
ABSTRACTS (MASTER THESIS)

Orbit Determination Technique Exploiting MU Radar

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Space debris are objects in the space including spent rockets, broken satellites and paint chips. Since the velocity of the space debris is on the order of several km/s, it can pose danger to operating satellites and to international space station. Therefore, observation and orbit determination of the space debris are very important problems. In previous study, a tool to design the scheme to observe space debris passing over MU radar based on known orbital elements was developed. In addition, observation method of debris using MU radar has been established. Therefore, in this study, the technique to perform the orbit determination of space debris observed by MU radar is developed. We have developed orbit determination technique using Gauss-Newton method by means to decide orbital elements from plural position vectors estimated from the observation. Our technique can apply for any observed results without considering the time for observation and number of detected points. With this method, elements defining the orbital plane can be estimated with its error is smaller than 1 deg. The results show that if the orbital inclination angle is small and the time for re-passing is short, the observation by MU radar provides enough accuracy to perform the second observation. To improve the accuracy of the estimation, we also study the probability to observe a given debris for several times. The estimation error of orbital period is also improved by the second observation. Moreover if the second observation can be conducted, the estimation errors are improved and the number of observation can also be extended.