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MACHINE LEARNING FOR VISION-BASED POSE ESTIMATION FOR PROXIMITY OPERATIONS.

Abstract

To tackle challenging space-related problems such as space debris removal and in-orbit servicing of non-cooperative spacecraft, Space Situational Awareness (SSA) is essential. A significant component of debris removal and in-orbit servicing is proximity operations, which introduces the need for robust and reliable navigation. To achieve reliable navigation during proximity operations an accurate pose estimation is a requirement, pose estimation being knowledge of the relative position and orientation of the target spacecraft or debris.

We propose using vision-based pose estimation for proximity operations to remove space debris or perform in-orbit servicing. Using vision-based pose estimation allows the capability of machine learning to be leveraged. It is possible to use images captured experimentally of proximity operations to train machine learning algorithms. Once a machine learning algorithm has been trained and tested, it is possible to use it for accurate pose estimation. Using machine learning for vision-based pose estimation offers improvements to the precision of proximity operations; implementation of this will lead to advancements in space debris removal and in-orbit procedures for servicing non-cooperative spacecraft.