

15th IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Interactive Presentations (IP)

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DEEP NEURAL NETWORK FOR VISION BASED ACTIVE DEBRIS REMOVAL TRACKING
SYSTEM**Abstract**

Recently, an artificial neural network (ANN) is used to improve performance in various fields, especially in the image processing and computer vision parts. In this presentation, the artificial neural network is applied to a vision based tracking system for the active removal of space debris. KARICAT (KARI CApture Testbed), developed by Korea Aerospace Research Institute (KARI), is a ground - based active space debris removal (ADR) testbed system with clean-up-nano-satellite simulating space environment on the ground. The cleaning satellite is a 5-degree-of-freedom platform capable of planar translating motion, Rolling, Pitching and Yawing. Also, it can recognize and capture a target using LiDAR and Kinect (RGB-D) image-depth sensors. A mockup of 6U nano-satellite configuration is used as a space debris and it is free to move in three-degree-of-freedom situations where planar translating motion and Rolling are possible on the ground based testbed. In this situation, the ANN is applied for discrimination of the target, and we set the recognition problem as two class problem. In order to train and test recognizer, we made many positive and negative image-patch dataset for accurate recognition of the target of the satellite debris. Positive image-patch is the image with the shape of the Target satellite and Negative is the image-patch without the shape. And it is aimed to judge whether there is a Target in the input image. The ANN consists of simple neural network (NN) with backpropagation. The purpose of this research is to find the appropriate number of layers and nodes of the neural network to solve this problem. For each layer, Dropout technique and an appropriate activation function are applied. Also, optimization technique is applied to reduce the cost function.