

RAI 911: Humanoid Robotics

Textbook

1. Motion Planning for Humanoid Robots by Kensuke Harada, Eiichi Yoshida, Kazuhito Yokoi (Springer), Introduction to Humanoid Robots by Shuuji Kajita, Hirohisa Hirukawa, Kensuke Harada, Kazuhito Yokoi (Springer).
Handouts and research articles may also be used by the instructor.

Objective

2. Humanoid Robots aim to replace humans in tasks that require human dexterity yet are too dangerous or mundane for us. Motion Planning and Control of Such robots is quite complex. It is therefore a key component of robotic research and a significant amount of research is being performed in this domain. This course aims to familiarize the students with various motion planning frameworks and control algorithms for humanoid robots including locomotion, manipulation and grasping tasks.

Pre-Requisite

3. Linear Algebra, Robot Mechanics and Control

Course Outcome

4. The students will be well-versed in whole body motion planning, task planning, biped gait generation and sensor feedback and control by the end of this course.

Course Outline

5. Students will be introduced to the concepts of Bipedal Walking, Manipulation Planning, Whole Body Planning, Pattern Generation and Grasping based on feedback.

Topics	Allocated Periods
<div> <input type="checkbox"/> Introduction to Humanoid Robots </div> <div> <input type="checkbox"/> Humanoid Kinematics and Dynamics </div> <div> <input type="checkbox"/> Walking and ZMP </div> <div> <input type="checkbox"/> Walking Pattern Generation </div> <div> <input type="checkbox"/> Navigation </div> <div> Whole-Body Planning and Manipulation </div> <div> Efficient Motion and Grasping Planning </div>	45