ME4245/ME4245E
Robot Kinematics, Dynamics and Control

Part 1: Topics 1 to 4

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CHAPTER 0

Introduction

What this module is about

Admin details

Learning Objectives

- Know what a robotic manipulator is
- Know what a robotic system is
- Different subsystems

- Analyze and synthesize robotic mechanisms including controllers

Robot

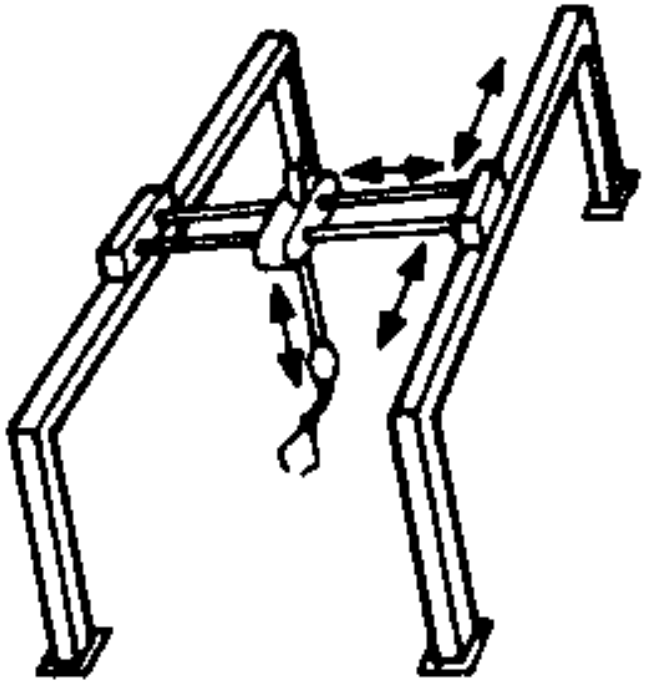
- Articulated system of bodies connected to each other
- Providing relative motion
- To achieve manipulation task
- Consists
  - Mechanism
  - Sensing
  - Actuation
  - Intelligence

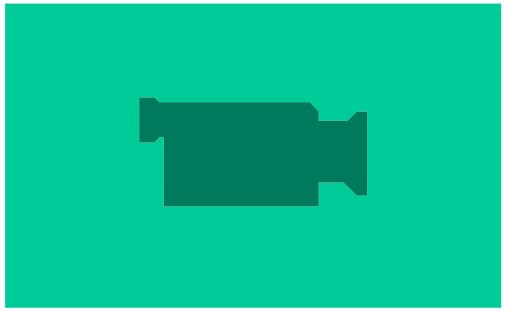
Robotics

- Interdisciplinary
  - Mechanical engineering
  - Electrical engineering
  - Computer science
  - Bio engineering
- Design, construction, operation, and use of robots, and computer systems for their control, sensory feedback and information processing.

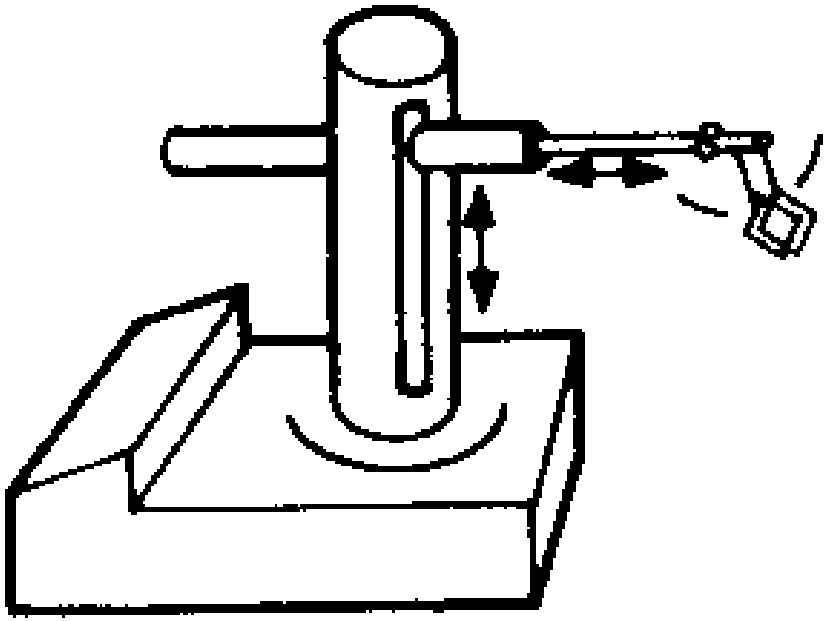
Robotic Manipulator Configurations

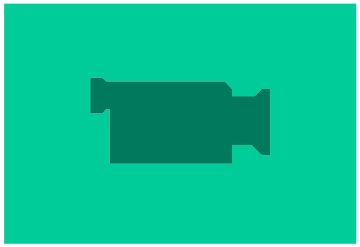
Cartesian



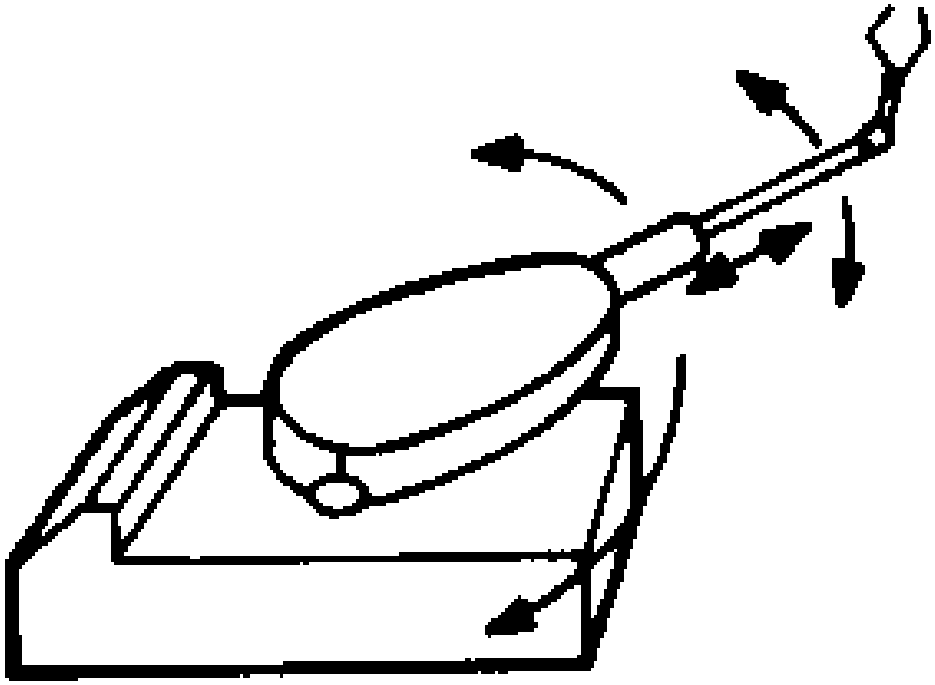


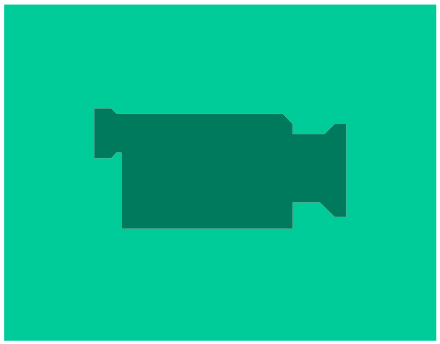
Cylindrical



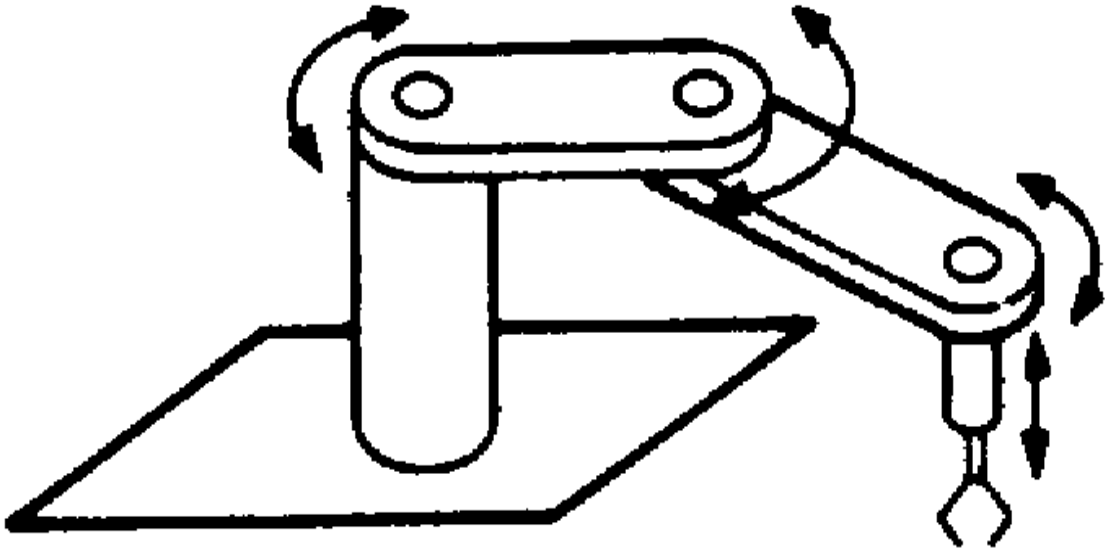


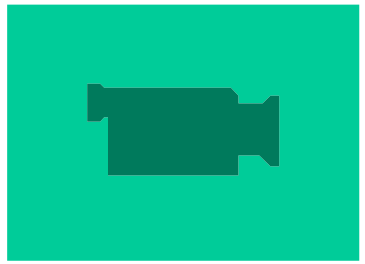
Spherical



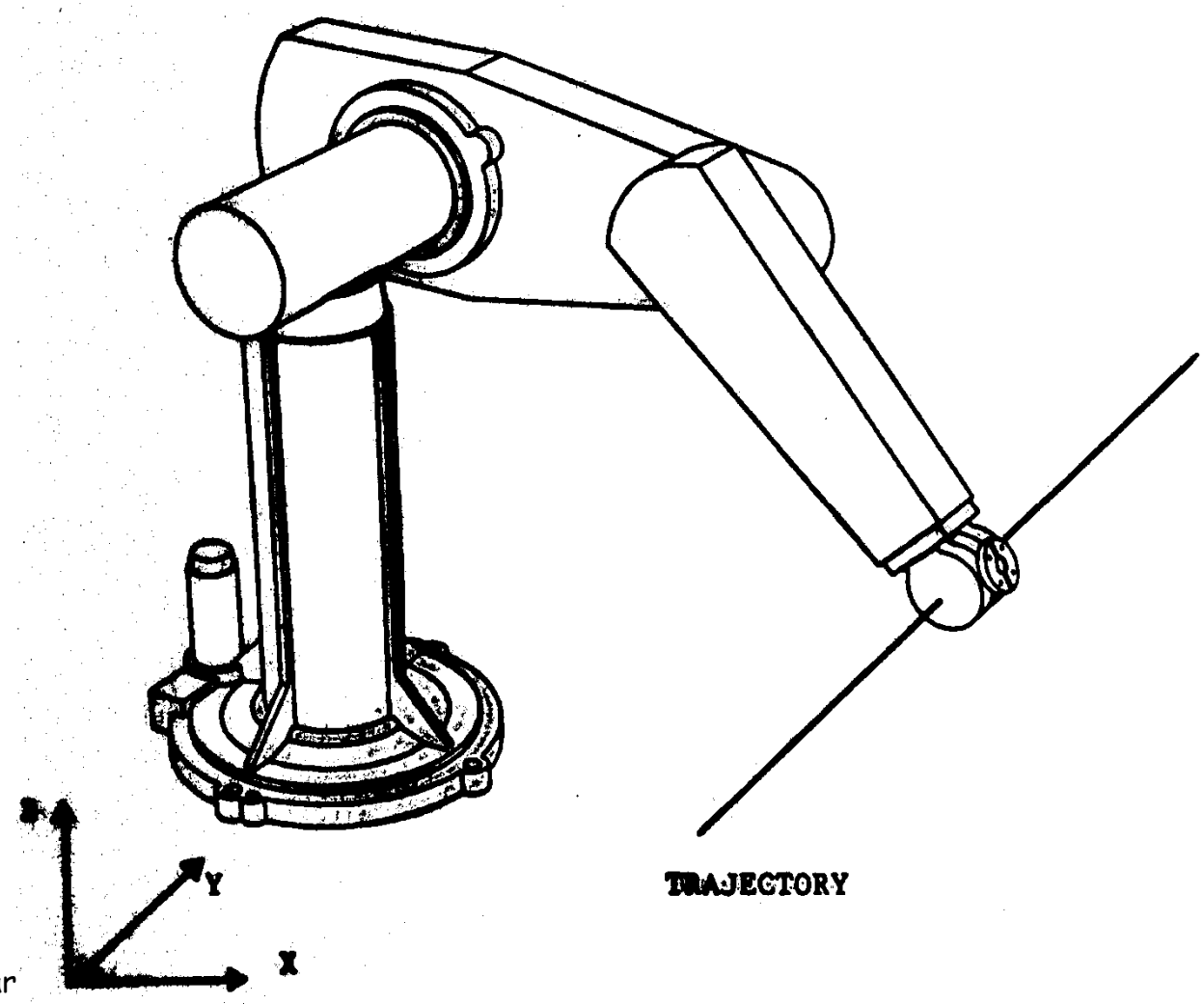


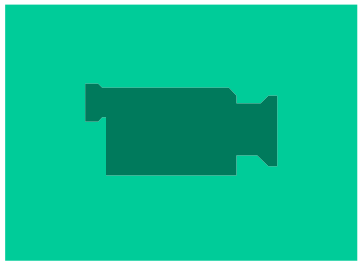
SCARA



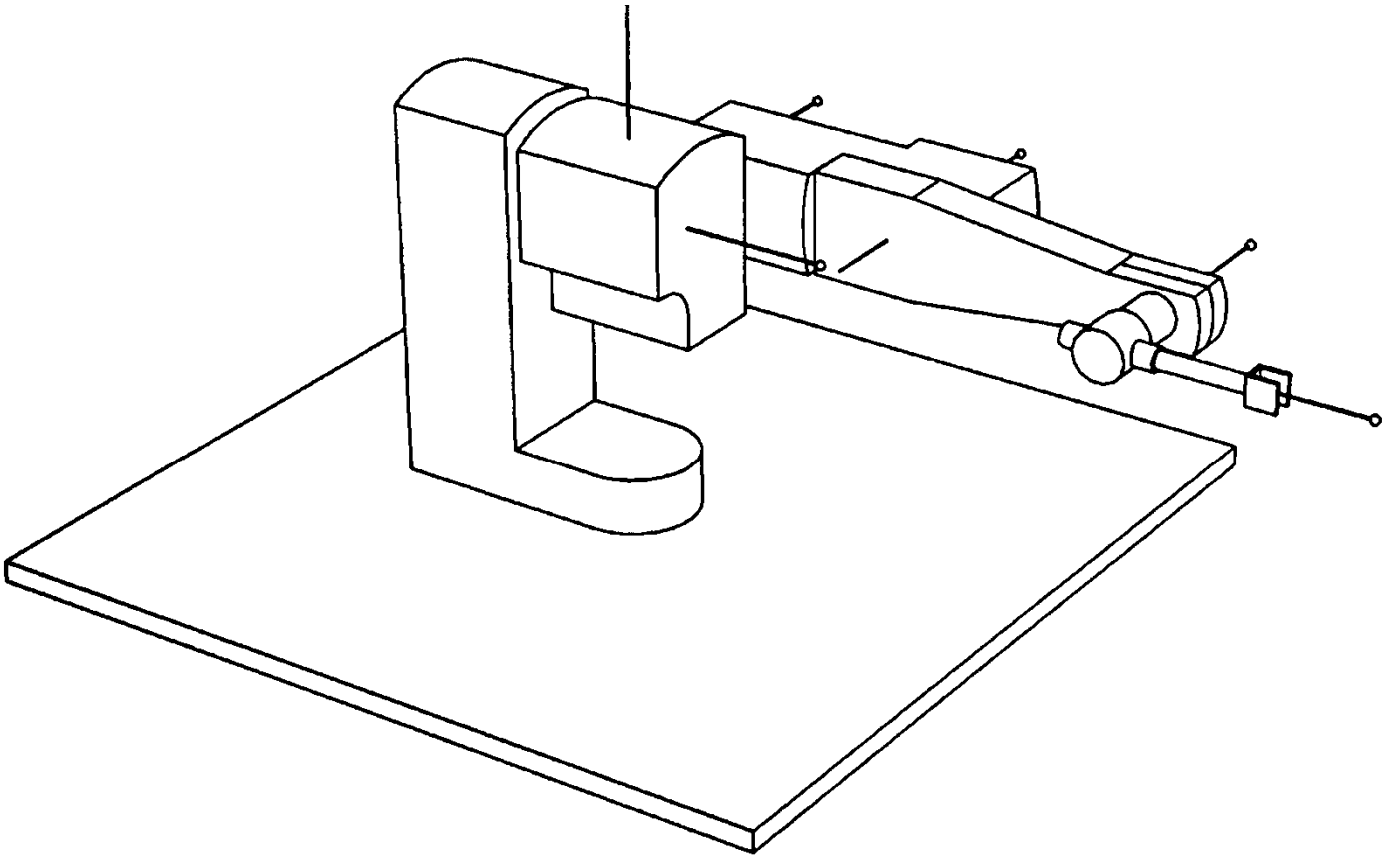


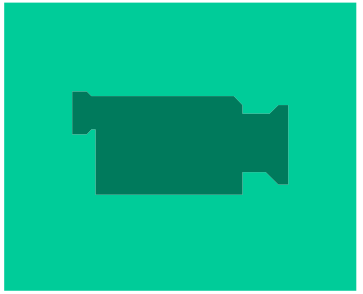
Articulated (PUMA)





Articulated (Intelledix)





Contents

- Robot Manipulator Kinematics (50%)
- Robot Manipulator Dynamics (25%)
- Robot Manipulator Control (25%)

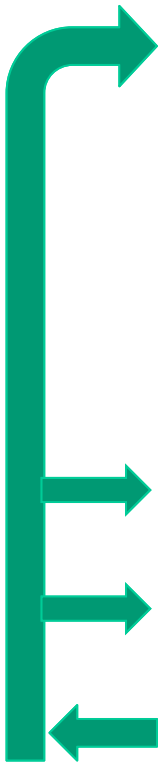
Assessment

- One final examination (70%)
- Quizzes (at least 2, 15% each)
- All quizzes and final examination are open book/notes
- Exercises / homeworks (not graded)

Other aspects (not covered)

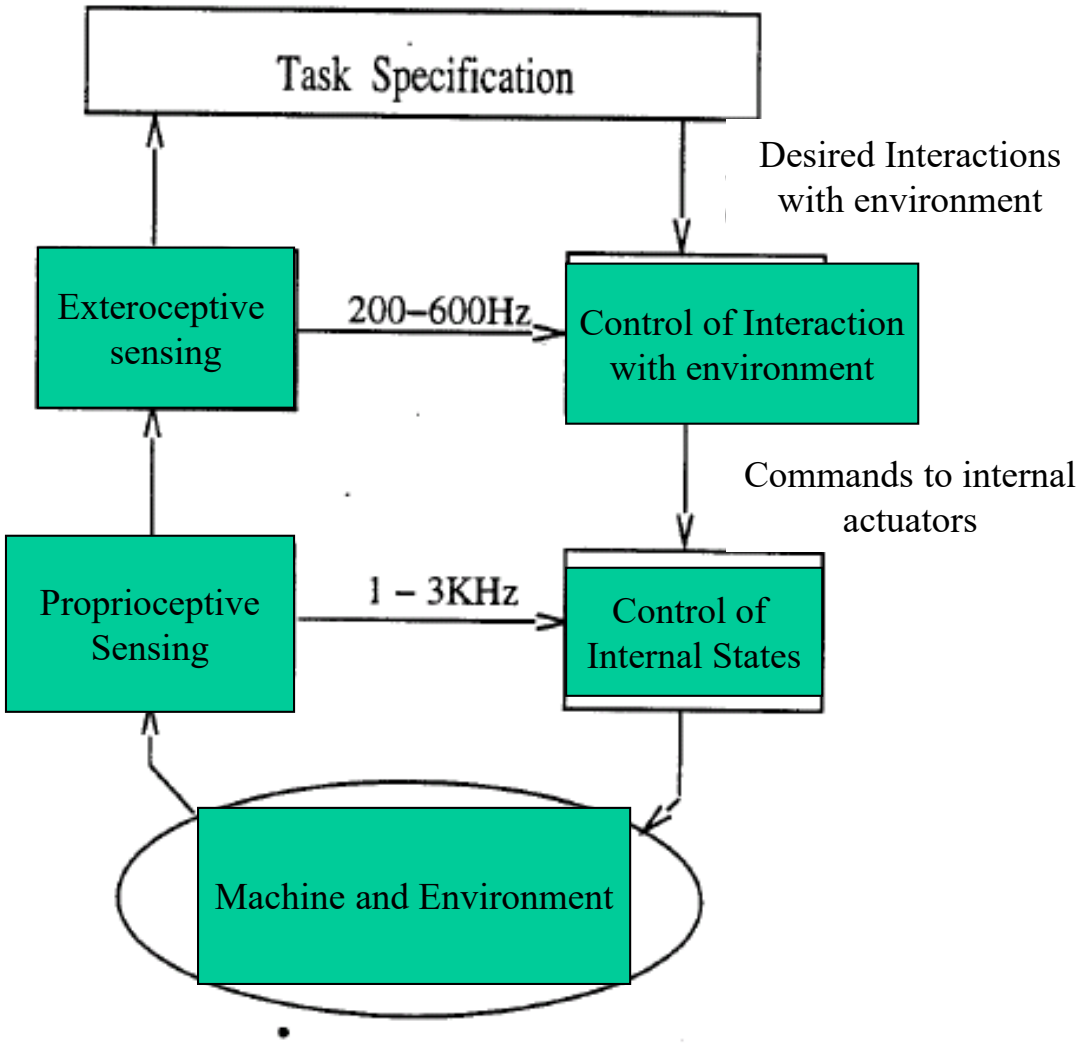
- Motion Planning
- Task Planning
- Intelligence
- Mobile Robots
  - Wheeled
    - Omni-directional vs non-omnidirectional
  - Legged

The Robotic System

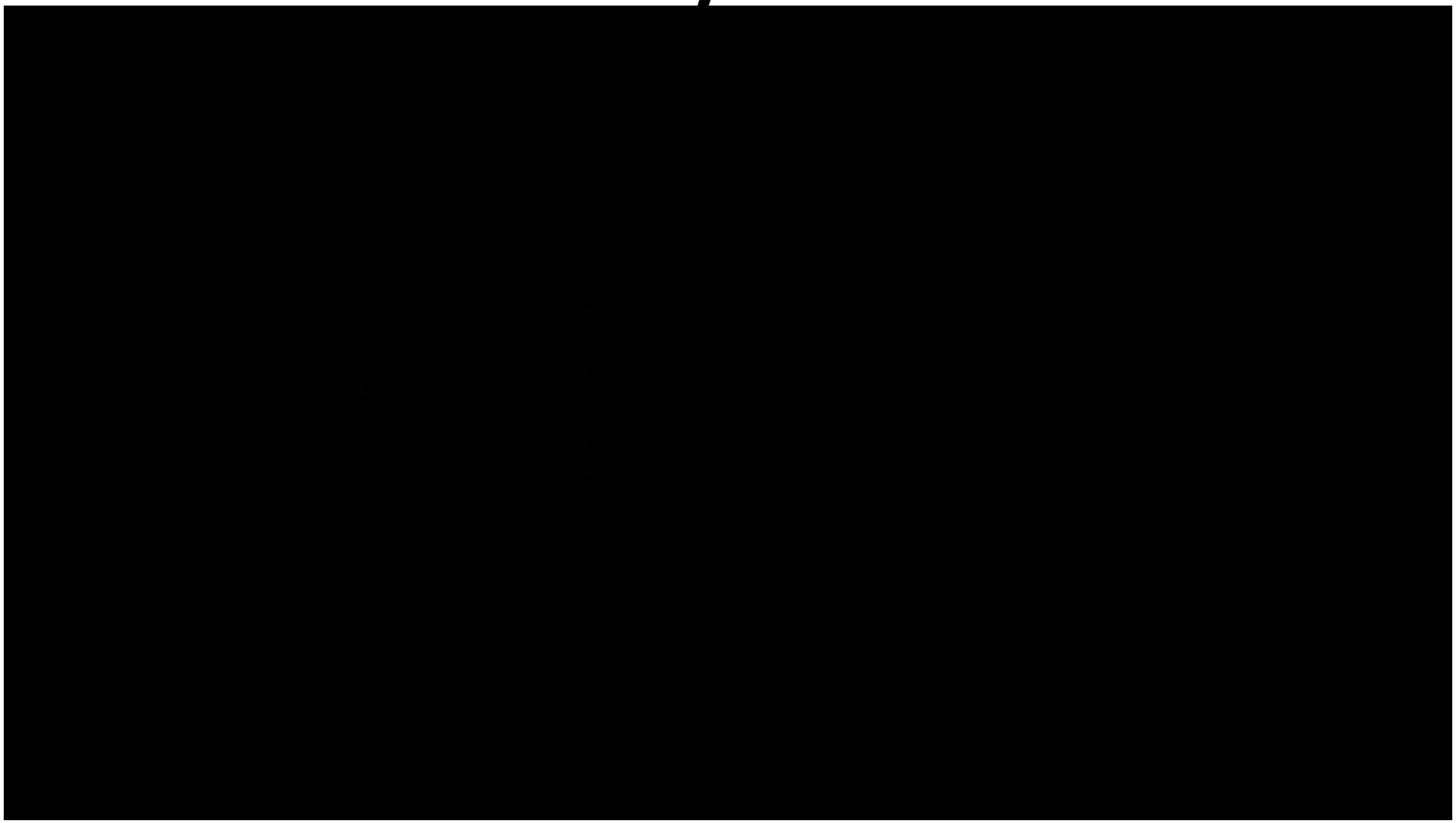


- Sensing to Perception
  - Raw sensors
  - Processing
  - Meaning (situational and context awareness)
- Planning and Decision Making
- Execution and Control
- Learning

Robotic System Architecture



Kuka IIWA – Human Friendly Robot



https://www.youtube.com/watch?v=7GdiN6KmGCc