4.4 Operational Boundaries

The ODD defines equipment, operations and environment of the system. For the Autonomous Extraction and Refueling Station, this is an important thing to define. The system will need to perform around the clock in space, but only for at most a week at a time. In this environment, with radiation from the sun and possible objects or debris occasionally on collision course, the system needs to navigate safely between Starships, extract from and refuel tanks in these ships and charge its batteries. To perform these actions, vision sensors, for detecting objects and identifying those of interest must be present. Any dangerous objects must be identified at a distance where evasive maneuvers are still possible. The system also needs a set of propulsion engines for quick movement in all three directions in space. While they need to be quick, they also need to be precise enough for the docking sequence to be possible. Tools for docking, extraction of fuel, detection of full and empty tanks and giving fuel to a rocket are also needed. Finally, equipment for recharging internal batteries and the batteries for storing electricity must be in the system. This equipment needs to function in a low gravity and vacuum environment, while still working quickly and safely. Finally, it needs to learn from experience how to best plan and create its movement paths, as moving in orbit can be both intuitive and complex, to increase the cost efficiency of its operation and allow less use of its precious fuel. As no humans are wanted in direct interaction with the station during operation, all these tasks and problems must be solved automatically. But maintenance, either routine or acute, will be beyond the scope of its autonomous behavior and must be done by astronauts during downtime.

ODD

DNT Fallback

As there are no operators in this system, there is no operator exclusive DNT, and the ODD will only contain automatic DNT. There is still a need for a DNT Fallback in case of dangerous objects or problems with battery or other equipment.