ABSTRACTS (MASTER THESIS)

An Investigation of Space-Based Space Debris Observation System

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Recently, the human activity in space is exposed to the menace of the dramatic increase of space debris. We know the position and the velocity of the debris over10cm, however we don't know the shape of them in detail. There are some assumption that many small debris under 10cm exist at an altitude of 800km -850 km, however there are no effective ways to detect them because of the resolution of the radar on the ground and the weather. Our purpose is to develop the system of debris observation satellite in order to estimate the shape and the orbit of known debris and unknown debris under 10cm around the Earth by observing in space.

In this paper, we focus on the three different factors of the debris observation satellite. The first one is the orbit. I choose the orbit of the debris observation satellite as Sun-synchronous orbit. The satellite is not influenced by the heat of sunlight in Sun-synchronous orbit. Moreover, if the direction of the sensor is held toward the opposite of the Earth, I can reduce the heat of sunlight and the Earth. The second one is the altitude. I consider the altitude of the debris observation satellite where I can find more space debris. If I choose the altitude of the satellite to be under that of 800km -850 km, I can reduce the possibility of a collision with space debris. On the other hand, the satellite cannot find space debris clearly because it is far from space debris. The third one is the equipment. I consider two kinds of the sensor for the debris observation satellite, an optical sensor and a laser radar sensor. An optical sensor observes space debris by perceiving visible rays or near infrared ray. A laser radar sensor uses a laser beam in order to investigate space debris. This detects the space debris by receiving the scattered light of space debris. Moreover, a laser radar sensor can get the velocity of space debris by the Doppler beat. If I assume the parameter of the debris and the capacity of the sensor, I can decide the distance between the satellite and the observable debris.

We will discuss the effective way of debris observation in detail and the possibility of space debris observation via satellites.