ROS and MoveIT Cobot Programming

Level: Bachelor/Master (1-3 students possible)
Duration: 3-4 months
Start: By agreement
Mentors: Nikola Knežević, Nikola Ružić
Institution: ETF Robotics

Overview and Technology: ROS and MoveIt cobot programming with the **Franka Emika Panda** focuses on building a complete software pipeline for planning, executing, and supervising robot motions in a flexible and safe way. In this approach, **ROS (Robot Operating System)** provides the modular communication framework (nodes, topics, services, TF, parameters), while **MoveIt** serves as the motion planning and manipulation layer—handling kinematics, collision checking, trajectory generation, and integration with controllers. A typical Panda programming workflow starts by modelling the robot and the cell in **URDF/SRDF**, then using **TF** to maintain consistent coordinate frames (base, tool, workpiece, camera/fixtures). MoveIt's **Planning Scene** represents the environment and is continuously updated with collision objects (tables, conveyors, fixtures, storage bins). This allows the robot to plan collision-free paths for pick-and-place, palletizing, kitting, or assembly tasks. Motion plans can be generated using different planners (commonly OMPL-based planners) and executed as joint trajectories through **ros_control** controllers connected to the Panda hardware interface (often via franka_ros / libfranka).

Platforms / hardware	Software & tools
- Franka Emika Panda 7DoF Cobot - PC Workstation - Intel RealSense Camera	- Linux + ROS - Python, C++, OpenCV - MoveIT

Project options (projects can be modified based on student interests**)**

- Bin pick and place
- Conveyor pick and place
- Palletizing

Expected outcomes	Recommended background
- Literature review - Project code and documentation/video - Final report in IEEE research paper form	- Basics of robot programming and control - ROS basics + MoveIT - Image Recognition

Literature

- MoveIT tutorials
- ROS Basics
- Franka ROS + ros_control