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Simulation of measurements for low Earth orbit satellite GPS receivers

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Satellite orbit determination can be defined as the method of determining the position and velocity (i.e., the state vector) of an orbiting object. For low Earth artificial satellites, the Global Positioning System (GPS) provides a powerful and fast means to compute orbits, by providing redundant measurements. Orbit determination based on observations from spaceborne GPS receivers can be done onboard in real time or on the ground in a postprocessing mode.
The objective of this work is to present a simulator of satellite GPS measurements, with the purpose of providing the necessary resources to test orbit determination algorithms based on GPS measurements, under controlled conditions. This simulator provides pseudorange and carrier phase measurements for a target satellite in low Earth orbit.
In order to compute the GPS measurements, the state of the target satellite is calculated using SGP4 propagator method from a given initial TLE, and each GPS satellite has its position and velocity given by interpolation of precise orbits distributed in SP3 format. Models of physical influences, such as tropospheric and ionospheric delays, clock errors, among others, are implemented [1, 2].
The effectiveness of the simulation measurement model is compared with real measurements available in some missions, like JASON or GRACE.

References
[1] Xu, G.; Xu, Y. GPS: Theory, Algorithms and Applications. 3 ed. Springer-Verlag, 2016.
[2] Leick, A.; Rapoport, L.; Tatarnikov, D. GPS satellite surveying. John Wiley & Sons, 2015.

Poster