Basic Fiducial Navigation Sketch

November 11, 2020 / hemals@nvidia.com

# Document Purpose

This document intends to lay out a scenario that we at NVIDIA believe distills a real-world use case for navigation and mapping using ISAAC SDK. The objective is to validate that this indeed is an actual use case as described before investigating whether it is feasible with ISAAC SDK 2020.1NX without source access or substantial modification.

# Overview

In this simple scenario, we expect a robot to navigate from an initial pose to a target pose in an indoor environment. The robot has one or more monocular cameras to estimate the pose of fixed AprilTag fiducials and perform visual odometry as well as depth sensors (stereoscopic or LiDAR). The environment is a simple rectangular room with simple obstacles. AprilTag fiducials are affixed to the walls such that the robot cannot necessarily perceive more than one from any given location. A map is surveyed as the pose tree of transforms between each fiducials and a room origin frame and the location of each fixed obstacle.



# Use Case Sketch

The robot initializes in front of a fiducial with a map and a target pose specified in the room frame. The robot generates a trajectory through its local occupancy grid towards the target. During travel, the robot will lose sight of a fiducial and operate on dead reckoning until reacquiring another fiducial.