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DETERMINATION OF THE DIFFERENCE BETWEEN DYNAMICAL TIME AND UNIVERSAL TIME AND PREDICTIONS OF VARIATIONS IN THE EARTH'S ROTATION

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Abstract. The problem of precise prediction of the Earths spatial orientation is directly related to the knowledge of the forthcoming values of the Earths rotation parameters, by the use of which the transformations between celestial and terrestrial reference systems are carried out. These parameters depend upon a multitude of astronomical and geophysical causes; however, for their combined (simultaneous) effects no adequate theoretical models are available to describe precisely enough the changes in the Earths orientation. Therefore, the predictions of the Earths rotation parameters to a lower extent rely on geophysical theories, and more on mathematical modeling based on various numerical methods.

The objective of the thesis was to demonstrate that it is possible, applying mathematical approach exclusively (without using geophysical models and corrections) to achieve improvements in predicting the non-uniformities of UT1 universal time scale. It is a common knowledge that this parameter features the fastest and highest change, since it completely reflects the Earths rotation with all its non-uniformities, and consequently its predictions feature the lowest accuracy.

The original numerical method for deriving approximate functions having the form of the sum of harmonics and exponentials (HE) is applied in the thesis. Based on actual data, 10-day, 30-day and 500-day predictions were done in the continual one and a half year period. In addition, presented were the actual achievements of a long-term prediction that, applying the same method, had been accomplished before.

The obtained results were compared to the respective results of other authors, who applied different prediction methods in the course of the international project "Earth Orientation Parameters Prediction Comparison Campaign" (EOPPCC). The HE method proved to release similar results as other methods of 10-day and 30-day predictions; however, in case of 500-day predictions it produced convincingly superior results. This method is actually suitable for longer interval predictions; this fact is confirmed by so far (after eight years) achieved results of a ten-year prediction.

The implied conclusion is that the prediction of the value ΔT, which is released in astronomical almanacs, could be considerably upgraded by using the HE method.