

ABSTRACTS (MASTER THESIS)

**Study on the improvement of the identification techniques for space debris orbits
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Recently, the amount of space debris has been rapidly increasing, and this is becoming an obstacle for space developments. The organizations in the world are tracing space debris and sharing their orbit information. However, the present surveillance network is not sufficient to completely avoid space accidents due to collisions with space debris, and we need to improve and expand the observation network. In our study, it is the objective to develop the orbit determination method through the observation by the MU radar held by RISH, Kyoto University. The MU radar is an atmospheric radar. The development of orbit determination methods of space debris by the atmospheric radar leads to the enhancement of tracing system over the world, because the global network of atmospheric radars are already established. In the previous our study, the orbit determination of the known debris was discussed. However, it is difficult to re-observe the same debris consulting the orbit elements which were identified by the MU radar because the accuracy for the orbit identification is not sufficient. We performed the simulation to examine the relation between the accuracy of the orbit determination method and measurement errors. From the simulation results, we confirmed the following relations. The orbit elements in the relation to geometries are influenced by the range error. The orbit elements for the location on the orbit are influenced by the Zenith error. The orbit elements for the orbital plane is influenced by the azimuth error. We found that the accuracy was not sufficient to re-observe through the MU radar observation data using the previous methods. We stress that it is important to determine the Mean motion correctly for the re-observation. It is necessary to improve the range determination accuracy for improving the determination accuracy of the Mean motion. We succeeded in improving the determination accuracy of the range by using the new proposed method based on Range Weighting Function.

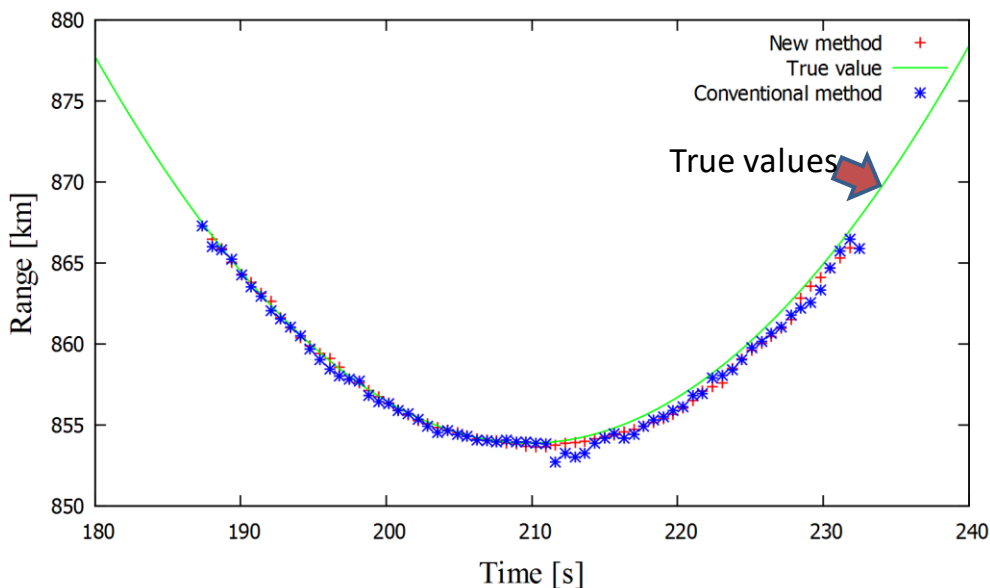


Figure 1. Estimated range distances of the space debris (ID: 23088). The values obtained by the new method are distributed well along the true value curve over the observation period.