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FEDERATED VECTOR TRACKING FOR SPACE VEHICLE NAVIGATION IN HIGH EARTH ORBITS

Abstract

GNSS is one of the most popular methods in navigation and automation. Due to its various advantages, it is preferred that spacecrafts be equipped with GNSS. Despite the increasing growth of satellites and spacecrafts in medium and high earth orbits (MEO, HEO) on one hand and demands for using GNSS in such orbits on the other hand, GNSS is not widely applicable for these conditions yet. Therefore Scientists are trying to find a possible way to use GNSS in high earth orbit. One of the most useful methods is vector tracking instead of scalar tracking. In vector tracking, a Kalman filter is employed to gather the information from all channels to correct the position and velocity of the receiver. Literature survey shows that this method could meet the requirements for high earth orbit navigation. In order to increase the reliability, it is recommended to integrate GNSS with Inertial Measurement Unit (IMU), but practically this would burden the Kalman filter calculations, therefore more than one Kalman filter in federated architecture is suggested. In this research three tracking architectures (FLL, VDFLL with central Kalman filter architecture, federated VDFLL) are compared and it is shown that the federated architecture is as convenient as VDFLL for high earth orbit space navigation.