



Find Viewpoint (for B.Sc./M.Sc.)

The goal of this project is to actively recover the camera viewpoint corresponding to a given RGB target image in an eye-in-hand tabletop setting. Unlike conventional camera relocalization [1], no pre-collected scene-specific reference-view dataset is assumed. Instead, the robot sequentially acquires observations and decides where to move the camera next.

The project consists of two main components:

- (1) **viewpoint selection** – deciding which reachable viewpoint should be observed next, and
- (2) **viewpoint evaluation** – estimating how well the current observation matches the target view.

The search is performed within a constrained hemispherical viewpoint space while considering robot reachability and collision-free motion. Students may explore classical image matching, learned visual features, adaptive search strategies, or reconstruction-based approaches.

Methods should be evaluated in terms of **target-pose accuracy, number of acquired viewpoints, robot path length, and computation time**. Comparisons against simple uniform or random-search baselines are expected.

[1] Brachmann, Eric, Tommaso Cavallari, and Victor Adrian Prisacariu. "Accelerated coordinate encoding: Learning to relocalize in minutes using rgb and poses." Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition. 2023.

Software Requirements:

Programming language	C++ / Python
Framework (e.g. ROS 1/2)	ROS 1 / 2 & Moveit / cuRobo
Simulator	Own Renderer & Gazebo / Pybullet

Hardware Requirements:

Robot	xArm7 / UR5e
Sensor (e.g. camera)	RGB camera

Notes:

- For Bachelor, the difficulty of the task will be adjusted downwards.