

**Call for application for research scholarships
for post-graduate international candidates**

RESEARCH PROJECT N. 57

Title
Time-Delayed Multiple Linear Regression for Compensating Errors in MEMS Inertial Sensors.
Scientific responsible (name, surname, role)
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Short description of the research activity (max 250 words)
Compensation of MEMS inertial sensors errors is mandatory for photogrammetry real-world applications. One of the classical approaches for noise compensation in MEMS inertial sensors consists of using the Moving Average technique (MA), which is a simple digital filter. More recently, with the increasing attention given to machine learning, several alternative methods have been proposed to increase MEMS inertial sensors performance by reducing different kinds of noises. However, despite manufacturers claim that non-linearity in MEMS inertial sensors can be considered in most cases negligible, the fact is that most of applied machine learning techniques were focused on dealing with non-linear behaviours. Such non-linearity assumption, may originate an unnecessary increase in the complexity of the resulting models. Previously, a linear regression technique known as Time Delayed Multiple Linear (TD-MLR) has been proposed to de-noise this type of sensors. The present project proposes a rigorous analysis of the viability of TD-MLR for compensating noise observed in MEMS inertial sensors. Experimental evaluation will be conducted considering MEMS sensors of different qualities on real trajectories. TD-MLR will be compared to three well-known methods with different complexity levels, i.e., the simpler and standard MA, the Multi Layer Perceptron (MLP), a robust non-linear machine learning technique, and Wavelets filtering, a well-known technique in field of digital signal processing. It is expected to prove that despite the assumption of non-linearity on MEMS sensors, a simple linear method such as TD-MLR can reduce significantly the error in MEMS inertial sensors.
Specific requirements (experiences, skills)
Digital signal processing, machine learning, positioning techniques using inertial sensors.
Website of the research group (if any)
http://www.polito.it/geomatics_lab
Keywords (min 3, max 6)
MEMS, INERTIAL, MACHINE LEARNING, FILTERING
Research Area (max 1)
Urban Studies and Planning