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MATHEMATICS

PHYSICS

SOME INVARIANTS CONNECTED WITH EULER-LAGRANGE EQUATIONS

Irena·COMIC¤

In Osc^kM, different kinds of homogeneity are defined, and properties of homogeneous functions are pointed out. The Euler-Lagrange equations for diferent types of variables in OsckM are given; they are coordinate invariant, and have different forms for $k = 2l$ and for $k = 2l+1$. The connection between Lagrangians in the space $L^{(k)n}$ and Hamiltonians in $H^{(k)n}$, is outlined. It is shown that in Osc^3M, only E_i^0 and E_i^3 are covectors, and one new scalar field is determined.

Keywords: Homogeneity, Euler-Lagrange equations, Lagrangians and Hamiltonians of higher order, Legendre transformation.

AMS Subject Classification: 53B40, 53C60.

DEPENDENCE OF THE ROOTS ON THE COEFFICIENTS

Alina NIȚĂ, Ana NIȚĂ

In this note, we give a new proof for the continuous dependence of an algebraic polynomial's roots on its coefficients and we discuss the case of polynomials with random coefficients [1], proving the existence of measurable solutions and also regarding their ordering and their measurable dependence upon coefficients, by making use of [2].

Keywords : algebraic polynomial, random polynomial, solutions depending on coefficients.

EULERIAN NUMBERS AND GENERALIZED ARITHMETIC-GEOMETRIC SERIES

Mircea I CÎRNU

Based on Cauchy-Mertens theorem of series multiplication, we obtain in a simple manner some well-known results, namely the Eulerian numbers representation, a combinatorial identity and the formula for the sum of generalized arithmetic-geometric series. Two applications are given.

Keywords: Eulerian numbers, generalized arithmetic-geometric series.

2000 MATHEMATICS SUBJECT CLASSIFICATION: 05A19, 11B68, 65B10**.**

VERIFICATION OF THE QUASI-ANALYTIC SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS USING THE ACCURATE ELEMENT METHOD

Maty BLUMENFELD

It is usually considered that an ordinary differential equation (ODE) can have on the whole integration domain either an ***analytic solution*** $\phi(x)$ *(which replaced in the ODE leads to an identity) or a* ***numeric solution*** *(represented by a string of numerical values whose accuracy is more difficult to quantify). The integration of a ODE by the Accurate Element Method leads to* ***Piecewise Polynomial Solutions*** *represented by a small number of polynomials, each one valid on a single sub-domain (element); they can be considered as* ***quasi-analytic solutions****. A quasi-analytic solution is suitable for* ***verification by replacing it in the ODE*** *that does not lead to identities but to a quantifiable residual. Based on the value of the residual one can decide either to accept the solution or to compute it once again with slightly modified parameters until an imposed allowable*

precision is reached. The paper presents a strategy valid for both cases.

ACCOMMODATION AND DIS-ACCOMMODATION PROCESSES IN PHYSICS AND BIOPHYSICS*

Dan A. IORDACHE

This work analyzes the obtained results – by means of the cooperation of the research groups (from the Physics Department of the "Politehnica" University from Bucharest) on Lasers Physics, and on Physics of Materials, respectively during the years 1978-1981 – concerning the accommodation - dis-accommodation processes specific to the action of the laser radiation on some magnetic materials, starting from the findings about the Universality classes of the physical phenomena and the growth-accommodation processes met in Physics and Biophysics, respectively. One finds that the description of the accommodation – dis-accommodation requires: a) the use of some similitude models of the growth-accommodation processes, that present a direct correspondence with some certain Universality classes, b) the use of some suitable numerical methods for the evaluation of the parameters of the theoretical relations specific to the Universality classes, c) the check of the local and global compatibility of the studied theoretical relations with the existing experimental data. A new theoretical model (of the auto-catalytic growth and stagnation coupling) is proposed, finding the possibility to describe the experimental results obtained during the 1979-1981 interval.

NATURAL OBJECT VISUALIZATION BY DIGITAL HOLOGRAPHY*

Mona MIHAILESCU, Liliana PREDA, Alexandru PREDA, Eugen SCARLAT

Using an in-line holographic setup, we recorded on a CCD the holograms of three natural samples: a parachute dandelion, a bird feather, a honey drop. By numerical reconstruction, from one single hologram we obtain the amplitude and phase imaging of the studied object and micrometric details, without mechanical scanning in experimental setup. Starting with these reconstructions we deduced that the wires from dandelion parachute are partially transparent in visible light, the wires from bird feather are opaque and the honey drop has optical properties like micro spherical lens.

Keywords: digital holography, dandelion, bird feather, honey droplet, Fresnel, convolution

OVERVIEW ON LASER CLEANING OF LEATHER OBJECTS

Monica SIMILEANU, Roxana RADVAN, Niculae PUŞCAŞ

This paper presents investigation of the laser cleaning fluence thresholds of leather patrimony objects. Cleaning of organic materials can be problematic for a variety of reasons: fragility of the materials, unwanted dimensional changes, three-dimensional structure, etc. yet stains and dirt will promote its degradation.

Keywords: laser cleaning threshold, paper, leather, parchment

PULSE SHAPE CALCULATIONS FOR THE "MARS" SEGMENTED GAMMA RAY DETECTOR

Raluca MARGINEAN

The paper shortly describes the principles of HPGe segmented detectors for gamma spectroscopy and of the pulse shape calculations for this type of detectors. The results obtained in pulse shape calculations for the MARS segmented detector are discussed in detail. A comparison is made between the results obtained with two pulse shape calculations software.

Keywords: pulse shape calculations, segmented gamma ray detectors

SURFACE INFLUENCE ON THE OPTICAL FREEDERICKSZ TRANSITION IN NEMATIC LIQUID CRYSTALS CELLS

Eleonora - Rodica BENA , Cristina CÎRTOAJE

The critical fields for electrical, magnetical and optical freedericksz transitions are strongly influenced by the anchoring conditions of the molecules of the liquid crystal to the solid walls of the cell. using an analytical method based on the euler-lagrange equations and considering that the surface anchoring energy of the liquid crystal-wall interface is described by rapini-papoular formula, we found a correlation between the value of the critical intensity of the laser beam producing the destabilization of the homeotropic alignment, the anchoring strength, the cell thickness and the material parameters. we also found the saturation intensity of the laser beam producing the planar alignment all over the cell, in terms of nematic liquid crystal properties, surface and cell parameters.

U.P.B. Sci. Bull., Series A, Vol. 71, Iss. 2, 2009 ISSN 1223-7027

CONSIDERATIONS ON FUTURE REDEFINITION OF THE KELVIN

Dumitru DINU, Maria-Magdalena POENARU

The actual definition of the kelvin, measurement unit of the thermodynamic temperature, based on the temperature of the triple point of water, will be replaced probably by the year 2011 with a definition based on the Boltzmann constant, k. This paper presents considerations regarding the necessity, defining elements and consequences of the redefinition of the kelvin. It also contains considerations regarding the thermodynamic temperature as an element of the set of „true temperature" parameters and „practical temperature" as supporting notions for a new definition.