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INTEGRATION OF A STRAPDOWN GRAVIMETER SYSTEM IN AN AUTONOMOUS UNDERWATER VEHICLE

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Abstract. We present a new mobile instrument for measuring dynamically the gravity vector and its gradients in underwater environment, named GRAVIMOB. Our instrument is a strapdown sensor, consisted of electrostatic accelerometers installed in a waterproof sphere. It is designed to be embedded in an Autonomous Underwater Vehicle (AUV). Since the positioning of an AUV is approximate in underwater environment, the key issue raised here is to estimate the uncertainty in the gravity field resulting from the use of such position data. This paper focuses on the assessment of the system performances. The latter have been studied by simulation with reference data calculated from actual submarine geological structures, on which different noise models have been added. Results show that spatial evolutions of the gravity field and statistical properties of stochastic processes affecting the measurements have to be considered carefully in order the minimize the error. The Unscented Kalman Filter (UKF) has been favored to the Extended Kalman Filter (EKF) by its ease of implementation and its better robustness to non-linearities.

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