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On techniques for fitting satellite laser ranging data

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The present paper is concerned with Chebyshev polynomials which are used to analyze the satellite laser ranging (SLR) data. We will apply two different techniques for fitting data. The spline technique is given to obtain a continuous approximation function of matching these Chebyshev polynomials developed for fitting data over progressively classified separate intervals. The other method is the overlapping technique. An application on the laser ranging data taken for the satellite Ajisai is given. The results followed by the discussion of the used technique are also presented. Satellite Laser Ranging (SLR) and Lunar Laser Ranging (LLR) use short-pulse lasers and state-of-the-art optical receivers and timing electronics to measure the two-way time of flight (and hence distance) from ground stations to retro reflector arrays on Earth orbiting satellites and the Moon. Scientific products derived using SLR and LLR data include precise geocentric positions and motions of ground stations, satellite orbits, components of Earth's gravity field and their temporal variations, Earth Orientation Parameters (EOP), precise lunar ephemerides and information about the internal structure of the Moon. Laser ranging systems are already measuring the one-way distance to remote optical receivers in space and can perform very accurate time transfer between sites far apart.

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The Universal Stellar Law and its application to the explanation of stability and forms of planetary orbits

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This work considers the universal stellar law (USL) for explanation of stabilities and forms of planetary orbits in extra solar systems based on the statistical theory of gravitating spheroidal bodies. It shows that knowledge of some orbital characteristics for multi-planet extra solar systems refines own parameters of stars based on the combined 3rd Kepler's law with universal stellar law (3KL-USL). The proposed 3KL-USL explains the stability of planetary orbits in the extra solar systems entirely and predicts statistical oscillations of the orbital angular velocity of rotation of planets around stars. This work applies the statistical theory of gravitating spheroidal bodies to explore forms of planetary orbits with regard to the Alfvén's oscillating forces in the Solar system as well as other exoplanetary systems. It explains an origin of Alfvén's radial and axial oscillations modifying forms of planetary orbits within the framework of the statistical theory of gravitating spheroidal bodies. This work finds that temporal deviation of the gravitational compression function of a spherically symmetricalspheroidal body (under the condition of its mechanical quasi equilibrium) induces the additional periodic force. In turn, as shown here, if the additional periodic force becomes counter balance to the gravitational force then the principle of anchoring mechanism is realized in extra solar systems, i.e. the stability of planetary orbits occurs. The work also notes that spatial deviation of gravitational potential of the rotating spheroidal body from spherically symmetrical one implies the difference of values of the radial and the axial orbital oscillations (even in the case of its mechanical equilibrium).

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