

Schematic removed for copyright reasons.



Parallel Linkage

Parallel Linkage

Position and Orientation

Position and Orientation

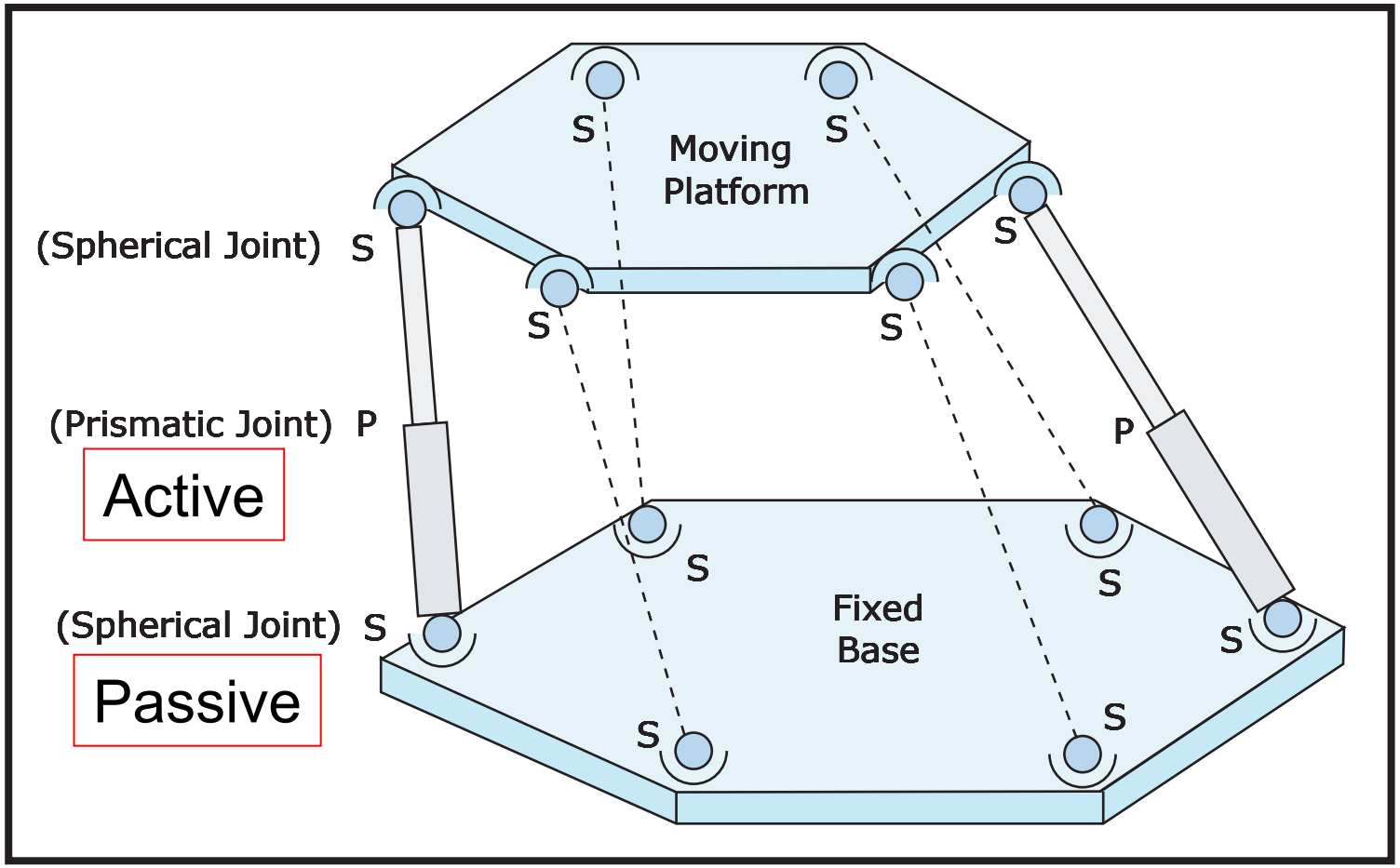


Figure by MIT OCW.

Stewart Mechanism

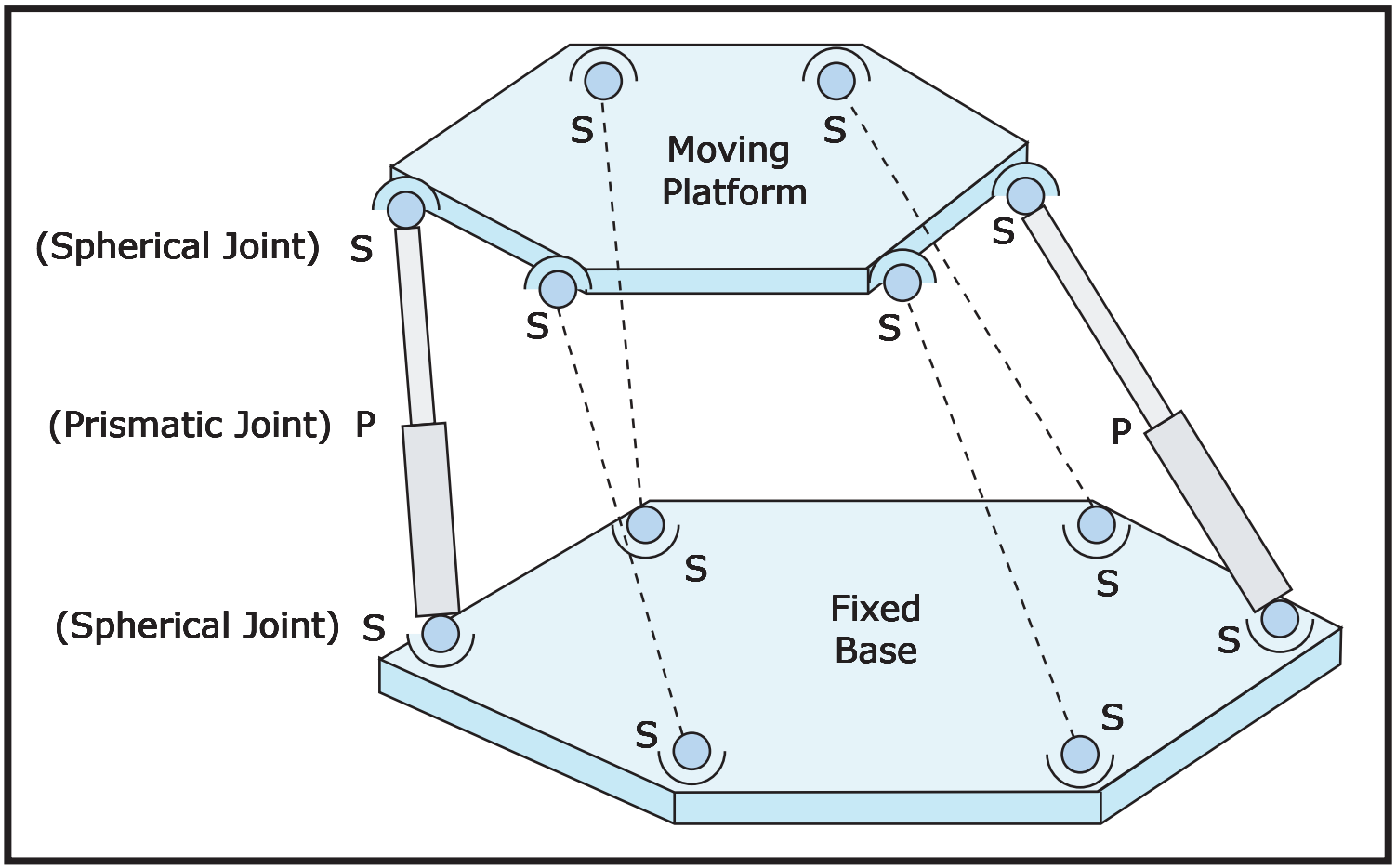
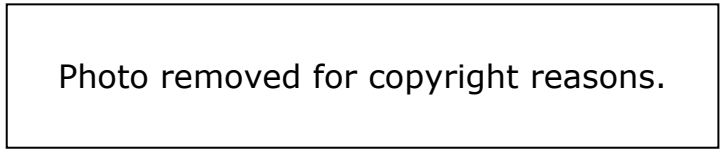


Figure by MIT OCW.

A High-Speed Robot with Closed Kinematic Chains



Biped Locomotion

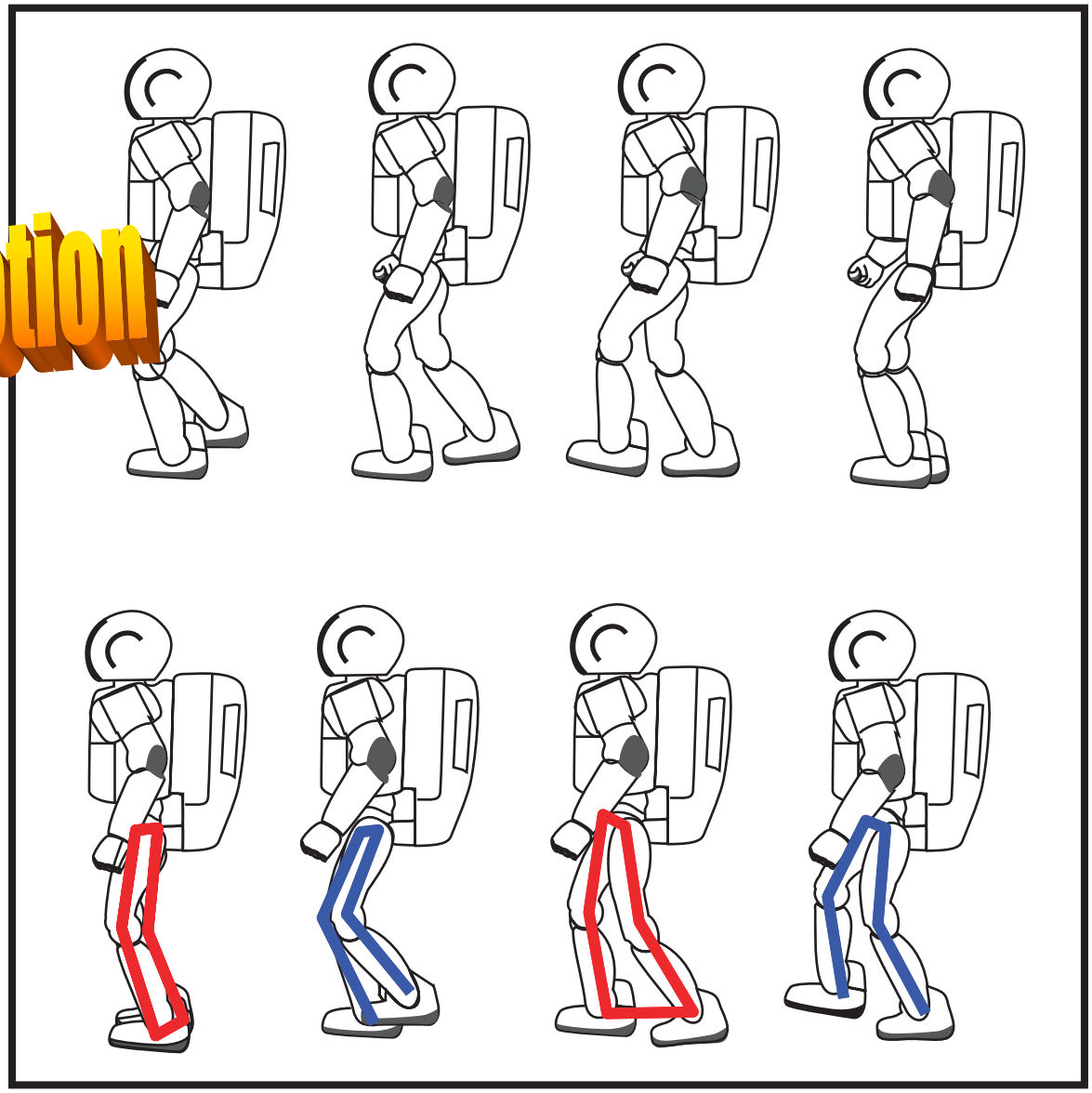


Figure by MIT OCW.

Closed-Loop

Open-Loop