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Classical and quantum sensing for precise inertial navigation

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Abstract

Inertial navigation is a technique to estimate self-position without the help of external signals such as electromagnetic waves from GPS satellites. Such a technique is essential, especially for controlling the position of the autonomous underwater vehicle since radio waves do not reach the deep sea. The current performance of the inertial navigation is the order of kilometers for 10 hours, which is not enough for various applications such as marine resource exploration and data acquisition under Arctic sea ice. An ultra-precise inertial navigation system can, in principle, be constructed by an accelerometer, gyroscope, and gravity gradiometer. Among them, the gyroscope and gravity gradiometer are key components to get high performance. I will talk about our experimental efforts to improve the precision of inertial navigation using both classical and quantum sensors.