



## Analysis of numerical differentiation methods applied for determination of kinematic velocities for LEOs

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Global Positioning System (GPS) receivers in gravimetry satellites measure valuable information about 3D satellite position continuously. We use this data in energy integral method or other methods based on earth gravity field motion equation to determine satellite velocity or acceleration. The result could be used to recover earth gravity field.

In this paper we introduce different numerical methods to estimate velocity vector with time series of satellite position vector. The numerical results show that Savitzky-Golay method has a better accuracy in comparison with other methods. We evaluate our results based on simulation data and also we calculate the velocity of real data with Newton method (As the base method).

Keyword: Numerical differentiation, kinematic velocity, orbit determination, energy integral method