ISSN 2312-4997

Automatics & Software Enginery

2016 N 1(15)

© Automatics & Software Enginery. 2016, №1(15)

UDK 681.2; 681.3; 681.5; 681.7

Automatics & Software Enginery. № 2(12), 2015
ISSN 2312-4997.
The Journal “Automatics & Software Enginery” has been found in June 2012.

Founder of the Journal:

Novosibirsk Institute of Program Systems
Web site of the organization: www.nips.ru

Registration certificate ПИ № ФС77-55079

Mailing Address of the editorship:

630090, Russia, Novosibirsk, Str. Prospect Akademika Lavrentieva, h. 6/1,
Novosibirsk Institute of Program Systems
To First Vice-Director

E-mail: oao_nips@bk.ru
Web: www.jurnal.nips.ru
Additional Web (reserve archives): http://ait.cs.nstu.ru/content/ape

Journal has been signed to publication on the 22 April 2016

Оглавление

Development of the Intelligent Control for the System “DPT-Generator”

K.Y. Lastochkin, I.O. Prikhodko

Abstract: The paper deals with the question of the control of nonlinear system “DC motor – generator” using the predictive model control, where the model is expressed explicitly. The paper gives used parameters of the regulator design and the object model. It also shows the actual results of the system wirking.

Key words: control with predictive model, intelligent control, DC motor, a linear object.

REFERENCES

[1] Magni, L. Nonlinear model predictive control: towards new challenging applications. Berlin: Springer, 2009, p. 345-369. ISBN 978-3-642-01094-1
[2] Maciejowski, J. M. Predictive control: with constraints. New York: Prentice Hall, 2002, XVIII, 331 p. ISBN 02-013-9823-0.
[3] Modrlak, O., Hubka, L., Gartner, S., Worlitz, F. Rotational Speed Control DC Motor with load. Liberec: TUL, 2012.
[4] Bemporad, A. Hybrid Toolbox User’s Guide URL: http://cse.lab.imtlucca.it/~bemporad/publications/cgi-bin/hybtbx_download.cgi
[5] Kopal, M. Explicit Model Predictive Control and its application. Liberec, 2014. Diploma thesis. TUL.

Kirill Lastochkin
E-mail: kirill.avt@gmail.com

Igor Prikhodko
E-mail: igor_prih92@mail.ru

Automation in Small Batch and Unit Production

L. Dimitrov, V. Zhmud

Abstract: One of the basic requirements of present-day market is the customization of goods and services offered. As the production process is driven by the market requirements it should fulfil in these requirements by changing the principle "the more the better" to the new principle "the more variety the better", which meets the flexibility in modifications and the customer requirements for fast delivery, good quality and relatively low cost (in comparison with the cost in mass production). This could be done by the use of special approaches and techniques such as Group technology approach, LEAN approach, Computer Integrated Manufacturing approach (CIM), Flexible Manufacturing Systems (FMS), Product Lifecycle Management systems (PLM), Enterprise Resource Planning systems (ERP) and some others. In this paper the experience in mass customization in single and small series batch production in a factory in Bulgaria is presented as a case study. The factory is a medium size enterprise and produces hydraulic cylinders, hydraulic pumps, hydraulic motors, and other hydraulic elements. The main specific of this production is the small number of elements in a series and the production can be determined as a single and small series production. Hundred percent of production is based on the principle of "Pull production" (or "Make to Order"). These specifics and the requirement for flexibility, low cost and high quality demand implementation of innovative technologies in design, production, assembly and testing of the goods produced by the company.

Key words: automation, small-scale production, classification, group technology

REFERENCES

[1] G. Silveiraa, D. Borensteinb, F. Fogliattoc, Mass customization: Literature review and research directions. *International Journal of Production Economics*, Vol.72, No.1, 2001, pp. 1–13.
[2] M. Onken, M. Strategic Global Mass Customization: Supporting Generic And Global Strategies. *International Journal of Management & Information Systems*, Vol.15, No2, 2011, pp. 71-78.
[3] B. Brief, Making it personal: Rules for success in product customization. http://www.bain.com/publications/articles/making-it-personal-rules-for-success-in-product-customization.aspx (31.08.2015).
[4] O. Taiichi. *Toyota Production System: Beyond Large-Scale Production*. Productivity Press, Portland, 1988.
[5] J.P. Womack, J.P., D.T. Jones. *Lean Thinking*. 2nd ed. Simon&Schuster Inc., 1996.
[6] Four Lean principles. http://www.fourprinciples.ae/lean/principles#.VeWIYU3os5s (01.09.2015)
[7] Principles of lean. http://www.lean.org/WhatsLean/Principles.cfm (01.09.2015).
[8] L.S. Lawrence, What's the technology in GT? *Managing Automation*, July 1986, pp. 51-56.
[9] M.P. Groover, *Automation, production systems and computer-integrated manufacturing.* 3rd ed., Prentice Hall, 2007.
[10] P.M. Swamidass, *Encyclopedia of production and manufacturing management*. Springer, 2000.
[11] J. Harrington, *Computer Integrated Manufacturing*. Krieger Pub Co., 1979.
[12] H. Zhang, L. Alting, *Computerized manufacturing process planning systems.* Springer, 1994.
[13] J.A. Rehg, H. Kraebber, *Computer Integrated Manufacturing*. Upper Saddle River, NJ: Pearson Prentice Hall, 2004.
[14] L. Dimitrov, P. Nedyalkov, A. Todorov, Automation in Design and Analysis of Hydraulic Cylinders. *Proceedings of the 7th International Conference Research and Development of Mechanical Elements and Systems*, Zlatibor, Serbia, 2011, pp. 209-212.
[15] L. Dimitrov, R. Shikov, H. Bankov, M. Klochkova, Automated Assembly of Hydraulic Cylinders in Small and Medium Size Production, *Proc. 32nd Congress with Int. Participation* HIPNEF, Vrnjačka Banja, Serbia, 2009, pp. 25-33.
[16] L. Dimitrov, S. Yordanova, Optimal Fuzzy Logic Based Enterprise Resource Planning System for Hydraulic Cylinders Assembly. – *International Journal of Systems Application, Engineering & Development*, Vol.5, No5, 2011, pp. 634-641.
[17] L. Dimitrov, S. Spasov. Automation in small series batch production. A case study, *2nd International Conference "Conference on Mechanical Engineering Technologies and Applications" COMETa* 2014, Sarajevo, pp. 9-16.
[18] S. Irani, *Handbook of Cellular Manufacturing Systems*, John Wiley & Sons, 1999.
[19] H. Nancy, U. Wemmerlov, *Reorganizing the Factory: Competing through Cellular Manufacturing*, Portland, OR, 2002.
[20] T. Tolio, *Design of Flexible Production Systems – Methodologies and Tools*. Berlin: Springer, 2009.
[21] SEMBA: User Manual, 2008.
[22] Mitrofanov, S.P. Grupovaja tehnologija mashinostroitel'nogo proizvodstva. Leningrad, Mashinostroenie, 1983.

Vadim Zhmud

E-mail: oao_nips@bk.ru

Lubomir Vankov Dimitrov

E-mail: lubomir_dimitrov@tu-sofia.bg

Modeling of the Distributed Fibre-Optical Sensor in Labview for Increasing of the Spatial and Temperature Resolution

E.Yu. Kuznetsova, Z.N. Alekseenko

Abstract. The distributed temperature sensors are often used in systems of technogenic monitoring and measurement technique. The metrological characteristics of such devices demand improvement. It is connected with improvement of data asquision and algorithms of digital signal processing. In the paper, the modeling of distributed temperature sensor in Labview is carried out. A new approach to improvement of characteristics, consist in digital filtration and use of median evaluation of signal instead of average value is offered.

Key words: Bragg temperature sensor, fiber optics, spectrum characteristics, modeling in Labview

REFERENCES

[1] Z.N. Alekseenko, O.V. Stukach. Design of the monitoring system based on sensor on Bragg fiber array for the objects with large infrastructure [Electronic]. Youth and modern information technologies: Proceedings of the XII All-Russia scientific-practice conference of students, post-graduates and young researches: in 2 v., Tomsk, November 12–14, 2014. TPU. Vol. 1. P. 335-336. http://www.lib.tpu.ru/fulltext/c/2014/C04/V1/C04_V1.pdf

[2] A. H. Hartog. A distributed temperature sensor based on liquid-core optical fibers. Journal Lightwave Technol. 1983. N 1. P. 498–509.

[3] J. P. Dakin, D. J. Pratt, G. W. Bibby, J. N. Ross. Distributed optical fiber Raman temperature sensor using a semiconductor light source and detector. Electron. Lett. 1985. № 21. C. 569–570.

[4] X. Bao, D. J. Webb, D. A. Jackson. Combined distributed temperature and strain sensor based on Brillouin loss in an optical fiber. Opt. Lett. 1994. № 19. C. 141–143.

[5] B. Culshaw. Optical fiber sensor technologies: opportunities and-perhaps-pitfall. J. Lightwave Technol., vol. 22, no. 1, pp. 39-50, 2004.

[6] 6. J. Park *et al.*, Raman-based distributed temperature sensor with simplex coding and link optimization. Photon. Tech. Lett., vol. 18, no. 17, pp. 1871-1881, 2006.

Ekaterina Kuznetsova

E-mail: katua1993k1@mail.ru

Zakhar Alekseenko

E-mail: zakharalekseenko@gmail.com

© Automatics & Software Enginery. 2016, №1(15)

Graphic OLED Display UG-2864ASYGG14: First Start

V.A. Zhmud, A.S. Kamenskaya, K.V. Kurbetyev, V.G. Trubin

Abstract: The paper discusses main issues arising according the development of OLED display based on UG-2864ASGGG14, which is controlled by the debug board STM32VLDISCOVERY.

Key words: microcontroller, STM32, STM32VLDISCOVERY, UG-2864ASGGG14, SH1106, OLED.

Vadim Zhmud

E-mail: oao_nips@bk.ru

Anna Kamenskaya

E-mail: ladymacbeth94@yandex.ru

Konstantin Kurbetiev

E-mail: kkurbetev@mail.ru

Vitaly Trubin

E-mail: trubin@ngs.ru

Design of swing and stabilization algorithms of the inverse pendulum fixed on a motor shaft

Nurbek Emirbekov, Mirbek Emirbekov

Abstract. In this paper, the task of swing and stabilization of the inverse pendulum fixed on a motor shaft is considered. The nonlinear differential equations describing this system behavior are given and transition to its linearized model is performed. The swing algorithm of the pendulum from stable position to area of a point of an unstable equilibrium is offered. The stabilization algorithm allowing to ensure demanded quality of transient in system is developed. Simulation of the closed system with the controller in Matlab Simulink program environment is spent.

Key words: inverse pendulum, swing, stabilization, controller.

REFERENCES

[1] Formal'skij A.M. Upravlenie dvizheniem neustojchivyh ob'ektov. M.: FIZMATLIT, 2012. 232 s.
[2] Druzhinina O.V. i dr. Modelirovanie i postroenie algoritma stabilizacii perevernutogo majatnika. Dinamika slozhnyh sistem -XXI vek. 2012. № 4. s. 74-78.
[3] Sablina G.V., Drozdova O.N. Issledovanie i sintez sistemy «dvojnoj perevernutyj majatnik na telezhke». Mater. VIII mezhdunarodnoj n.-t. konferencii «Aktual'nye problemy jelektronnogo priborostroenija (APJeP)». Novosibirsk, Izd-vo NGTU, 2006, T7, s. 249-252.
[4] Nishida M., Kaneshide A., Terashima K. Control system of nonlinear process to swing up and stabilize inverted pendulum. Trans. of the Society of Instrument and Control Engineers, № 9, 1995, Vol. 31, p. 1452-1461.
[5] Andrievskij B.R., Guzenko P.Ju., Fradkov A.L. Upravlenie nelinejnymi kolebanijami mehanicheskih sistem metodom skorostnogo gradienta. Avtomatika i Telemehanika. M: Nauka, 1996.
[6] Sablina G.V. Razrabotka i issledovanie metodiki stabilizacii ob#ekta upravlenija «karetka-majatnik»: Avtoref. dis. … kand. tehn. nauk. – Novosibirsk. 2000.
[7] Sablina G.V., Sazhin A.I. Issledovanie real'nogo skol'zjashhego rezhima v model'noj sisteme «perevernutyj majatnik». Avtomatika i programmnaja inzherenija. 2015, №1(11), s. 9–15
[8] Hemani H., Golliday C. The inverted pendulum and biped stability. Math. Biosci, 34, 1977, p. 95-110.
[9] Kieffer J., Bale R. Walking viability and gain synthesis for novel class dynamically-simple biped walking machines. Informatica, 17, 1993, p. 145-155.
[10] Kvakernaak X., Sivan R. Linejnye optimal'nye sistemy upravlenija. M: Mir, 1977. 653 s.
[11] Bronshtejn I.N., Semendjaev K.A. Spravochnik po matema-tike dlja inzhenerov i uchashhihsja vtuzov.-13-e izd., ispravlennoe. - M.: Nauka, 1986.
[12] Vostrikov A.S., Francuzova G.A., Gavrilov E.B. Teorija avtomaticheskogo regulirovanija: Ucheb. posobie. Novosibirsk, Izd-vo NGTU, 2008. 476 s.

Nurbek Emirbekov

email: wolf__2011@mail.ru

Mirbek Emirbekov

email: wolf__2011@mail.ru

Structure and Methods of Control of Oscillating Objects

Vadim Zhmud, Vladimir Semibalamut, Lubomir Dimitrov

Abstract: The relevantness of the task of control of oscillatory object is beyond doubt. Yet it is still has not been solved successfully, except for individual examples. In particular, the task of control of the object, having in its transfer function numerator or denominator negative coefficients of the polynomial, is of great interest. This task is even more complicated if there is a negative coefficient both in the numerator and in the denominator. This task can be solved by various methods. It is worth of noting among them the use of the bypass channel, the use of the equalizer, the use of a switching regulator, the use of additional external control loop and the use of the filter on the reference input. The paper dealt with these methods. It demonstrats their advantrages and disadvantages with mathematical modeling (simulation). It is shown that the choice of integration method for modeling of integrators and derivative devices can significantly affect to the result of simulation and optimization. This should be considered when choosing the algorithm of the digital controller, because without the choice of integrating method in the control algorithm it is not complete and it can not act. If the calculation would be done without taking into account the this choose, then the results of its use will not match, at least due to the mismatch of the methods for calculating of the integrals and derivatives of the used and signals. It is shown that it is not possible to choose the best method of integration for all problems, because the two most appropriate methods, namely, a simple Euler method and adaptive method Bulirsh-Stoyer, each has both advantages and disadvantages, which are discussed in the paper.

Key words: Control, locked loops, regulators, design of controlling systems digital control, feedback, optimization

REFERENCES

[1] V.A. Zhmud. “Simulation, research and optimization of locked system of automatic control”. Monograph. Novosibirsk. Publishing house of NSTU. 2012. – 335 p.

[2] A.A. Voevoda, V.A. Zhmud, R.Yu. Ishimtsev, V.M. Semibalamut. “The modeling tests of the new PID-regulators structures”. Proceedings of the IASTED International Conference on Applied Simulation and Modelling, ASM 2009. P. 165–168.

[3] V.A. Zhmud, O. D. Yadrishnikov, A.V. Poloshchuk, A.N.Zavorin. “Modern key technologies in automatics: Structures and numerical optimization of regulators”. 2012. Proceedings of 7-th International Forum on Strategic Technology, IFOST-2012.

[4] V.A. Zhmud, A.V. Liapidevskiy, E.V. Prokhorenko. “The design of the feedback systems by means of the modeling and optimization in the program VisSim 5.0/6”. 2010. Proceedings of the IASTED International Conference on Modelling, Identification and Control. P. 27–32.

[5] V.A. Zhmud, O.D. Yadrishnikov. “Numerical optimization of PID-regulators using the improper moving detector in cost function”. Proceedings of the 8-th International Forum on Strategic Technology 2013 (IFOST-2013), vol. II, 28 June – 1 July. Mongolian University of Science and Technology, Ulaanbaator, Mongolia. IEEE organized. 2013. P. 265 – 270. http://www.must.edu.mn/IFOST2013/

[6] V.A. Zhmud, AV.. Polishchuk, A.A. Voevoda, R.V. Rao. “The Tuning of the PID-Regulator for Automatic Control System of Thermo Energetic Equipment”. Proceedings of the Fifth International Conference on Advances in Mechanical Engineering (ICAME-2011), June 06-08, 2011. Surat – 395 007, Gujarat, India. pp. 254-263.

[7] V.A. Zhmud, A.N. Zavorin. “The method of designing energy-saving controllers for complex objects with partially unknown model”. In the book: Issues of control and modeling in complex systems. Proceedings of the XVI International Conference June 30 - July 3, 2014, Samara. Russia. P. 557-567.

[8] V.A. Zhmud, A.N. Zavorin. “Metodi di ottimizzazione del controllo numerico su una modelli troncati”. Italian Science Review, 2014, № 4(13). PP. 686-689. Available at URL: http://www.ias-journal.org/archive/2014/april/Zhmud.pdf and http://www.ias-journal.org/archives/april-2014

[9] V.A. Zhmud, L.V. Dimitrov. “The providing of the power saving control of one output value with two controlling channels having different effectiveness and cost of the controlling resource”. Proceedings of 23-nd Internationakl Scientific and Technical Conference of Transport, Road-Buildong, Agricultural, Hosting & Hauling Military Technics and Tachnologies “Trans & MOTAUTO ‘15”. 24-27 June, 2015. Varna, Bulgaria. Vol.3. P. 118 – 122. ISSN:1310 – 3946. Publisher: Scientific-technical union of mechanical engineering.

[10] V.A. Zhmud, L.V. Dimitrov. “The providing of the power saving control of one output value with two controlling channels having different effectiveness and cost of the controlling resource”. International Lournal for Science, Technics and Innovations for Inductry. 2015. Issue 9. ISSN 1313 – 0226. Sofia. Bulgaria. P. 50 – 54. Publisher: Scientific-technical union of mechanical engineering. URL: www.mech-ing.com/journal

[11] V.A. Zhmud, L.V. Dimitrov, O.D. Zavorin. “Calculation of regulators for the problems of mechatronics by means of numerical optimization method”. 2014. 12-th International Conference on Actual Propblems of Electronic Instruments Engineering (APEIE) 34006. Proceedings. Novosibirsk. 2014. Vol.1. P. 739 – 744.

[12] V.A. Zhmud, V.M. Semibalamut, A.S. Vostrikov. “Feedback Systems with Pseudo Local Loops”. Testing and Measurement: Techniques and Applications: Proceedings of the TMTA-2015. 16-17 January 2015, Phuket Island, Thailand. Taylor & Francis Group. London. ISBN: 978-1-138-02812-1-8. P. 411 – 416. Typeset by diactriTech, Chennai, India, Published: CRC Press / Balkema. P.O. Box 11320, 2301 EH Leiden, The Netherland. www.crcpress.com , Printed and bond in the UK and US, ISBN 987-1-138-02812-8, 978-1-315-68493-2.

[13] V.A. Zhmud, L.V. Dimitrov. "Adaptive feedback systems on the base of Concurrent Criteria of Optimum". Automatics & Sof tware Enginery. 2015. № 4 (14). P. 19–25. ISSN 2312-4997.
[14] V.A. Zhmud. "Control of Object with Linearly Increasing Delay". Automatics & Software Enginery. 2015. № 4 (14). P. 26–34. ISSN 2312-4997.

Vadim Zhmud

E-mail: oao_nips@bk.ru

Vladimir Semibalamut

E-mail: wladim28@yandex.ru.

Lubomir Vankov Dimitrov

E-mail: lubomir_dimitrov@tu-sofia.bg

Calculation of the Desired Coefficients of the Characteristic Equation of the Locked Control System

V.A. Zhmud, L.V. Dimitrov

Abstract: The choice of the desired polynomial is very relevant in the design of regulators. In the literature devoted to this problem are very few publications tend to this problem is solved at a primitive level, i.e. the selected polynomial having set equal multiple negative roots (binomial theorem), or the roots of the polynomial are set in a certain region of the negative half-plane (trapezoid, sphere, rectangle) . This choice is not only justified, but also far from optimal. The paper solves the problem of the selection on the basis of the requirements for dynamic and static properties of the control loop. For the first time in the solution of this problem among the criteria it effectiveness introduced in consideration of the reverse overshoot.

Key words: control, regulation, dynamic accuracy, the static accuracy of the characteristic polynomial of the system, the polynomial of desired dynamics

REFERENCES

[1] A.S. Vostrikov, G.A. Francuzova. Teorija avtomaticheskogo regulirovanija: uchebnik. M.: Vysshaja shkola, 2006. - 365 s.
[2] V. A. Zhmud', G. A. Francuzova, A. S. Vostrikov. Dinamika mehatronnyh sistem: ucheb. posobie. Novosibirsk: Izd-vo NGTU, 2014. - 176 s.
[3] V.A. Zhmud. Vybor zhelaemyh polinomov harakteristicheskogo uravnenija zamknutoj dinamicheskoj sistemy. http://zhurnal.lib.ru/editors/z/zhmudx_w_a/polinom.shtml
[4] V.A. Zhmud, V.M. Semibalamut, L.V. Dimitrov. Structure and Methods of Control of Oscillating Objects. Automatics & Software Enginery. 2016. № 1 (15). C. 19–30.
[5] V.A. Zhmud, L.V. Dimitrov. “Adaptive feedback systems on the base of Concurrent Criteria of Optimum”. Automatics & Software Enginery. 2015. № 4 (14). P. 19–25. ISSN 2312-4997.
[6] V.A. Zhmud. “Simulation, research and optimization of locked system of automatic control”. Monograph. Novosibirsk. Publishing house of NSTU. 2012. – 335 p. ISBN 978-5-7782-2162-8

Vadim Zhmud

E-mail: oao_nips@bk.ru

Lubomir Vankov Dimitrov

E-mail: lubomir_dimitrov@tu-sofia.bg

Wavelet filtering with two parametric threshold functions: selection of the function and justification of optimal parameters

Y.E. Voskoboynikov

Abstract: This paper studies the optimization of wavelet filtering algorithms with two-parameter threshold functions. Optimization of wavelet filtering algorithm is performed in two directions: a) optimization by selecting of the best function of the threshold used in practice functions; b) optimization by evaluating of the optimal parameters of the best threshold function.

Key words: estimation, wavelet transform, filtering

REFERENCES

[1] Fodor, I. K., Kamath C. Denoising through Wavelet Shrinkage: An Empirical Study. SPIE Journal on Electronic Imaging. 2003. vol. 12, N. 1, pp. 151-160.
[2] Voskobojnikov Ju.E., Gochakov A.V. Ocenivanija optimal'nyh porogovyh velichin v algoritmah vejvlet-fil'tracii izobrazhenij. Avtometrija. 2011. t. 47. №2. S. 3-12.
[3] Voskobojnikov Ju.E., Gochakov A.V., Kolker A.B. Fil'tracii signalov i izobrazhenij: Fur'e i vejvlet algoritmy (s primerami v Mathcad) Novosibirsk: NGASU (Sibstrin), 2010. 188 s.
[4] Voskobojnikov Ju.E. Vejvlet-fil'tracii signalov i izobrazhenij (s primerami v Mathcad) Novosibirsk: NGASU (Sibstrin), 2015. 196 s.
[5] Voskobojnikov Ju.E., Gochakov A.V. Postroenie algoritmov vejvlet-fil'tracii s dvuhparametricheskimi porogovymi funkcijami. Avtometrija. 2012. t. 48. N 1. P. 17-29.Mallat S. A theory of multiresolution signal decomposition: the wavelet representation. IEEE Trans. Pattern Anal. Machine Intell. 1989. v.11. N 9. P. 674-693.
[6] Gao H-Y, Bruce A.G. Waveshrink with firm shrinkage. Statistica Sinica. 1997. V. 7. P. 855-874.
[7] Lin Y, Ma Y, Liu F, Zhang X. The research based on genetic algorithm of wave image denoising threshold of medicine. Journal of chemical and pharmaceutical research. 2014.

Yury Voskoboynikov

E-mail: voscob@mail.ru

Prospects for the Development of Systems for Monitoring Seismodynamics Rock

V.A. Zhmud, V.M. Semibalamut, L.V. Dimitrov

Abstract: Lunar-solar tides occur on the Earth surface under the influence of gravitational forces of the Sun and Moon not only with ocean water, and with soil and rock. These oscillation movements may be harbingers of earthquakes and of other seismic events. So far, the monitoring of these oscillations is not disseminated widely enough. It does not allow reliably predict the time and location of upcoming earthquakes or other seismic activity of the Earth. Among the reasons for the lack of prevalence of these devices along with the lack of mines for their installation, another important reason there is the high cost and the uniqueness of such sensors. This reduces the reliability of their work and do not allow to accumulate sufficient statistical data for scientific forecasting. These sensors use laser interferometer method of measuring of the increments of the interferometer arms. Gas lasers and highly sensitive interferometers are extremely expensive and not reliable enough. The solution can be based on the use of inexpensive laser (such as semiconductor ones), as well as the use of the efficient optical measuring systems and highly intelligent signal processing methods that will improve the reliability of these measurements and ensure the production of certified sensors models for widespread use. The proposed methods can reduce the demands on the optical part of the device due to the higher complexity and extend the functionality of electronic part and software of these devices, which will increase their accuracy and reliability, and lower their price. Therefore, the proposed recommendations for further modification of such devices will expand their application and increase the reliability of seismic forecasts.

Key words: interferometer, displacement measurement, vibration measurement, laser

REFERENCES

[1] S. Bagayev, V. Orlov, Yu. Fomin, V. Cheborayev. Heterodyne laser deformation meters for the precise geophysical measurements. Earth Physics. 1992. N 1, p. 85–91.
[2] Russian Patent N 362923. S. Bagayev, A. Dichkov, A. Ohm, V. Orlov, Yu. Fomin. Two-frequency interferometer system for the measuring of the linear displacements.
[3] Russian Patent N 2082085. S. Bagayev, V. Orlov, A. Ribushkin, V. Semibalamut, Yu. Fomin. Two-frequency interferometer system for the measuring of the linear displacements.
[4] S.N. Bagayev, V.A. Orlov, A.V. Pyatigorets. Observation of Earth's oscillations by a laser interferometric method. Proceedings of SPIE 2006, vol. 6284, PP.628404-(12 pages).
[5] V. Orlov, V. Panov, S. Parushkin, M. Parushkin, Yu. Fomin. About the relation between seismic activity of the Earth with the Sun activity on the results of the precision deformation measurements. Proceedings of the conference "Geodynamics and stress of the Earth's interior", Russia, Novosibirsk, 2008, p.31–40.
[6] V. A. Zhmud. The Use of the Feedback Control Systems in Laser Physics Researching Experiments. Proceedings of RFBR and DST Sponsored "The 2-nd Russian-Indian Joint Workshop on Computational Intelligence and Modern Heuristics in Automation and Robotics", 10 – 13 September, 2011, Additional volume, pp.40–43.
[7] V.A. Zhmud. Novyj vzgljad na opyt Majkel'sona. Sbornik nauchnyh trudov NGTU. 2004. №4 (38). S. 157–164. ISSN 2307-6879.
[8] Voevoda A.A., Goncharenko A.M., Zhmud V.A. Fazometry dlja radiochastotnyh i lazernyh izmeritelej peremeshhenij i vibracij. ch.1. // Nauchnyj vestnik NGTU. 2009. - N 4(37). S.25-32. ch.2. // Nauchnyj vestnik NGTU. 2010. - N 1(38). S.35–74.
[9] GOST 10994-74. Splavy precizionnye. Marki
[10] https://en.wikipedia.org/wiki/Invar
[11] Materialy v mashinostroenii. Spravochnik. Tom 3. Special'nye stali i splavy. M., Mashinostroenie, 1968 g, str. 297.
[12] V.A. Orlov, Ju.N. Fomin, V.M. Semibalamut, D.O. Tereshkin, V.A. Zhmud. Kompleks dlja izmerenija sverhmalyh prilivnyh deformacij skal'nyh porod na osnove He-Ne–lazera. Avtomatika i programmnaja inzhenerija. 2014. №3(9). C. 54-65.
[13] V.A. Orlov, M.D. Parushkin, D.O. Tereshkin, Yu.N. Fomin, V.A. Zhmud. The usability of the laser methods in monitoring of Earth seismic dynamics // Proceedings of DST-RFBR-Sponsored Second Indo-Russian Joint Workshop on Computational Intelligence and Modern Heuristics in Automation and Robotics. NSTU, Novosibirsk, Russia. 9th – 12th September 2011. Novosibirsk, NSTU. p. 176–183.

Vladimir Semibalamut

E-mail: wladim28@yandex.ru.

Vadim Zhmud

E-mail: oao_nips@bk.ru

Lubomir Vankov Dimitrov

E-mail: lubomir_dimitrov@tu-sofia.bg

Presentation of Fresnel Transform in the Discrete Form

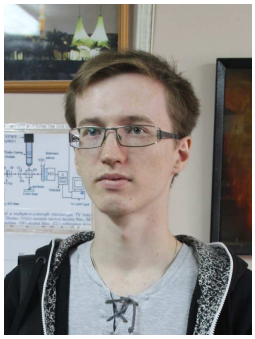
V.I. Guzhov, R.B. Nesin, V.A. Emelyanov

REFERENCES

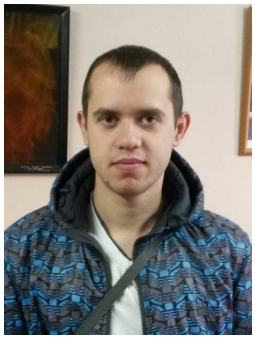
[1] Matematicheskaja model' rasprostranenija sveta v prostranstve. Guzhov V.I., Berdnikov P.A., Kuznecov R.A. Avtomatika i programmnaja inzhenerija, Novosibirsk, 2013. № 1(3) S. 121–127.
[2] J.W. Goodman Introduction to Fourier optics. Roberts and Company Publishers, 2005 – 491 p.
[3] Jaroslavskij L.P., Merzljakov N.S. Cifrovaja golografija. M.: Nauka.- 1982.- 219 s.
[4] N.Verrier, M.Atlan Off-axis digital hologram reconstruction: some practical considerations. APPLIED OPTICS. Vol. 50, No. 34. 1 December. 2011, p.H136-H146.

Vladimir Guzhov

E-mail: vig@nstu.edu.ru



Victor Emelianov



Rostoslav Nesin
E-mail: Rashpil93@mail.ru

The Area of Possible Application of Discrete Fourier transform and Fresnel transform

V.I. Guzhov, V.A. Emelyanov, D.S. Hajdukov

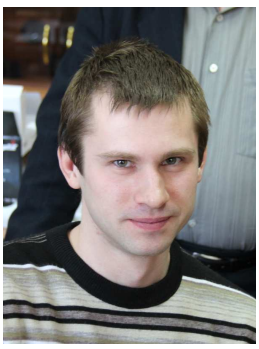
REFERENCES

[1] M.Born, E.Volf Principles of Optics. Seventh (Expanded) Edition, Cambridge University Press. 1980. (first published 1959). 936 p.
[2] V.M. Domnenko, M.V. Bursov, T.V. Ivanova. Modelirovanie formirovanija opticheskogo izobrazhenija. Uchebnoe posobie. – SPb: NIU ITMO, 2011 -141 s.
[3] Matematicheskaja model' rasprostranenija sveta v prostranstve. Guzhov V.I., Berdnikov P.A., Kuznecov R.A. Avtomatika i programmnaja inzhenerija, Novosibirsk . 2013. №1(3) S. 121–127.
[4] J.W. Goodman Introduction to fourier optics. Roberts and Company Publishers, 2005. 491 p.
[5] Jaroslavskij L.P., Merzljakov N.S. Cifrovaja golografija. M.: Nauka. 1982. 219 s.
[6] Merzljakov N.S., Popova N.R. Nekotorye osobennosti ispol'zovanija diskretnogo preobrazovanija Frenelja pri cifrovom vosstanovlenii gologramm. Avtometrija.-№5. 1987. s. 17-22.
[7] Presentation Fresnel transform in the discrete form. Guzhov V.I., Nesin R.B., Emelyanov V.A. Automatics & Software Enginery, Novosibirsk. 2016. №1(14) P. 91–96.

Vladimir Guzhov

E-mail:
vig@nstu.edu.ru

Victor Emelianov



Dmitry Hajdukov

About Patentability of Innovative Ideas for Products of Mass Production

VADIM ZHMUD

Abstract. The need for innovative ideas for the development of the industry is evident. It is widely known that the patenting of ideas contributes to the protection of copyright in the profit from the sale; however, this issue has its own peculiarities. This paper discusses some of these features and gives examples of innovative ideas, difficult for patenting. The paper gives recommendations on possible ways of overcoming these problems. This article is debatable.

Key words: innovation, patents, patentable, innovative ideas, mirror screen, a matte screen

REFERENCES

[1] Henry Cavendish. https://en.wikipedia.org/wiki/Henry_Cavendish
[2] Leo Szilard. https://en.wikipedia.org/wiki/Leo_Szilard
[3] Principles of the Sewing machine working (*In Russian*): http://pikabu.ru/story/printsip_rabotyi_shveynoy_mashinki_161731
[4] Sewing machine. https://en.wikipedia.org/wiki/Sewing_machine

Vadim Zhmud

E-mail: oao_nips@bk.ru

On the new Representations of Physical Essence of the Quantum Planck Constant, Light, Radiation, and the Structure of Elementary Particles

K.K. Karpov

Abstract: [1] Modern physics, and especially quantum and particle physics, is full of contradictions and uncertainties. Many of the most important concepts are blurred or not defined at all. This is the concept of "mass", "back", "photon" and others. Huge amounts of money are spent on accelerators, to experiment, and the structure of elementary particles, and especially the electron still has not been determined. The article shows that the reason for this lies in the fact that initially was not understood the true, deeper meaning of the greatest discoveries of the XX century - the opening of Max Planck in 1900, photon energy and action. It is shown that the lowest possible energy quantum Planck (h), in essence, there is a new elementary particle of the universe with a mass of $7.36 \cdot 10^{-51}$ kg, which has its own structure and characteristics. And precisely because it comprised all of the radiation, in Vol. H. And the light, and all the elementary particles. Recognition of quantum h Planck particle can not only correctly understand the structure and essence of light, radiation and particles, but it helps to reveal the essence of all natural forces - electromagnetic, magnetic, and even gravity, the essence of the changes the electron (nucleon) of the mass and energy in the accelerator. Lets show the real essence of the physical mass and spin of the particles, to determine the nature and parameters of the velocity of light, and even gravity. It allows you to reveal the physical essence of the formula $E = mc^2$ i.e. the device to show the essence of all the particles of matter how difficult the rotating masses, having twice the kinetic energy.

Key words: elementary particles, photons, quantum gravity

REFERENCES

[1] Trofimova T. I. Kurs fiziki, M, Vysshaja shkola, 1990.
[2] Okun' L. B. Fizika jelementarnyh chastic. M, Nauka, 1988.
[3] Belozjorov A. F. Optika Rossii. Kazan'. Centr innovacionnyh tehnologij, 2012.
[4] Kanarjov M.F. Monografija mikromira, 2012.
[5] Bolotov B. V., Bolotova N. A. Osnovy stroenija veshhestva s pozicii avtorov. Kiev, Mezhdunarodnyj centr «Universarium», 2009.
[6] Polishhuk R. F. Kanonicheskaja kalibrovka gravita-cionnogo vakuuma i zakona sohranenija v prostranstvah Rimana-Kartana». Vserossijskaja konferencija po problemam dinamiki, fiziki chastic, plazmy i optojelektroniki. M, U-t Druzhby narodov, 2014.
[7] Polishhuk R. F. Sovremennaja fizicheskaja kartina mira. Stat'ja, 2010.
[8] Savel'ev I. V. Kurs obshhej fiziki. T3. M, Nauka, 1987.
[9] Loccy Mario. Istorija fiziki. Mehanika. 1970. http://physiclib.ru/books/item/f00/s00/z0000008/st000.shtml
[10] Zhmud' A. M. Kvant "dejstvija" ili kvant "momenta kolichestva dvizhenija"? Zhurnal Samizdat, 2004. http://samlib.ru/z/zhmudx_w_a/quantdeystviya.shtml
[11] A. Sommerfeld, Uber die letzte Fortschritte der Atomphysik, Scientia, 39, 18. 1926.

Konstantin Karpov

E-mail: karpov.kk@yandex.ru

[1] The author did not propose the abstract in English. The Editng board does not makes the translates of the papers published in the “Discusions” paragraph in this case. This translation is made by means of web site https://translate.google.ru/. Any quations please address to the author to his e-mail or to the Editing board of the journal “A&SE”

The Dispersion Treatment of the Hubble Effect

VADIM ZHMUD

Abstract. Hubble effect is in the shift of the spectrum of the light from stars toward the red field. It is noted that the farther from the earth are astronomical sources of radiation, the greater the shift is. This undeniable fact is the basis of the assumption, deniable one, that the farther away the star are, the more quikly it move away from us. If such removal would occurr, of couse, it would lead to such an effect. However, not only such movevemt can cause such effect. Therefore, the alternative hypothesis is competent, that the global expansion of the Universe is not taking place, but there is only the dispersion attenuation of light energy as it propagates through space. This brings science to the hypothesis of infinite size of the universe. It is relatively stationary in the sense that none of its sufficiently large areas is moving in average in any given direction. It does not deny the movement of any of the objects in any direction and with at any speed. The author has published a series of articles explaining these views. These articles provoked many responses, and these responses continue to arrive through different channels, either through websites and e-mail. Incoming questions indicate that even those readers, who generally agree with some thesises of these publications, as it turns out, could not understand the unity and harmony of the proposed physical picture, describing the structure of the universe. Therefore, this paper answers to their questions and gives a holistic presentation of the resulting picture.

Key words: universe, astrophysics, galaxy, ether, relativity, Hubble effect, the speed of light.

REFERENCES

[1] V.A. Zhmud. Information approach to the problems of metrology and physics. Automation and Software Engineering 2015. № 3 (13). p. 80-109.

[2] V.A. Zhmud. Novyj vzgljad na opyt Majkel'sona. Sbornik nauchnyh trudov NGTU. 2004. №4 (38). S. 157–164. ISSN 2307-6879.

[3] Zhmud V.A., Bugrov S.V. The modeling of the electron movements inside the atom on the base of the non-quantum physics. С.В. Бугров, В. А. Жмудь. Proceedings of the 18th IASTED International Conference “Applied Simulation and Modeling” (ASM 2009). Sept. 7-9, 2009. Palma de Mallorka, Spain. P.17–23.

Vadim Zhmud

E-mail: oao_nips@bk.ru

Content of Full-Version in Russian

ISSN 2312-4997