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The combined Kepler 3rd law with universal stellar law: Derivation and application to extra solar systems investigation

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We need a unique law connecting thermodynamic parameters of star with orbital characteristics of exoplanets moving around the star. This work derives the equation of state of an ideal stellar substance based on conception of gravitating spheroidal bodies. Taking into account, this equation obtain the universal stellar law (USL) for the exoplanetary systems connecting temperature, size and mass of a star (in particular, the Sun). Using the ratio of temperature of the solar corona to effective temperature of the Sun' surface the modification of USL is developed. The modified USL is testified by substitution of known parameters of different types of stars (see figure 1). The prediction of parameters of new stars is also carrying out by means of the modified USL; in particular, the Hertzsprung–Russell's dependence is derived by means of USL. This paper also shows that knowledge of some orbital characteristics for multi-planet extra solar systems refines own parameters of stars based on the combined Kepler 3rd law with universal stellar law (3KL–USL). The proposed 3KL-USL predicts statistical oscillations of circular motion of planets around stars. Really, this combined law connects the mechanical values (the angular velocity and the major semi-axis of a planetary orbit) and the statistical (thermodynamic) values (the parameter of gravitational condensation and the temperature). It means that a stability of the mechanical values (entering in the left part) depends on a statistical regularity of the right part of the 3KL–USL equation. Thus, we conclude about a possibility of presence of statistical oscillations of orbital motion, i.e., the oscillations of the major semi-axis and the orbital angular velocity of rotation of planets and bodies around stars. Really, this conclusion is completely confirmed by existing the radial and the axial orbital oscillations of bodies for the first time described by Alfvén and Arrhenius.

Biography

Alexander M Krot is a Head of Laboratory of Self-Organization System Modeling at United Institute of Informatics Problems of National Academy of Sciences of Belarus. He completed his Graduation at Belarusian State University, Department of Radio-physics in 1982. He completed his PhD in 1985, then Doctor of Sciences (DSc) in 1991 and Professor Degree in 1997. His research interests include "The analytical theory and computational modeling of self-organization processes and phenomena in complex systems (gas-dust proto-planetary media, aero-hydrodynamic viscous flows, nervous fiber and neural network structures etc.), statistical theory of planetary (stellar) system forming, theory of nonlinear analysis of attractors of complex systems, digital signal processing etc". He has published 280 scientific works including three monographs and more than 80 articles in refereed journals.

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