

## Efficient Analytical Methods and Algorithms for Faster Computations

A university in Belarus has developed a new approach to formulation of the universal laws. The novel approach underlies a unified mathematical theory of the *spinor field* – an organized vector field of dynamic system rotation moments and spin moments of elementary particles.

Being extended over macrosystems, the generalized concept of a spinor field enables to treat organization and selforganization of vector fields of dynamic system rotation moments as a laser generation effect. Applying the ideas of synergetics and the methods of applied theory of catastrophes to elementary particle physics has made possible to interpret and treat the results of the physical vacuum theory in the formal frames of the differential equation theory.

A research programme for solution of various types of differential equations has been expounded in “*Catastrophe Theory for Scientists and Engineers*” by P. Gilmore. The programme comprises of 8 levels of complexity, the first one (level 0) representing the most complex system of integral-differential equations, the last (level 7) having to do with equilibrium-state gradient dynamic systems.

Until recent, methods for solution of level-6 and level-7 problems have been used (the extensive catastrophe theory has been intended for level-6 problems). The spinor field theoretic approach has allowed to climb from level 6 to level 4. Thus, there have been provided instruments for solution of level-5 “autonomous dynamic system” problems and “dynamic system” problems of level 4. Parameters of order system are determined by level-5 dynamic system equations, whereupon a hierarchy-arranged system model is built to the parameters. According to the model a potential environment function is determined. A non-gradient model is put into the obtained environment. Regarding rotation of a model phase plane around its coordinate axis in the vector field of gradient for potential function, the angular displacement is regarded as scaled time, which paves the way up to level 4. Applicability of the spinor field theory has been illustrated by determining limit cycles of all types and a particular point, the “n-order centre”. These problems have been solved without using Liapunov’s values, the latter normally requiring cumbersome computations to get determined.

The geometrical nature of the spinor field methods has been conducive to a novel interpretation of various object invariants and their properties. Every object may now be described by its integral characteristic (both qualimetrically and quantimetrically), which made feasible the introduction of a privileged invariant basis of an object.

With such interpretation of object invariants, the number of computations can be reduced by the factor

$$n^p/np = (1/p)n^{p-1},$$

where  $n$  stands for space dimensionality,  $p$  for an object's degrees of freedom (if the object is presented in p-linear form in n-dimensional space).

Using of the algorithms will allow multiple increase in operation rates of graphic and multimedia applications, bring more options for developing stable- and dynamic-surface modeling programmes; the software development and operation in chemical, biological medical and other fields of research (calculations and computations, output data visualization, various process simulations) will be simplified considerably.

The proposed methods provide the instruments for creation of brand new computer software products over a short period of time, by immensely increased efficiency of programmer's labour and drastically reduced data processing time rates with the existing computer facilities and future generation of computer hardware. In the engineering and technology domains the methods would give the keys to upper-level solutions for optimization problems, to determination of the optimal control actions and responses, to notably more efficient designing of systems with predetermined properties that meet certain selected criteria.

The essential basis of the method has never been published. The innovation is directed at practical application in interindustrial spheres. It is basis for use in various domains, to bring great economic benefits, especially in the programming and computer fields, in the area of professional and personal computer engineering and application, in the spheres of scientific research, engineering, system design and optimization, process technologies, instruments and machinery.

The developers are seeking a company (investor) interested in mass production of the software based on the suggested approach to computation organization, as well as in subsequent joint world-wide marketing of the obtained software products meant for various purposes and applications. The developer institution would prefer concession of the intellectual property rights by licensing the know-how. A patent application can be issued and filed in a patent authority as may be required.