United States Naval Academy
Department of Weapons, Robotics, and Control Engineering

Course: EW450 Introduction to Robotic Systems

Credits: 3 credit – 2 recitation hours – 2 laboratory hours

Course Description: An introduction to the modeling and control of articulated robotics, primarily in the kinematic domain. Students develop methods for modeling and describing articulated robots including robot configurations, workcell layout, reachable and dexterous workspace, forward kinematics, inverse kinematics, and Jacobians. Methods are applied using introductory computer vision and camera modeling to accomplish pick-and-place, industrial-style tasks.

Pre-requisites: EW200 and EW316

Course Coordinator: Prof. Mike Kutzer

Textbook: None

Course Objectives:
Explain the basic considerations in robot workspace and workcell layout;
Compute, apply, and manipulate rigid body transformations;
Derive, utilize, and explain the uses and limitations of forward kinematics for articulated robots;
Derive, utilize, and explain the uses and limitations of inverse kinematics for articulated robots;
Derive, utilize, and explain the uses and limitations of the Jacobian for articulated robots;
Implement and explain the basic strategies behind segmentation-based image processing; and
Calibrate and register a camera to a robot, and use it to complete fundamental pick-and-place tasks.

Topics:
Robot Configuration
Robotic Workcells
Workspace
Rigid Body Transformations
Forward Kinematics
Inverse Kinematics
Robot Jacobian
Pinhole Camera Model
Camera Registration
Fundamental Computer Vision
Color Thresholding
Segmented Object Properties

Last Updated: 15-December-2020