Fractal dimension structure of Cosmos and its mathematical foundations

YAN Kun (yankun@nature.ac.cn)
(Xi'an Modern Nonlinear Science Applying Institute, Xi'an 710061, China)

Abstract Fractal dimension structure of the Cosmos are explored, and the mathematical foundation, which include the expressions of fractal dimension differential and calculus, regular space integral solutions of fractal dimension differential equations, the fractal calculus definitions of fractal measure as well as the measure computational equation of self-similar fractal, fractal dimension calculus and fractal measure are given. As annotation, an equation of the relation between neutrons and protons in nuclei and its periodical solutions as well as atomic number limit are discussed.

Keywords Cosmos, fractal dimension structure, fractal dimension calculus, fractal differential equation, fractal measure, atomic number limit

Yan Kun. Fractal dimension structure of Cosmos and its mathematical foundations[J]. Progress in Geophysics(in Chinese), 2004, 19(3): 709～716. DOI:10.3969/j.issn.1004-2903.2004.03.036.
http://en.cnki.com.cn/Article_en/CJFDTOTAL-DQWJ200403036.htm
http://www.nature.ac.cn/papers/paper-pdf/cosmosandmaths-pdf.pdf

Energy-exchange descriptions on the superluminal velocity and quantum fractal

YAN Kun (yankun@nature.ac.cn)
(Xi'an Modern Nonlinear Science Applying Institute, Xi'an 710061, China)

Abstract In this paper, consider taking the vacuum as a form of medium, by exploring the constancy of light velocity in the vacuum and the energy-exchange equation of a particle, the expressional forms of equation of the one-way velocity of light(equation of the one-way speed of light, or equation of one-way variable speed of light) for the constancy of the two-way velocity of light(or constancy of the two-way speed of light), superluminal velocity, medium action equation of particle fractal motion for the wave-particle duality, and quantum fractal are studied deeply. As a result, it shows that a tentative theoretical frame which includes not only the superluminal-velocity motion but consists with Einstein special relativity and quantum theory can be established.

Keywords equation of one-way velocity of light, medium action equation, superluminal velocity, quantum fractal, energy exchange, particle fractal motion.

Yan Kun. Energy-exchange descriptions on the superluminal velocity and quantum fractal[J]. Basic Science Journal of Textile Universities(in Chinese), 2004, 17(3):223～227. DOI:10.3969/j.issn.1006-8341.2004.03.010.
http://en.cnki.com.cn/Article_en/CJFDTOTAL-FGJK200403010.htm
http://www.nature.ac.cn/papers/paper-pdf/physics-pdf.pdf

Introductions on the medium shell and discrete orbits of celestial bodies motion

YAN Kun (yankun@nature.ac.cn)
(Xi'an Modern Nonlinear Science Applying Institute, Xi'an 710061, China)

Abstract By using phenomenological method for the medium shell curve, an energy equation on three dimensions regular space and the energy-gravitation form about gravitational interaction between bodies are given. Further more, two condition solutions of the gravitational expression is close by with the results of Newton's gravitational theory and Einstein's general relativity respectively. The localizations in the functions of the fractal dimension calculus at present are discussed, and the similar expanded equation is given. Subsequently，by discussing the expanded baseline property on the celestial motion orbit, the discrete orbital equation of the celestial bodies motion are given. And referring to the related orbital data of planets and some satellites in the solar system, the concrete expression on the discrete orbit of the celestial bodies motion are given.

Keywords medium shell curve, discrete orbital equation of celestial bodies motion, energy equation, localization of fractal dimension calculus, similar expanded equation, fractal dimension expanded

Yan Kun. Introductions on the medium shell and discrete orbits of celestial bodies motion[J]. Progress in Geophysics(in Chinese), 2004, 19(4): 984～995. DOI:10.3969/j.issn.1004-2903.2004.04.046.
http://en.cnki.com.cn/Article_en/CJFDTOTAL-DQWJ200404046.htm
http://www.nature.ac.cn/papers/paper-pdf/celestial-pdf.pdf

The general expression of Binet equation about celestial bodies motion orbits

YAN Kun (yankun@nature.ac.cn)
(Xi'an Modern Nonlinear Science Applying Institute，Xi'an 710061，China)

Abstract By discussing the existent equations of mass-velocity relation, the equivalent polar coordinate equation and its Binet equation of the mass-velocity relation are given, and the expressions of the mass-velocity relation and mass-energy relation are given too, which include the forms of superluminal motion. Subsequently, using the mass-energy relation, the general expression of the solution of the energy equation on the medium shell curve method is discussed, and the general expression of Binet equation and its approximate solutions about orbits of the celestial bodies motion in the weak and strong gravitational field are given. Further more, the analysis solutions of the advance of the perihelion of planets and bending of light for the gravitational force are given too.

Keywords orbit of the celestial bodies motion, equations of mass-velocity relation, Binet equation, superluminal motion, advance of the perihelion of planets, bending of light, gravitational frequency shift

Yan Kun. The general expression of Binet equation about celestial bodies motion orbits[J]. Progress in Geophysics(in Chinese with abstract in English), 2005, 20(2): 534～539. DOI:10.3969/j.issn.1004-2903.2005.02.052.
http://en.cnki.com.cn/Article_en/CJFDTOTAL-DQWJ200502052.htm
http://www.nature.ac.cn/papers/paper-pdf/celestialBinet-pdf.pdf

The tendency analytical equations of stable nuclides and the superluminal velocity motion laws of matter in geospace

YAN Kun (yankun@nature.ac.cn)
(Xi'an Modern Nonlinear Science Applying Institute, Xi'an 710061, China)

Abstract In this paper, by discussing the existent distribution trend of relation for the proton number and the neutron number to be included by the stable nuclides in geospace, the tendency analytical method and it's periodic distribution equation forms of the stable nuclides are expressed at first. Then the comparison result between the curve of the theoretical equation analysis and the points of the experimental distribution data of the stable nuclides in geospace are given. Further more, the stable nuclide limit and the chemical element limit for the chemical element periodic table are given, and the possible corresponding relation equation with the positron-particle annihilation is expressed, which includes the estimation of the order of the static mass to be situated nearby at the electron neutrino structural dimension. Subsequently, by forming two hypotheses about the energy state of vacuum matter, and basing on the equivalent Binet equation, the mass equations and the energy equations of the partial moving with light-velocity or superluminal-velocity motion fusing with the results of Einstein special relativity are expressed. As inference, the possible corresponding relations between the mass equations and energy equations with the dark matter and dark energy are discussed tentatively.

Keywords stable nuclide, tendency analytical equation, periodic law, chemical element limit, energy state of vacuum matter, equations of superluminal velocity motion

YAN Kun. The tendency analytical equations of stable nuclides and the superluminal velocity motion laws of matter in geospace[J]. Progress in Geophysics(in Chinese with abstract in English), 2006, 21(1): 38～47.
DOI:10.3969/j.issn.1004-2903.2006.01.007.
http://en.cnki.com.cn/Article_en/CJFDTOTAL-DQWJ200601006.htm
http://www.nature.ac.cn/papers/paper-pdf/vacuumenergy-pdf.pdf

Introduction on background medium theory about celestial body motion orbit and foundation of fractional-dimension calculus about self-similar fractal measure calculation

YAN Kun (yankun@nature.ac.cn)
(Xi'an Modern Nonlinear Science Applying Institute, Xi'an 710061, China)

Abstract In this paper, by discussing the basic hypotheses about the continuous orbit and discrete orbit in two research directions of the background medium theory for celestial body motion, the concrete equation forms and their summary of the theoretic frame of celestial body motion are introduced. Future more, by discussing the

general form of Binet's equation of celestial body motion orbit and it's solution of the advance of the perihelion of planets, the relations and differences between the continuous orbit theory and Newton's gravitational theory and Einstein's general relativity are given. And by discussing the fractional-dimension expanded equation for the celestial body motion orbits, the concrete equations and the prophesy data of discrete orbit or stable orbits of celestial bodies which included the planets in the Solar system, satellites in the Uranian system, satellites in the Earth system and satellites obtaining the Moon obtaining from discrete orbit theory are given too. Especially, as the preliminary exploration and inference to the gravitational curve of celestial bodies in broadly range, the concept for the ideal black hole with trend to infinite in mass density difficult to be formed by gravitation only is explored. By discussing the position hypothesis of fractional-dimension derivative about function and the formula form the hypothesis of fractional-dimension derivative about power function, the concrete equation formulas of fractional-dimension derivative, differential and integral are described distinctly further, and the difference between the fractional-dimension derivative and the fractional-order derivative are given too. Subsequently, the concrete forms of measure tendency calculus equations of self-similar fractal obtaining by based on the definition of form in non-integral order calculus about general fractal measure are discussed again, and the differences with Hausdorff measure method or the covering method at present are given. By applying the measure calculation equations, the measure of self-similar fractals which include middle-third Cantor set, Koch curve, Sierpinski gasket and orthogonal cross star are calculated and analyzed.

Keywords orbit of celestial body motion, background medium theory, continuous orbit, discrete orbit, self-similar fractal measure, non-integral order calculus, fractional-order calculus, fractional-dimension calculus

YAN Kun. Introduction on background medium theory about celestial body motion orbit and foundation of fractional-dimension calculus about self-similar fractal measure calculation[J]. Progress in Geophysics(in Chinese with abstract in English), 2007, 22(2): 451～462. DOI:10.3969/j.issn.1004-2903.2007.02.018.
http://en.cnki.com.cn/Article_en/CJFDTOTAL-DQWJ200702017.htm
http://www.nature.ac.cn/papers/paper-pdf/celestialandmaths-pdf.pdf

Primary annotation of symbol basing on imaginary form about infinity

YAN Kun (yankun@nature.ac.cn)
Xi'an Modern Nonlinear Science Applying Institute, Xi'an 710061, China

Abstract In this paper, the primary annotation of symbol basing on imaginary form about infinity is given.
Keywords infinity, zero, imaginary form, symbol, annotation, Euler's formula

YAN Kun. Primary annotation of symbol basing on imaginary form about infinity[R]. Xi'an Modern Nonlinear Science Applying Institute, 18 March 2009.
http://www.nature.ac.cn/papers/paper-pdf/spirit-pdf.pdf

Research on tendency equation about the concentration data of carbon dioxide in the atmosphere over the past 60 years

YAN Kun (yankun@nature.ac.cn)
(Xi'an Modern Nonlinear Science Applying Institute, Xi'an 710061, China)

Abstract In this paper, by discussing the existing distribution of the CO_2 concentration data in the atmosphere over the past 60 years, and adopting the tendency analytical method, the concrete tendency equation forms of the CO_2 concentration are presented at first. Further more, the comparison result between the curve of the theoretical equation and the data curve of CO_2 concentration from the ice cores analysis or the observation is given. The result shows that the tendency equation curve agree well with the existing data. Subsequently, the predictive data of the CO_2 concentration in the atmosphere during the year from 2010 to 2016 are suggested tentatively.

Keywords concentration of carbon dioxide, atmosphere, tendency equation, curve fitting, predictive data, data analysis

YAN Kun. Research on tendency equation about the concentration data of carbon dioxide in the atmosphere over the past 60 years[J]. Progress in Geophys. (in Chinese with abstract in English), 2009, 24(5):1665～1670. DOI:10.3969/j.issn.1004-2903.2009.05.016.
http://d.wanfangdata.com.cn/Periodical_dqwlxjz200905016.aspx
http://www.nature.ac.cn/papers/paper-pdf/co2concentration-pdf.pdf

Research on adaptive connection equation in discontinuous area of data curve

YAN Kun (yankun@nature.ac.cn)
(Xi'an Modern Nonlinear Science Applying Institute, Xi'an 710061, China)

Abstract In this paper, by discussing the approximate equivalent analytical solution of the nonlinear dynamics equation and the properties in discontinuous area of data curve, a form of adaptive connection equation and the preset iteration method determining parameters in discontinuous area are given. Subsequently, a computing example is given too. This connection equation can be applied as a general form of expansion of the S-curve (sigmoid curve) equation or Logistic function, and for the step discontinuous area of slowly varying data curve, its form of the adaptive connection equation can be obtained by automatic calculating. And in this paper, basing on the form of the adaptive connection equation, the equations of magnetic hysteresis loop for magnetic material, the extended form of average energy equation and the tendency differential equation of the average particle number for the statistical distributions of the particles, the equation of average binding energy per nucleon in stable nuclide，the curvilinear equation of potential energy function (such as curvilinear equation of potential energy function of diatomic molecule, etc), the equation of natural saturation process (such as tree growth and physical reaction or chemical reaction process, the equation of fracture toughness for steel material, etc) and the equation of typical creep process for metal or rock material are explored and analyzed tentatively.

Keywords nonlinear dynamics equation, discontinuous area of data curve, adaptive connection equation, equations of magnetic hysteresis loop, equation of statistical distributions of the particles, equation of average binding energy per nucleon, curvilinear equation of potential energy function, equation of natural saturation process, equation of creep process

YAN Kun. Research on adaptive connection equation in discontinuous area of data curve[J]. Progress in Geophys(in Chinese with abstract in English), 2011,26(1): 162～171. DOI:10.3969/j.issn.1004-2903.2011.01.018.
http://en.cnki.com.cn/Article_en/CJFDTOTAL-DQWJ201101020.htm
http://www.nature.ac.cn/papers/paper-pdf/curveandequation-pdf.pdf

Brief annotation of the connection equation

YAN Kun (yankun@nature.ac.cn)
(Xi'an Modern Nonlinear Science Applying Institute, Xi'an 710061, China)

Abstract In this paper, the brief annotation of the properties and applications of the connection equation are given. An analytical method of the connection equation as an approximate equivalent analytical solution of the nonlinear dynamics equations is discussed, and then a new electronic circuit element (nonlinstor) with the deepening charge-controlled capacitor properties based on the form of the nonlinear differential equation is predicted, and the nonlinear differential equation for a RLCN series circuit is also analyzed. According to the approximate form of the nonlinear dynamics equation of the connection equation, the tendency equation and its conditional solutions of the statistical distributions of the particles are given, a approximate expression of extended hyperbolic tangent series for the continuous functions is constructed, a concise model of the database theoretical framework (this framework to be made up of the foundation database, the tendency equation, and the analytic database) is discussed, the equation of relationship between the total annual energy consumption with the annual GDP in the United States, and the equation of relationship between the annual population with the annual GDP in the United Kingdom are established, and the limit values of the total annual energy consumption in the United States and the annual population in the United Kingdom are calculated and predicted. Subsequently, the tendency fitting equations of the curves are explored, which included the creep process curve of the rock and the single-crystal superalloy, the Volt-Ampere characteristic curve of the discrete semiconductor device, the resistance (or resistivity)-absolute temperature curve of the superconducting material, the direct current *I-U* characteristic curve of the bicrystal Josephson junction, and the current step amplitude of Shapiro steps, the friction-speed characteristic curve (that included the stages of Coulomb friction, Stribeck friction, viscous friction, friction hysteresis, and anomalous friction hysteresis effect) in mechanical system or servo system, etc. At the end, the limitations of the connection equation in the data fitting and long-range forecasting are discussed.

Keywords connection equation, shape of curve, nonlinear dynamics equation, approximate equivalent analytical solution, saturation process, creep process

YAN Kun. Brief annotation of the connection equation[R]. Xi'an Modern Nonlinear Science Applying Institute, 18 March 2011.
http://www.nature.ac.cn/papers/paper-pdf/ConnectionEquation-pdf.pdf

未 含（节选）
http://www.nature.ac.cn/sky/nature-sky-pdf.pdf

如 若（朴本）
http://www.nature.ac.cn/star/nature-star-pdf.pdf