Contributed Talk

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Title: Computing positioning errors in Relativity Positioning Systems

Abstract: General Relativity Theory provides a framework to compute the most precise orbits of Earth satellites. Four satellites are needed to locate a user in Relativistic Positioning Systems. In 2014, Puchades and Sáez (Astrophys. Space Sci. 352, 307, 2014) computed the difference in positioning taking satellites world lines with Schwarzschild metric and with a statistical perturbation of such world lines. Such differences are named the U-errors. To compute the photons null geodesics of the satellites signals they used the solution given by Coll, Ferrando and Morales Lladosa (Class. Quantum Grav. 27, 065013, 2010). Our team (Puchades, Arnau and Fullana, 2021, Astrophys. Space Sci., in press) has taken more accurate satellites trajectories as perturbations of Schwarzschild world lines. These more accurate trajectories take into account the gravitational effects of the Earth, the Moon and the Sun and also the Earth oblateness. A robust algorithm has been built to compute the U-errors with this more accurate description of satellites orbits. We are now incorporating more relativistic perturbations in the metric to describe the satellites world lines. Our method is applied to the ESA Galileo Satellites Constellation. However our algorithm is also applied to other satellites at different heights. In this presentation a summary of this research is presented.