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Wavelet neural network employment for continuous orbit construction

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The scope of this paper is to present a comparison between a novel wavelet neural network (WNN) approximation and currently used polynomial and trigonometric interpolations for continuous GNSS (Global Navigation Satellite System) orbit construction. In the first part we propose the wavelet network construction and algorithms for regression estimation. Since the algorithms for non-parametric regression estimation with wavelet networks overcome backpropagation limitations of small input data domain training, this procedure is employed for the GNSS satellite position computations from precise ephemerides. Finally, the performance of WNN and polynomial and trigonometric interpolations is examined and most efficient WNN algorithm is presented. Simulation studies proved that WNN function overcomes traditional interpolation deficiency in better performance near the end of the interval. The method is linked to a single function determination for the entire interval and overcomes the obstacle of several discrete function establishment, which was the basis for the interpolation methods. Furthermore it is shown that WNN approximation offers better solution in storage of data used for GNSS orbit re-construction, but retains the computation efficiency and generalization ability in any function domain.