

Project: Design, analyze, and prototyping of a walking robot

Objective: The purpose of this project is to

1. Design a multi-loop walking mechanism and study the kinematic motion characteristics of it.
2. Showcase the integration of Smart servo motors, ROS, Matlab, rapid prototyping, and manufacturing and assembly techniques to create a walking robot using the Jansen mechanism.

Procedure:

1. Design – You need to research the Jansen mechanism before starting this step. You will be provided with the link lengths required for building the mechanism.
2. Mechanism Analysis – The kinematic analysis of the designed mechanism must be done, and a linkage simulation using Matlab must be submitted during the mid-evals.
3. Mechanism simulation – A motion simulation of the complete robot using a CAD must be submitted during the mid-evals.
4. Equipment provision - You will be provided with a kit containing 2 - smart servos, 1 -power supply, and a controller. The controllers for the Dynamixels are provided on a shared basis.
5. Laser cut – The sketch files for the laser cut must be submitted after thorough analysis and simulation.
6. Innovative modification - You will be evaluated based on making creative modifications to the design and improving its functionality.
7. Dynamixel motor control – Either MATLAB or ROS can be used for controlling the motors.

Conclusion: This project serves as a comprehensive demonstration of how to design, 3D print, laser cut, assemble, and control a walking robot.

Instructions:

1. Please follow the link lengths, or feel free to scale the dimension if needed.
2. The acrylic sheets will be given for laser cut upon submission of motion simulation and the .dxf files necessary for it to be thoroughly verified to reduce wastage.
3. Please try to minimize the usage of 3D prints.
4. Please follow the timeline given below
5. Report submission - with all the details, analysis, and improvements carried out for the project.
6. Final Presentation – A ppt template will be shared with you soon.

Timeline:

Date	
Floating	17-03-2023
Mid-Eval	06-04-2023
Deadline for Sketch files	06-04-2023
Final presentation	21-04-2023

Learning outcomes:

1. Designing mechanical hardware of robots.
2. Developing mechatronics system design and Apply programming and hardware design skills.
3. Implementing kinematic motion study.
4. Design for manufacturing.
5. Using smart servo motors and integrating them with ROS and Matlab.
6. How to use manufacturing facilities like rapid prototyping and laser cutting.

Link Lengths:

