

原 著

回転運動がもたらす慣性航法誤差の軽減効果

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2007年8月16日受付, 2008年2月15日採録

Abstract

The Inertial Navigation System (INS) is one of navigation devices for moving objects, and it makes positioning without the communication with the external environment because it is composed of just internal sensors; gyros and accelerometers. Thus the moving object can move owing to the position data if it is equipped with the INS. And recently, the INS is applied as the navigation device for many autonomous underwater vehicles (AUVs). And they use the position data outputted by the INS in order to understand its own current position in real time and cruise along the course line according to the position data. However it includes the error caused by the drift-bias error of the internal sensors, and the position error increases with the time. So it is very difficult for AUVs to cruise autonomously dependent only on the position data.

We have proposed the method which improves the INS's performance owing to a rotational motion. In this method, The INS is rotated with one rotational axis according to some rules. This causes the cancellation of the drift-bias errors of the internal sensors and consequently the position error of the INS is decreased. In order to cause this effect, a precondition must be met. It is that a moving object keeps its own posture to horizontal. However, in reality, AUVs never keep its own posture horizontal because they cruise with a roll motion as their body-specific behavior. In this paper, the reduction effect of the INS's position error caused by this method is shown in experiments. And also, utility of this method if AUV's roll motion is applied to the INS while it is rotated is confirmed in experiments.

Keywords : Inertial Navigation System, Rotational motion, Position error, Error reduction, Underwater vehicle