На примере системы ЧФАПЧ с фильтрами первого порядка рассмотрено влияние частотного кольца на область параметров для вращательных режимов.

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Abstract: the system of frequency-phase synchronization with the inverted characteristic of a frequency ring is considered; for cases of filters of the first order conditions of existence of several rotary modes are received; on an example of system with sinusoidal nonlinearity influence of the inverted characteristic of a frequency ring on rotary modes is considered.

Keywords: : rotary modes; limiting cycles; frequency auto fine tuning.

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TWO WORLDS OF MATHEMATICAL FORMULAS: MATHEMATICA`S AND CLASSICAL

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Keywords: mathematical formulas; functions site; system Mathematica.

Abstract: This talk shows how developing mathematical formulas for site of mathematical functions makes effect on developing system Mathematica and back.

So happened that during centuries nobody seriously investigated how to build internally consistent world of mathematical formulas for analytical functions on the base of the following general restriction: the arguments (arg) of all complex variables z should satisfy inequality $-\pi < \arg(z) \leqslant \pi$.

Appearance of mathematical computer systems demanded from developers to fill out this hole in the theory of analytical mathematical functions. As result, we have new, sometimes different from classical, but internally logically consistent world of these functions and corresponding formulas, presented at the functions site (www.functions.wolfram.com) and realized at the computer system *Mathematica*. The functions there can be evaluated for all

possible values of variables, including their branch cut values.

For example, the value $\sqrt{-z^2}$ can be correctly presented as $ize^{i\pi\left\lfloor-\frac{\arg(z)}{\pi}\right\rfloor}$ or $\sqrt{-z}\sqrt{z}$ (where $\lfloor x \rfloor$ means the maximal integer less than or equal to x, it is Floor function), the formula $\sqrt{1-z^2} = \sqrt{1-z}\sqrt{1+z}$ is correct formula for all complex z-plane and formula $\sqrt{-1+z^2} = \sqrt{-1+z}\sqrt{1+z}$ is correct not everywhere at the complex z-plane (it is wrong for $z < -1$), the correct formula for logarithm from product has special additional term, including floor-arg construction: $\log(wz) = \log(w) + \log(z) + + 2i\pi\left\lfloor\frac{1}{2} - \frac{\arg(w)}{2\pi} - \frac{\arg(z)}{2\pi}\right\rfloor$.

The author of the talk works as developer of calculus related functionality of Mathematica for over 18 years. He derived thousands of new formulas in different areas of elementary and special functions, which are included into the functions site (http : // functions.wolfram.com/) and describe mentioned above *Mathematica*`s world of mathematical formulas. This talk shows how developing mathematical formulas for functions site makes effect on developing system Mathematica and back.

Аннотация: В докладе показывается, как разработка математических формул для сайта математических функций влияет на развитие системы "Mathematica"и наоборот.

Ключевые слова: математический формулы; сайт функций; система "Mathematica".

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THE FILIPPOV THEORY AND ITS APPLICATION TO GENE REGULATORY NETWORKS [1]

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Keywords: piecewise-linear differential system; singular stationary point; differential inclusion; Filippov solution.

Abstract: We study some properties of piecewise-linear differential systems describing gene regulatory networks, where the dynamics is governed by sigmoid-type nonlinearities which are close to or coincide with the step functions. To overcome the difficulty of describing the dynamics of the system near singular stationary points (i.e. belonging to the discontinuity set of the system) we use the concept of Filippov solutions. It consists in replacing differential equations with discontinuous right-hand sides with differential inclusions with multi-valued functions. The global existence and some basic properties of Filippov solutions such as continuous dependence on parameters are studied. We also study uniqueness and non-uniqueness of the Fillipov solutions in singular

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