TWO APPROACHES TO THE DETERMINATION OF SATELLITE PERTURBATIONS DUE TO AN EXTERNAL BODY ATTRACTION

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Abstract. The development of analytical theories of the Earth's satellite motion is considered. Two different approaches to the problem are developed which essentially depend on the structure of the disturbing body coordinate representation. The corresponding effective softwares are elaborated. An advanced pure trigonometric theory of satellite motion is constructed for the case when the disturbing bodies are the Moon and the Sun. Then a new kind of analytical theory of combined trigonometric-polynomial form is developed, in which the Moon's and Sun's coordinates are taken from the planet-Moon ephemeris DE200/LE200, in form of Chebyshev polynomial series whose arguments are linear functions of time. In this approach the disturbing body perturbations are short truncated trigonometric series whose coefficients represent Chebyshev polynomial linear functions with time-dependent argument: the latter form of perturbations is more compact and less time consuming over short time intervals than pure trigonometric series. Both theories take into account the first order perturbations due to the Moon's and Sun's attractions. The advantage of the methods results from the fact that the motion model of the disturbing bodies can be included to the theory with a full necessary precision. The efficiency of both approaches is tested by performing numerical integration for the cases of some types of satellites.