Optimal derivation of velocity field from discretely sampled position vector at GPS permanent stations

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Time-series of the recorded positions at GPS permanent stations can usefully show discrete changes of the stations over the observation period. However, continuous velocity field is required for analyzing and predicting deformation pattern over the GPS stations' area.

Velocity field can be interpolated/approximated using different numerical schemes. To find the optimal numerical method, we have studied the following computational scenarios:

- Spline interpolation

- Newton-Gregory differentiation

- Kalman Filtering

First, the methods were applied on some simulated data set. Kalman filtering with an appropriate setting outperformed the other solutions. Then, we employed Kalman filtering on few real GPS stations and the achieved results compared with those of the conventional computational procedure.