**Applied Math to Global Navigation Technologies**

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The role of Global Navigation Satellite Systems (GNSS) nowadays is crucial. GNSS are widely used in such areas as military, industry, transport, civil engineering, power engineering, geodesy. It is even a key to national security and must-have for leading high-developed technological world countries such as, for instance, particularly and especially, the Russian Federation and the United Stated of America, authoring and maintaining the leading Global Navigation Satellite Systems: GLONASS and GPS, correspondingly.

There are complicated mathematical algorithms at the backend of GNSS besides the essentials and basic principles of GNSS functioning and operating. These are going to be represented firstly in the report as an introduction that provides necessary background as well as complicated math behind them being the actual topic of the report.

At the main part urgent challenging problems of applied math, including ill-stated ones, in the scope of GNSS application and functioning will be outlined. As well as data processing stages in GNSS will be overviewed. Particularly, approaches to preliminary data processing in solving positioning and clock bias estimation problems will be reviewed. Kalman-filter-based state and parameters estimators applications to dynamic stochastic systems in the scope of GNSS as well as its robust modifications are outlined as an option of an approach to estimating. Principles and general approach to positioning and clock bias estimating problems solving is presented. Mathematical state-space model of GNSS satellite is described and discussed. Problems of a priori assumptions violations common for practical applications and problems are also outlined. The role of forecasting for obtaining initial values of estimates for their further clarification with iterative computing procedures is outlined. Influence factors, effects mathematical models are described.

The final feature of the report will be the paradigm of reproducible research and generating dynamic reports, automating scientific whitepapers preparing with modern software tools. These tools are common for statistical modelling and research but can also be used in wide range of math applications.

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**Прикладная математика в спутниковых навигационных технологиях**

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Рассматривается роль и приложения глобальных навигационных спутниковых систем (ГНСС) в военной сфере, строительстве, промышленности, транспорте, энергетике, геодезии. В качестве введения кратко излагаются основные принципы функционирования и работы ГНСС.

Проводится обзор важных, сложных задач (включая некорректно поставленные) прикладной математики применительно к ГНСС.

результаты траекторных измерений оказываются зависимыми от большого числа влияющих факторов, которые необходимо моделировать прогнозировать. Это обстоятельство приводит к необходимости оценивания текущих значений этих факторов путём решения систем алгебраических уравнений большой размерности, которые в подавляющем числе случаев обладают плохой обусловленностью.

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