

Numerical Linear Algebra in the Global Positioning System

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Abstract: The Global Positioning System (GPS) is a satellite based navigation system. GPS satellites transmit signals that allow one to determine the location of GPS receivers. In this talk, it will be shown how numerical linear algebra techniques can be applied to this interesting area. This talk has two parts. The first part is concerned with position estimation. I will use relative positioning as an example to show how to use the structures of the mathematical model to design an efficient and numerically reliable least squares algorithm for computing the position estimates. The second part is concerned with data quality control, which has applications beyond GPS. When processing observational data, statistical testing is an essential instrument to eventually render harmless incidental anomalies and disturbances in the measurements. I will present a numerically stable algorithm to compute the commonly used generalized likelihood ratio test statistic.