

# ROBOTICS WORKSHOP

## DAY 1

- Logistics
  - Workshop Structure
  - Content Overview
  - Resources: (Our repo, pybullet user manual, Kevin Lynch's video)
- Introductory Talk
  - Robotics: as we know it (an intro)
  - Simulations, why, what and how?
  - Key differences between:
    - hardware -> sim
    - sim -> hardware
- Getting Started in Pybullet
  - URDF's
  - Types of joints
  - Demo: Making a simple two-link mechanism and loading it inside pybullet Show how to simulate as well.
  - Robot Coordinates
  - Task Space
  - Joint/Configuration Space
  - Base position, orientation (explain rpy, mention quaternion exists, but no need to explain)

## DAY 2

- Controlling the/any Robot
  - types of control over types of joints
  - pos, vel, and torque control
  - revolute and prismatic joints

- Simple Robot Kinematics
  - Forward Kinematics (explain with 2R link and trigonometry)
  - Inverse Kinematics (explain with 2R link and trigonometry)
  - Demo: So, a 2R Link manipulator in actions(1) with trigonometric IK 2) with inbuilt IK)

## DAY 3

- A brief intro to dynamic parameters of the simulation
  - `changeDynamicsInfo()`
  - Demo: show how the simulation responds to these changes (like block sliding vs friction, a ball bouncing vs restitutions or how a husky reacts to these changes)
- Robot Control
  - Open Loop vs Closed Loop
  - P control
  - PD control
  - PID control
  - Demo: show a line (line segment) follower in action (with base orientation and not image data, will explain more clearly in a meet)

## FINAL TASK

- ❑ Implementation of **PID** controller for a robot