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Oleg V. Stukach Dr. of Sci., Professor of National Research University "Higher school of Economics" and Novosibirsk State Technical University, **Tomsk – Novosibirsk – Moscow, Russia**

Aleksey D. Pripadchev Professor, Doctor of Technical Sciences, Head of the Department of Flying Apparatus of Orienburg State University, Aero-Space Institute, Orienburg, **Russia**

Victor P. Melchinov PhD., Assistant Professor, Head of the Department of Radiotechniques and Information Technologies of North-West Federal University honored to M.K. Ammosov, Yakutsk, **Russia**

Vyacheslav N. Fyodorov PhD., Assistant Professor, Department of Radiotechniques and Information Technologies of North-West Federal University honored to M.K. Ammosov, Yakutsk, **Russia**

Ulyana A. Mikhalyova PhD., Assistant Professor, Head of the Department "Multi-Channel Telecommunication Sustems" of Technology Institute of North-West Federal University honored to M.K. Ammosov, Yakutsk, **Russia**

Anastasiya Stotskaya PhD., Assistant Professor, Deputy Head of Automatic control system department, Saint-Petersburg Electrotechnical University (ETU LETI), Saint-Petersburg, **Russia**

Anastasiya Rusina Professor of the Department of Automated Electical and Power Systems of NSRU, Doctor of Technical Sciences, Novosibirsk, **Russia**

Olga Dolinina Dr. of Techn. Sciences, Professor, vice-rector in development & digital transformation, professor of the chair "Information systems & Technologies" Ulyanovsk State Technical University, **Ulyanovsk**, **Russia**.

Michail V. Kalinin Content manager, NIPS, Novosibirsk, **Russia**

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NIPS PJSC, Deputy Director for Science
E-mail: oao_nips@bk.ru
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The Device of Data Transmission for Sim 900D

V.P. Melchinov, J. S. Zakharov, N. S. Neustroev

North-Eastern Federal University named after M.K. Ammosova Institute of Physics and Technology, Yakutsk, Russia

Abstract: The description of the device of data transmission using the GSM module Sim 900D is presented. This device is used to monitoring the presence of voltage, transmit the temperature value and water level in reservoirs in residential and industrial buildings in the presence of cellular communication. The main functions of the device: automatic supply alarm signaling when the power supply disconnection at the facility, monitoring the ambient temperature in the mode of transmitting its value over SMS and sending over SMS the values of the water level in the expansion tanks of the heating system. The device comprises a SIM900D module with a SIM card, a PIC16F628 microcontroller, an HC-SR04 ultrasonic sensor and a DS18B20 temperature sensor. Connection the device to a computer for debugging of the microcontroller operating programs is provided. The device is powered by a 7-12 V battery or a power adapter. The advantage of the developed device is its efficiency, reliability, small size and is used to control the above parameters for various purposes in private houses and in the country house.

Key words: microcontroller programming, GSM module, ultrasonic sensor, temperature sensor.

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Viktor Petrovich Melchinov – Candidate of Physical and Mathematical Sciences, Associate Professor of the Department of Radiotechnics and Information Technologies, Institute of Physics and Technologies NEFU
E-mail: melchinovvp@mail.ru

Julustan Semyonovich Zakharov - 1st year postgraduate student of the Department of Computational Technologies, Institute of Mathematics and Informatics NEFU.
E-mail: zakharovjulus@gmail.com

Nikita Sergeyevich Neustroev – student of the 2nd year of the master's program of the Department of Radiotechnics and Information Technologies, Institute of Physics and Technologies NEFU.
E-mail: neustroev-nikita@bk.ru

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Against the Falsification of Higher Education: to Suppress the Market for Custom Examinations and Graduation Works

V.A. Zhmud [1, 2, 3, 4]

[1] Novosibirsk State Technical University, Russia
[2] Institute of Laser Physics SB RAS, Russia
[3] Siberian Branch of the Federal State Budgetary Institution of Science of the Geophysical Service of the SB RAS
[4] Novosibirsk Institute of Software Systems

Abstract. Our legislation has taken several sluggish steps to slightly restrict advertising of test and graduation services to university and college students. These sluggish steps are certainly ineffective, although they indicate an intention to fight it, or, at any rate, to create the appearance of a fight. From the position of a teacher with great teaching experience, the author declares that the measures taken are clearly not enough, and the commercialization of higher education, covering all its stages, has turned this business into a widespread one. The experience of communication with many colleagues shows that this situation is known to everyone, and few people are worried about it to such an extent as to cause active opposition to this process. With general connivance, this dishonest business is spreading more and more, as evidenced by a small private study, the results of which are presented in this article. The article does not in any way advertise such services, on the contrary, it categorically condemns them and finds many arguments in favor of voluntarily abandoning this practice by teachers, who, unfortunately, apparently sin with this, and students, who often resort to to this, and everyone else, including those who are the organizers of this process due to the share deducted to them, develop their dishonest business to such a state in which they manage to use the most modern Internet technologies, including auctions, automatic search for orders, winding up ratings performers and so on. Unfortunately, appeals and exhortations no longer work in a fully market society, therefore the article provides grounds for a legislative regulation of the situation, which seems to be that such services are recognized as unlawful, and that all three parties guilty of such relations (customers, executors and intermediaries) would be punished, at least administratively. The number of punishments should be very substantial, far exceeding the monthly earnings of such figures. The article continues the cycle of works on the fight against fake science, fake publications, fake scientific research.

Key words: higher education, technical education, disclosure, anti-advertising

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Vadim Zhmud – Head of the Department of Automation in NSTU, Professor, Doctor of Technical Sciences.
E-mail: oao_nips@bk.ru

630073, Novosibirsk,
str. Prosp. K. Marksa, h. 20

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International Siberian Conference on Control and Communications SIBCON-2021

E.A. Magid, O.V. Stukach

Kazan Federal University, Kazan, Russia
National Research University Higher School of Economics, Moscow, Russia
Novosibirsk State Technical University, Novosibirsk, Russia

Abstract: International Siberian Conference on Control and Communications SIBCON is traditionally organized by the Tomsk Chapter of the Institute of Electrical and Electronics Engineers (IEEE) and IEEE Electron Device Society in order to promote interdisciplinary discussion and interaction among scientists and engineers, to develop the international cooperation with an emphasis on the IEEE units membership and activity. In this report, achievements and results of the XV SIBCON-2021 are highlighted. Necessity of professional meetings and expansion of connection between science and industry is proven. Importance of the continued professional interaction based on IEEE activities on advanced control, robotics, computer science, and communications is described.

Keywords: professional meeting, scientific conference, the publication activity, the science metrics, the conference proceedings, quality of conference, automatic control, electronics.

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Evgeni Magid is Professor of Intelligent Robotics Department, PhD, Senior IEEE member. Institute for Information Technologies and Intelligent Systems (ITIS), Kazan Federal University
kpfu.ru/robolab.html
E-mail: dr.e.magid@ieee.org

Stukach Oleg V. is founder of the Tomsk IEEE Chapter, Dr. of Sci., Professor of National Research University Higher School of Economics and Novosibirsk State Technical University.
E-mail: tomsk@ieee.org

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Mixer of Optical and Microwave Frequencies Based on the LFD-2a Photodetector

V.F. Zakharyash

Institute of Laser Physics SB RAS, Novosibirsk, Russia

Abstract. A mixer for optical frequencies (corresponding to a wavelength of 0.85–1.2 μm) and microwave frequencies (up to 200 GHz) based on APD-2a has been created. Preliminary experimental results of a study of a structure (hereinafter referred to as MLPD) consisting of an LPD-2a germanium structure and a discharge electrode, which serves as an antenna for a microwave field placed in a waveguide, are presented. The resulting signal is removed from the lead-off electrode and used to supply an optimizing offset. The detecting and mixing properties (MLPD) have been investigated. It is shown that high sensitivity for the detection of both laser radiation, corresponding to the LFD-2a photodiode, and microwave radiation are preserved. The speed of the created mixer MLFD exceeds 200 GHz. The efficiency of the device for mixing laser and microwave radiation is shown.

Key words: photodetector, mixer, laser, microwave radiation.

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Valery Feodorovich Zakharyash - candidate of technical sciences (PhD), leading researcher,
Institute of Laser Physics SB RAS.
630090, Novosibirsk, prosp. Academician Lavrentiev, 13/3
house. address: Novosibirsk 630058, st. Vakhtangov, 39, apt. 104
Phone: +7 9231544160
E-mail: valera@laser.nsc.ru
The paper has been received on 21/06/2021

The Human Factor at The Start of The Digital Economy of the Russian Federation

V.A. Zhmud [1, 2, 3, 4]

[1] Novosibirsk State Technical University, Russia
[2] Institute of Laser Physics SB RAS, Russia
[3] Siberian Branch of the Federal State Budgetary Institution of Science of the Geophysical Service of the SB RAS
[4] Novosibirsk Institute of Software Systems

Abstract. The implementation of the Digital Economy of the Russian Federation program requires many advanced technical solutions. The initiators of the program expect the creation of a huge number of sub-technologies. But this is not enough. Significant changes in the way digital services are delivered are also critical. Just as a fleet is made up not only of ships, but also of their crews, so digital technology also includes teams of specialists. This is not only about the creators of these technologies, but more about those people who will use these digital technologies. If digital technologies are to transform the economy into a more efficient, responsive, targeted one, the success of achieving these goals depends on specific users and on the tasks they will set. Technologies will have to use all the necessary open information, this should save citizens from the need to remember many personal accounts and go to many instances in person, as well as from the need for phone calls where issues can be resolved online. These technologies consist not only of software and hardware, but also of the people who create and operate them. It is useless to fill an obsolete car with the most modern fuel. It is also useless to automate outdated approaches. It is necessary to change the very approaches to solving these problems. Some actions of some organizations and officials demonstrate movement not forward, but backward. This happens in those industries where nothing stands in the way of resolving the issue efficiently and quickly. It is necessary to change a lot, not only in the field of software and hardware, but also in the way of thinking of many specialists. It is not enough to create new software tools that allow remote maintenance (or trading) if there are rules that do not work remotely until the end, and the user must always personally carry out some actions. The problems seem to be caused by a lack of educational activities, a lack of quality education, and a lack of measures to ensure the transition to digital technologies.

Key words: digital economics, digital development, digitalization, informatics, digital university, digital city, smart city

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Vadim Zhmud – Head of the Department of Automation in NSTU, Professor, Doctor of Technical Sciences.
E-mail: oao_nips@bk.ru

630073, Novosibirsk,
str. Prosp. K. Marksa, h. 20

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Master's program "Management in technical systems". Double degree program with European universities in the Czech Republic, Germany, Greece, Latvia, Bulgaria

V. A. Zhmud[1], *G.A. Frantsuzova*[1], *L. Dimitrov*[2], *W. Hardt*[3], *O.N. Dolinina*[4,9], *U. Tudevdagva*[3,5], *J. Nosek*[8]

[1] Novosibirsk State Technical University, Novosibirsk, Russia
[2] Technical University Sofia, Sofia, Bulgaria
[3] Technical University Chemnitz, Chemnitz, Germany
[4] Saratov State Technical University. Gagarina Yu.A., Saratov, Russia
[5] Mongolian University of Science and Technology, Ulaan-Baator, Mongolia
[6] Novosibirsk Institute of Software Systems (NSTU), Novosibirsk, Russia
[7] Institute of Laser Physics SB RAS (ILP SB RAS), Novosibirsk, Russia
[8] Technical University of Liberec, Liberec, Czech Republic
[9] Ulyanovsk State Technical University, Ulyanovsk, Russia

Abstract. This article talks about the progress of the implementation of two double degree programs by the Novosibirsk State Technical University in partnership with European, Russian and Asian universities, the level of training is a master's degree, the direction of training is "Management in technical systems". The program is also called "Automation and Mechatronics" within the framework of an international program with a Czech university (Technical University of Liberec), and under a partnership program with a German university (Technical University of Chemnitz) it is called "Smart City Technologies and the Internet of Things". The base department at NSTU in both cases is the department of automation. To implement these programs, it was required to perform a lot of preliminary research and approvals, trainings, and mutual trainings. Many joint textbooks have been prepared and published, and a special hybrid educational space has been created. Currently, the program with the Czech University is in full swing, it receives annual support from the Erasmus + Foundation. This article continues the series of articles on this topic. This article is addressed primarily to students who can take part in it, as well as their parents and sponsors, as well as other teachers in order to exchange useful experience.

Key words: double diploma, automation, smart city, smart home, automation, mechatronics, mobility, computer science, computer technology

INTRODUCTION

Recently, teachers may notice a significant decrease in average student motivation to study effectively at universities. Perhaps this is due to the low dependence of an employee's income on the level and quality of his education. There are many professions that do not require higher education and provide a fairly high standard of living. There are also many professions and positions where higher education is required only as such, that is, you need a diploma of higher education, and the specific type of work and specific job descriptions do not correlate too much with the knowledge and skills acquired. Awareness of this situation creates all the prerequisites for the fact that students are only interested in the fact of receiving a diploma, are less interested in high grades in this diploma and are practically not at all interested in obtaining specific professional knowledge. The foregoing applies only to the average mass of students, since at all times there have been and exist extremes, on the one hand, students who will not be interested in obtaining high-quality knowledge never, no matter what their university and future employer attracted, and students who are self-sufficient in their motivation, are interested in gaining knowledge (and, of course, on this basis in obtaining an honors degree), regardless of the current recessions or the growing interest in the quality of higher education in society.

Experience shows that in the middle group of 20-24 masters there are always at least three to five students who are interested in their own development and in entering the best possible

educational path in order to further the best employment. It is these students that are targeted at double degree programs.

STATEMENT OF THE PROBLEM

The Education Law grants students the right to study along an individual educational path.

This implies the possibility of studying at several universities in succession in order to obtain a diploma from at least one of these universities, while the competencies of the graduate are formed by all universities participating in this process. Indeed, it seems attractive to study each group of subjects at the university that provides the best education in this group of subjects. Another motivation is to freely choose exactly those subjects that the student sees as the most important and useful for his further development and participation in the production and research or pedagogical process. Those subjects that are not taught at the chosen base university can be studied at another university. In its simplest form, this concept can be implemented at one university by moving from one educational direction to another. As a rule, this is not implemented in order to improve education, but is implemented only if the student has changed his priorities. For example, he entered one direction of study, then realized that there is another direction in the same university, more interesting for him, or easier, or his friends or girlfriends are studying in this direction, and so on. The student may not explain the motivation, but simply exercise his right to transfer to another direction of study at the same university. Of course, if the new program contains subjects that this student did not study, then he must study them on his own and pass all credits and exams that are treated as academic debts. If the first few semesters at a given university are completely the same for all areas of study, then the transition can be made without losing a year of study and without having to pay such debts. If the subjects differ, the student may need an additional year to eliminate arrears, so the transition is carried out with the loss of a year, for example, instead of transferring to the fourth year, the student will study for another year in the third year, but in a new direction of training. This option does not give the student a much better education quality, it simply solves his problems, which have arisen as a result of insufficiently correct choice when entering the university. It also happens that a student, upon admission, does not go to the chosen direction, and when he is faced with a choice, to study in the chosen direction under a contract (for money), or to study in another direction for free (since the passing score is lower there), then the student can choose this path, which from the position of teachers does not seem entirely honest, since the student takes someone else's place.

Indeed, after all, perhaps someone who would like to study in this direction may not have passed, whereas this student has passed, but was not going to graduate from the university in this direction. Therefore, while this option is legal, it does not appear to be ethical enough.

Studying at several universities looks completely different, especially if one of these universities is foreign.

The most attractive in this training option are the following possibilities:

1. Getting the best education at a leading European university.
2. Obtaining two diplomas at the end of the training: from the university in which the training was started and from the university in which the training was completed.
3. The best social and technical conditions for studying at a European university.
4. Excellent language practice.
5. An excellent chance for admission to graduate school at a European university (and not only in the one in which there was a master's degree).
6. Excellent job prospects in a European country or in another developed country.

These distinctive features of such a program create over-motivation for students, even in cases where the conditions in the country of residence are not very conducive to motivation, even at an average level. Indeed, if a student is focused on international mobility, then participation in a program that already has financial support due to the efforts of the organizers of this process, i.e. partner universities, then he just needs to wish to participate in this program and pass the selection in a not too strong competition among students of the same group. Three conditions are almost always sufficient for victory: a) successful education in undergraduate and graduate programs; b) sufficient knowledge of a foreign language, as a rule, English (but knowledge of the language of the country in which the study is supposed to be sufficient); c) sufficient motivation and the ability to explain it at the interview.

WHY NOT BACHELOR

Preliminary information about the implemented programs can be found in earlier publications on this topic [1–13].

The main idea of this program, in accordance with the Bologna Process, is that the two universities recognize the education of students in each of them to be sufficiently equivalent. In this case, each university recognizes the completed study at another university as a sufficient basis for transferring these subjects to this university.

To understand the essence of this process, let us turn to such a process as obtaining a second higher education on the basis of the existing first higher education. If a student successfully graduated from the university and has one higher education, but wants to have a higher education in another specialty, then he does not need to re-learn those subjects that are present in both programs. The

more such subjects that are the same in both programs, the shorter the training for obtaining a second higher education can be. For example, let us consider the situation in the case of the implementation of the “two plus two” system by the university; such a system of the undergraduate level, in which the first two years (four semesters) of study in all areas of training are completely identical. Then the holder of one diploma, for example, in economics, if he wishes to receive a diploma in another direction, for example, in computer science, can receive a second diploma following the results of two additional years of study. If the training programs are even closer, for example, differ only in two semesters, then such a graduate of one of such programs may, after one year of study, receive a diploma in the second direction of training. This does not happen automatically, of course, but only if there is an appropriate educational center providing such services - a second higher education based on the first.

If now we imagine that the programs are completely identical, it turns out that in order to get a second diploma, it is enough to simply “ask” it at the second university. But, of course, things are not so simple. The second university has no reason to issue a diploma if it did not participate in the training of this student.

But the situation becomes logical and justified in the event that a student received half of the required amount of knowledge as a result of studying at one university, and acquired the other half of the amount of knowledge as a result of studying at another university. If these universities have the required agreement, and if the two programs are deemed to be related to such an extent that study on the proposed program does not require any additional study beyond the usual period of study, then the student can receive two diplomas based on the results of studies in only one standard period. ...

Of course, for a bachelor's degree, this procedure for coordinating the two programs would be much more complicated. After all, it would be necessary to agree on the volume of not a two-year, but a four-year direction of training. In addition, the need for such a double degree program for bachelors is questionable. Currently, the most advanced employers consider the undergraduate program as the minimum higher education, in fact it is the level of a highly qualified employee who can maintain numerically controlled machines, participate in the production process using rather complex equipment, maintain and repair software and hardware. But this level is not enough for deep scientific research, especially independent, for the management of scientific research, for pedagogical work at the university, for research work in a scientific institute. Of course, this requires a master's level.

Therefore, two bachelor's degrees will allow you to enter the master's program, but one bachelor's degree also allows you to enter the master's program. Thus, the second bachelor's degree is superfluous. Even three or more bachelor's degrees do not give the right to enter postgraduate studies, while one specialist or master's diploma gives such a right.

Thus, a double degree undergraduate program would be much more difficult for universities to implement, and for students it would be completely meaningless.

By analogy, one might assume that it is better to study not under a double degree program for a magistracy, but to enter a double graduate school. But this analogy doesn't work. It is the master's degree for the dual degree program that is best suited.

WHY A MASTER'S, NOT A POSTGRADUATE

Developing the thoughts expressed in the previous section, it can be assumed that one should not rush to a double master's degree, the issue can be resolved at the postgraduate level.

But such an opinion would be erroneous.

The difference between a master's program and a postgraduate study is also that the duration of study in a master's program is the shortest. This makes it the most attractive for creating a dual degree program for universities, since less training is easier to synchronize and reconcile. But this is not the only argument.

Postgraduate studies are most often not a formal stage of education, although there is a tendency towards such a metamorphosis, but it is assumed that it will soon be canceled on the territory of the Russian Federation.

Traditionally, postgraduate studies in Russia lasted three years, but according to the latest standard, it began to last four academic years. And it is already clear that the logic that was in effect when deciding on such a change did not live up to expectations.

Previously, the difference between postgraduate studies in the Russian Federation and European postgraduate studies was that after graduating from the European one, almost all graduates received the title of PhD. The procedure for defending a thesis (namely, a thesis, not a thesis) is not too different from the procedure for defending a master's and bachelor's degree thesis. The Defense Commission, as a rule, consists of the professors of the given university, and in some cases may contain invited external professors. In fact, completing postgraduate studies at European universities is almost guaranteed to secure the desired degree. The situation is similar in the United States, China and other countries. Of course, a situation is possible when, according to the results of the defense, the desired degree is not awarded, but almost all students who have successfully prepared their

theses are allowed to the defense itself. Of course, plagiarism is unacceptable, and certain formalities are also required. And yet, planned defense at home university gives the best chance for success. If the defense did not take place, it can be postponed, but this should already be recognized as some serious failure.

In the Russian Federation, postgraduate studies, when it lasted three years, did not imply the issuance of any diplomas at the end of it, except for the document on the passed candidate exams. The defense of a Ph.D. thesis did not require the mandatory completion of postgraduate studies. Accordingly, it could be said that the defense of a dissertation is more difficult, it is not part of the educational process, the applicant is not guaranteed to be provided with a dissertation council at a given university, and any external dissertation council is much more complicated for the defense procedure. The number of such a dissertation council is significantly higher than the commission for the defense of theses for the title of PhD. We do not question the level of the PhD commission, it's just a different procedure. As a rule, the result was such that if the success of graduating from postgraduate studies was determined by obtaining diplomas, then postgraduate studies in the Russian Federation were the least successful. By the time of graduation, not all graduate students had a finished dissertation. It should be noted that a dissertation is not a thesis, but a full-fledged scientific work, moreover, it should be based only on the printed works already published by the author. If there are no published works, or they are insufficient in quantity (less than three) or in quality (publications are not included in the publications included in the list of the Higher Attestation Commission), then the thesis cannot be defended. Efficiency at the level of 30% is defined as sufficient for a positive assessment of postgraduate studies, i.e. even if only a third of the students receive diplomas at the end of their studies, that will be good. In addition, the term of protection was indicated as a year from the date of graduation, i.e. in fact, the dissertation had been prepared not for three years, but four years before its defense.

In the new version of the standard, which has been in effect for several years, postgraduate studies began to be carried out for four years. In addition, at the end of the training, the final qualifying work should be defended. This protection does not give the academic title of Candidate of Sciences, but it allows you to issue a diploma of completion of postgraduate studies, and if there was no defense, then only a certificate of training and a certificate of passing the candidate exams (if passed) is issued.

It turns out nonsense. Ideally, a graduate student should defend his work twice, and it is issued twice, according to different requirements. If a graduate student defended his final qualifying work (WQ), then after that he is expelled from graduate school. Consequently, he did not have time to formally defend his dissertation before the end of his postgraduate studies. Whether he will protect her after that is a big question. Communication with the supervisor is formally terminated, except for the personal relations of the graduate student and the supervisor, nothing else binds. A graduate student needs to improve his life, find a job. Most often, at a new place of work (if he did not get a job at a university or in a research institute), the dissertation practically does not give any advantages. Consequently, the motivation to complete the dissertation preparation process and to defend it is greatly reduced. In this situation, defenses rarely occur, much less often than one would like. So, if a graduate student successfully defended his FQP, most often this is where it all ends. Just like in European universities, a graduate student must defend his theses in accordance with the calendar schedule, but unlike European graduate school, such protection gives practically nothing.

Let us now consider the situation when a postgraduate student, due to particular success, was able to prepare and defend a candidate dissertation during his postgraduate studies. Or at least send her to the dissertation council, where she was accepted for defense. The question is, why would he, in this case, protect the WRC? What will she give him? If you have a PhD diploma, the possession of a postgraduate diploma does not matter, it is pointless. It turns out that the most successful graduate students can make a negative contribution to the statistics of graduate school, because they will be early expelled. Probably, there is a possibility of sending some letters with a request to consider the defense of a Ph.D. thesis as proof of the successful completion of graduate school, but formally, if the curriculum includes the defense of an FQP, and it has not happened, therefore, the graduate school has not been completed successfully. Some kind of confusion turns out. This WRC is not needed, neither in that case, nor in the other. It should have been canceled and only the dissertation defense should be left, or its status should be equated to the dissertation defense.

It is also pertinent to mention the terms of study in different countries. Master's degree in some countries lasts not two years, but one and a half years. Of course, this is some obstacle, but it can be overcome. A student can simply study, for example, in Russia, for the first year, then in Bulgaria - six months and defend the FQP, then return to Russia and study for another six months, and then defend the FQP at the university where he began his studies. If we talk about postgraduate studies, then the mismatch of terms is more significant: in Russia it lasts four years, and in most European countries only three years.

Suppose that a postgraduate student of two universities has successfully completed his postgraduate studies at a European university and defended his theses, received a PhD diploma. What

is the point in this case for him to study for another year in graduate school in Russia and what is the point of defending the FQP? After all, he can simply nostrify this PhD diploma. Or it may not do this, formally it is equated to a candidate's diploma. He can get a job as an assistant professor at a university or a leading researcher at a research institute. He will even be equated with a foreign assistant professor, that is, the university can include the euro in the report on an indicator that includes the number of foreign teachers. And if it is not needed, then who will do it? It turns out that when studying in two postgraduate studies, in case of successful completion of studies in European postgraduate studies, there is no need to wait for the completion of postgraduate studies in Russia. And if training in European postgraduate studies is not successful, then what was it for? And this and that makes no sense. In addition, formally, such dual education in graduate school is not defined in any way. Universities can sign as many agreements as they want, but it makes no sense for a person who enrolled in a European postgraduate study to enroll in a Russian graduate school. If, while studying in Russian graduate school, he can simultaneously enter the European graduate school, then, most likely, only in order to help in obtaining funding for trips to this European university, and in case of successful graduation with a defense, his connection with the Russian university will naturally be lost. as unnecessary. Thus, a double postgraduate study is an unnecessary exoticism, it does not seem to make much sense for two universities to invest in the development of this method of interaction, except, of course, a situation when, well, two professors really want to be joint supervisors of some talented graduate student.

THE MASTER PROGRAM IS THE ONLY VARIANT

The advantages of implementing a double degree program (two degrees from two different universities, one of which is European) follow from the above.

Master's studies are completed within a two-year period. Division into two periods of one academic year is most natural. The first year of study is carried out at a Russian university, in this case, at NSTU. Also participating in this program is another Russian university, Saratov State Technical University. Gagarina Yu. A. This university also implements many joint educational programs, one of which was created in a joint project [8], [10]. This project lasts three years and ends in November this year. Upon completion, six joint educational programs will be implemented, respectively, between six pairs of universities. European universities are represented by three technical universities: these are universities from Greece (International Hellenic University, ex Alexander Technological Educational Institute of Thessaloniki), Germany (Chemnitz Technical University) and Latvia (Riga Technical University). The Technical University of Sofia (Bulgaria, Sofia) also participates in the project, which is the coordinator responsible for the distribution and proper use of project funds from the Erasmus + fund. Among the universities that are implementing joint master's educational programs in this partnership are two mentioned Russian universities, Novosibirsk State Technical University (NSTU-NETI) and Saratov State Technical University named after I. Gagarina Yu.A. (SSTU). These Russian universities send their students to Chemnitz, Germany, to the Chemnitz University of Technology. Also in partnership are two universities from Kazakhstan, namely the Kazakh National University. Al-Farabi (KazNU, see https://www.kaznu.kz/ru) and the Eurasian National University. L.N. Gumilyov (ENU, see https://www.enu.kz/ru/). These universities are implementing a joint educational program in conjunction with the University of Greece (International Hellenic University, ex Alexander Technological Educational Institute of Thessaloniki). In addition, two universities from Mongolia participate in the project, they are the Mongolian State University (National University of Mongolia, NUM, https://www.num.edu.mn/en/) and the Mongolian University of Science and Technology, MUST, https://www.must.edu.mn/en/). This university sends its students for the second year of study to Latvia, to the Riga Technical University. Also in the project, organizations from Romania, Mongolia, Kazakhstan and Russia are present as coordinators from industrial organizations and employers.

Students from Mongolia (two students from each of the above-mentioned universities) have already successfully completed their studies under the program and received diplomas from both universities, which is an overfulfillment of the project plans, which involved the implementation of trial training, but did not necessarily require its full implementation, which is necessary to be carried out only by the end of the project. Nevertheless, the project allowed and recommended this, therefore, the successful implementation of this project can be noted.

The four other partner couples were unable to achieve such a brilliant result, exceeding the project's plans, as student travel was interrupted by the coronavirus pandemic. The borders turned out to be closed, so students from NSTU did not have time to leave for Germany, although students from SSTU left and successfully arrived in Chemnitz. But upon their arrival, a lockdown was announced, in fact, they had to study remotely from hotels, although their personal arrival allowed them to apply for admission. These students from SSTU have a chance to receive double diplomas, the issue has not yet been resolved. Students from NSTU studied remotely, the teaching procedure was no different from the procedure for teaching students

from SSTU and students from the Technical University of Chemnitz, who also studied remotely during this period.

Of course, the double degree program is not at all focused on a remote form of study, although this form of study is not excluded. Still, its main goal is student mobility, support for student travel to other countries in order to obtain high-quality European education.

Also, the arrival of students from Kazakhstan to Greece turned out to be problematic, which was impossible to predict at the stage of writing this project and at the first stage of its implementation, however, all parties took all available opportunities to implement the project program in full, therefore, distance learning took place in all cases. , all students who were selected through a competition to participate in this program at the expense of the project participated, at least, in the learning process in a distance form using skype, zoom and other similar Internet technologies for online communication.

One of the advantages of implementing this program for masters is that the entire program naturally develops into two parts: the first two semesters are mainly filled with the so-called ringing hours, when the student studies in the mode of lectures, workshops, seminars, practices and laboratory works. The third and fourth semesters are mainly devoted to scientific research with the aim of completing the final qualifying work and writing this final qualifying work, as well as its defense. FQP protection is carried out in both universities. Accordingly, the student receives a supervisor for FQP at a European university, and a co-director from a domestic university is responsible for the student's acquisition of knowledge in the first two semesters, participates in the choice of a topic, advises the student in a distance form, and also advises him on the preparation of FQP in a domestic university.

On the international accreditation of joint educational programs

Of course, every educational program receives state accreditation. The presence of state accreditation is recognized by the international community as the presence of international accreditation (formally), however, the procedure for international and public accreditation is very desirable, since it allows the quality of education to be checked by an independent international expert community, which, as a result, recommends the appropriate authorities to issue certificates of international accreditation of the established sample. In Fig. 1, 2 3 shows certificates (certificates) of international accreditation of the relevant technical areas of NSTU, which also includes the direction "Management in technical systems", these certificates were obtained as a result of the accreditation procedure, they testify to the high quality of student training at NSTU in these areas, which is confirmed by an independent examination of a collegium of reputable scientists, teachers and employers from several countries.

Experience in implementation of double masters with Czech University

NSTU has a long-term positive experience in implementing a double degree program with the Technical University of Liberec, Liberec, Czech Republic. The state of this type of international activity can be characterized by the rating “Extremely successful”. Indeed, the first program funded from the TEMPUS fund (TEMPUS MPAM project) was intended only to create conditions for the implementation of a double degree program, as well as to train two students from each pair of partner universities. The program involved three universities from Russia and Ukraine, as well as one university from France, the Czech Republic, and Bulgaria. Each university from Russia and Ukraine had to send two students to the university that was most convenient for the implementation of the double degree program. The choice naturally settled on a university from the Czech Republic, since, firstly, the duration of study coincides (two calendar years), and secondly, the Technical University of Liberec (TUL) successfully resolved the issue of not taking money for student tuition. For example, the Technical University of Sofia could not solve this issue, although the university administration would be ready to give up this money, but the legislative framework in Bulgaria does not allow this: foreign students must study for a fee, other options are excluded.

The first two students studied completely in accordance with the curriculum, they completed all tasks on time, passed tests and exams, defended their Graduation qualification works and received TUL diplomas. After that, they returned to NSTU and defended their Graduation qualification works in Russian at NSTU; based on the results of the defense, they also received master's degrees from this university.

Other students from other universities had similar achievements, not always as successful, but generally satisfactory. This ended the financing of cooperation between universities, since the project was completed, all the goals were achieved. It was further proposed to continue this program with support from other sources, including the ERASMUS + fund.

Due to the extraordinary activity of the TUL teachers (in particular, personally Professor Yaroslav Nosek), applications for support to the ERASMUS + fund were submitted annually from this university, each time the project was written so reasonably and efficiently that there was never a situation when it was not supported.

In addition, an effective strategy for conducting a competitive selection and preventive registration

of documents for a trip by students was developed, which made it possible to fulfill all the conditions of the new project in full every time. The essence of this is that the selection of students by competition and the preparation of documents for the trip should be started in advance, when it is not yet known whether the project will receive support or not. The paperwork is associated with some costs, which NSTU compensated for the students so that they do not get into a situation where the result is not yet known, but it is already necessary to pay. Therefore, students were only asked to invest in this project their interest, their activities, their knowledge and learning outcomes. As a result, since 2014, almost every year (with the exception of 2016 and 2020), the Department of Automation of NSTU has sent two or three students to TUL to implement training in the third and fourth semesters within the framework of this program of a double master's degree in the direction of "Automation and Mechatronics", the corresponding direction in NSTU "Management in technical systems". Due to the grant, students were paid for the flight, as well as a scholarship (800 euros per month) was paid throughout the entire period of study (9 months). The university provides an extremely favorable learning environment. The university has the most modern educational equipment, educational and research stands, robots, computers, 3D printers, etc. There are opportunities for the development and manufacture of complex electronic products, mechanics, mechatronics.

This creates extremely favorable conditions for teaching, scientific research, for writing a high-quality FQP and its positive defense. In addition, during the training, students have the opportunity to write and publish articles in journals or conference proceedings included in the highly rated databases. This provides excellent opportunities for admission to graduate school, and not only in TUL, but also in any other European university.

This cooperation greatly contributed to the improvement of the quality of education at NSTU in the direction of "Management in technical systems". One of the obvious results is obtaining international certificates of international and public-professional accreditation (see Fig. 1 – Fig. 3).

NATIONAL ACCREDITATION BOARD
NATIONAL CENTRE FOR PUBLIC ACCREDITATION

CERTIFICATE
OF INTERNATIONAL ACCREDITATION

Registration No 1341-08-IA119.1

Educational programmes in the fields of study:

"APPLIED MATHEMATICS AND COMPUTER SCIENCE" (01.04.02),
"INFORMATICS AND COMPUTER ENGINEERING" (09.04.01),
"CONTROL OF TECHNICAL SYSTEMS" (27.04.04),
"INFORMATION AND COMMUNICATION TECHNOLOGIES AND SYSTEMS" (11.04.02),
"INFORMATION SYSTEMS AND TECHNOLOGIES" (09.03.02)

offered at the Federal State Budgetary Educational Institution of Higher Education
NOVOSIBIRSK STATE TECHNICAL UNIVERSITY

are accredited until July 1, 2027.

The quality of the educational programmes listed in the Annex complies with the Standards and Criteria of Public Accreditation developed by the National Centre for Public Accreditation in accordance with the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG-ENQA).

Chair of the National Accreditation Board V.A. Bolotov

Director of NCPA V.G. Navodnov

«Национальный центр профессионально-общественной аккредитации»

Issued on July 1, 2021

NCPA is listed in European Quality Assurance Register (EQAR) and in Asia-Pacific Quality Register (APQR).

Fig. 1. Certificate of international accreditation of the direction "Management in technical systems" in NSTU and other areas (document in English)

Several graduates of the double master's program have already successfully defended their theses and received PHD diplomas, one of the graduates did this at the University of Munich, the rest at the University of Liberec. Interestingly, at one stage, TUL students, also within the framework of international cooperation in the field of higher education, traveled to Germany for an internship at a German university. Thus, for students from Russia there was an opportunity to study sequentially in two European universities.

Students applying for this program are only required to study well and know English well enough, since teaching at TUL to foreign students is carried out in English.


НАЦИОНАЛЬНЫЙ АККРЕДИТАЦИОННЫЙ СОВЕТ
НАЦИОНАЛЬНЫЙ ЦЕНТР ПРОФЕССИОНАЛЬНО-ОБЩЕСТВЕННОЙ АККРЕДИТАЦИИ

СВИДЕТЕЛЬСТВО
О МЕЖДУНАРОДНОЙ АККРЕДИТАЦИИ

Регистрационный № 1341-08-IA119.1

Образовательные программы по направлениям подготовки

«ПРИКЛАДНАЯ МАТЕМАТИКА И ИНФОРМАТИКА» (01.04.02),
«ИНФОРМАТИКА И ВЫЧИСЛИТЕЛЬНАЯ ТЕХНИКА» (09.04.01),
«УПРАВЛЕНИЕ В ТЕХНИЧЕСКИХ СИСТЕМАХ» (27.04.04),
«ИНФОКОММУНИКАЦИОННЫЕ ТЕХНОЛОГИИ И СИСТЕМЫ СВЯЗИ» (11.04.02),
«ИНФОРМАЦИОННЫЕ СИСТЕМЫ И ТЕХНОЛОГИИ» (09.03.02)

федерального государственного бюджетного образовательного учреждения высшего образования
«НОВОСИБИРСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ»

аккредитованы до 1 июля 2027 г.

Качество реализуемых программ, указанных в приложении к настоящему свидетельству, соответствует стандартам и критериям, установленным в соответствии с Европейскими стандартами гарантии качества образования ESG-ENQA.

Председатель Национального аккредитационного совета В.А. Болотов

Директор Нацаккредцентра В.Г. Наводнов

Выдано 1 июля 2021 г.

Нацаккредцентр официально зарегистрирован
в Европейском реестре гарантии качества образования EQAR и в Азиатско-Тихоокеанском реестре гарантии качества образования APQR

Fig. 2. Certificate of international accreditation of the direction "Management in technical systems" in NSTU and other areas (document in Russian)


НАЦИОНАЛЬНЫЙ АККРЕДИТАЦИОННЫЙ СОВЕТ
НАЦИОНАЛЬНЫЙ ЦЕНТР ПРОФЕССИОНАЛЬНО-ОБЩЕСТВЕННОЙ АККРЕДИТАЦИИ

СВИДЕТЕЛЬСТВО
О ПРОФЕССИОНАЛЬНО-ОБЩЕСТВЕННОЙ АККРЕДИТАЦИИ

Регистрационный № 1341-08-A119.1

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«НОВОСИБИРСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ»

аккредитованы до 1 июля 2027 г.

Качество реализуемых программ, указанных в приложении к настоящему свидетельству, соответствует стандартам и критериям профессионально-общественной аккредитации, установленным в соответствии с Европейскими стандартами гарантии качества образования ESG-ENQA.

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Директор Нацаккредцентра В.Г. Наводнов

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Fig. 3. Certificate of professional and public accreditation of the direction "Management in technical systems" in NSTU and other areas (document in Russian)

Photos 1–12 show the performance of research and laboratory work by undergraduate and graduate students at the Technical University of Liberec (Liberec, Czech Republic).

Photo 1. Nuclear power plant Temelín and students of TUL

Photo 2. Electro mobile developed in TUL with the helps of students

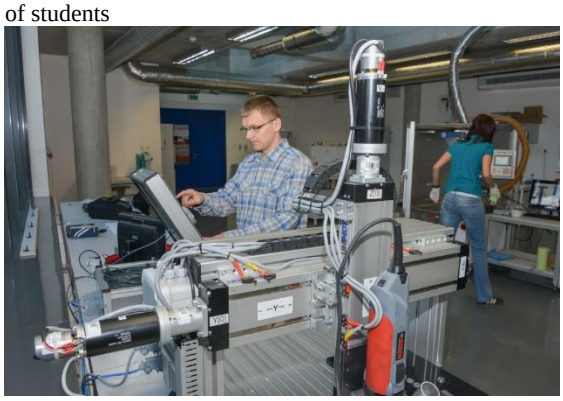

Photo 3. Students developing robotic device

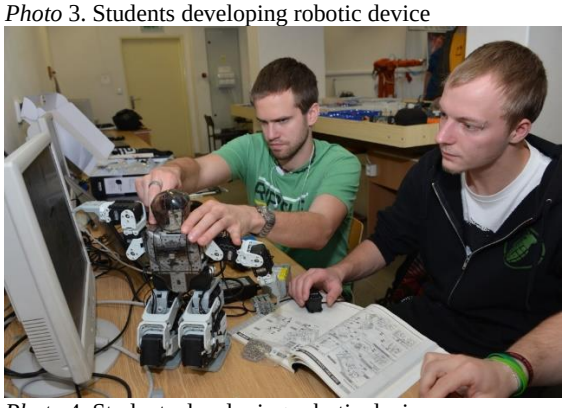

Photo 4. Students developing robotic device

Photo 5. Students developing robotic device

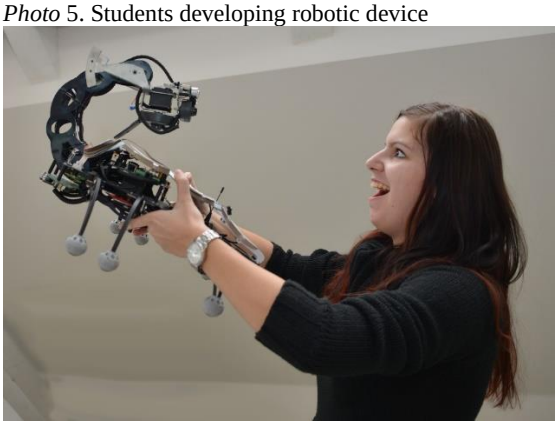

Photo 6. Students developing robotic device

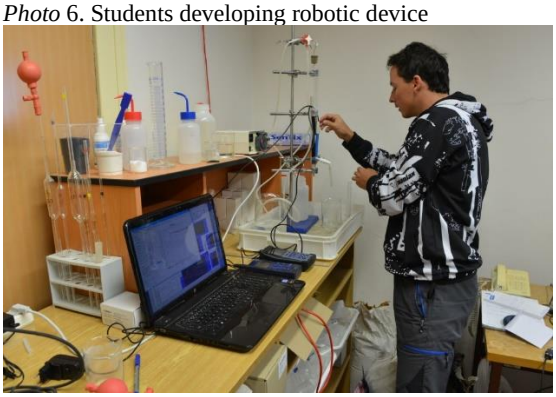

Photo 7. Students of TUL doing laboratory works

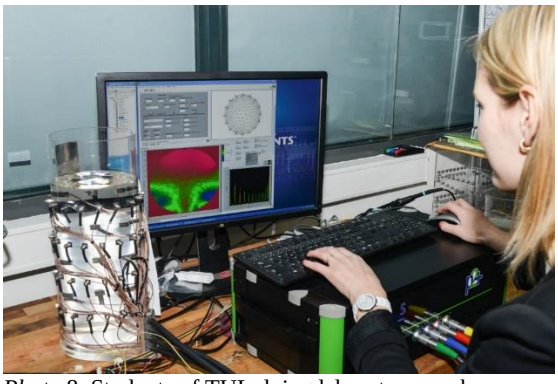

Photo 8. Students of TUL doing laboratory works

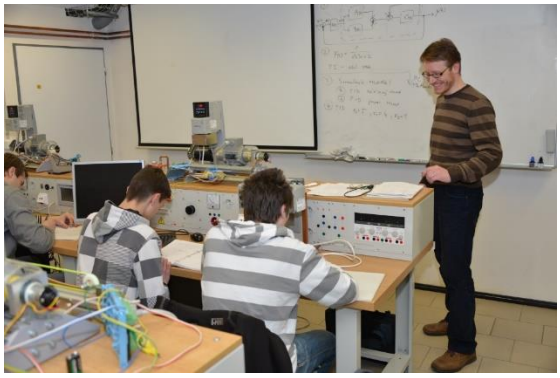

Photo 9. Students of TUL doing laboratory works

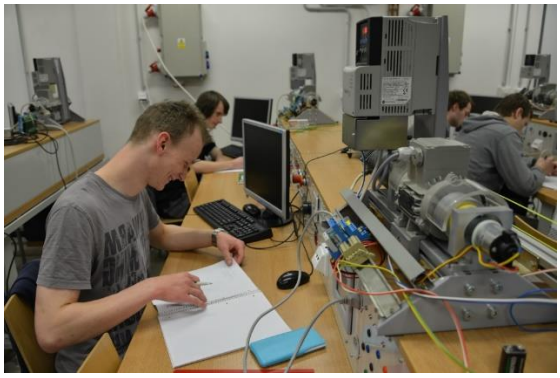

Photo 10. Students of TUL doing laboratory works

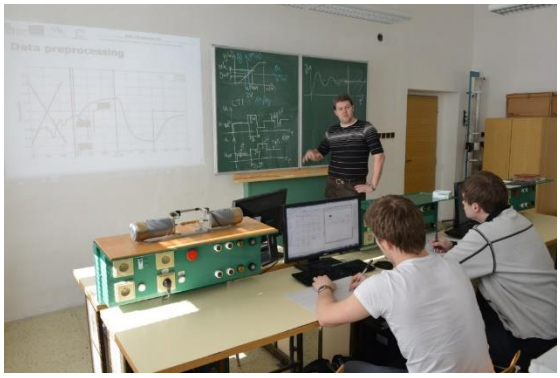

Photo 11. Students of TUL doing laboratory works

Photo 12. Students of TUL doing laboratory works

Photo 13 shows the exterior of the main building of the Technical University of Liberec.

Photo 13. Exterior of the main building of the Technical University of Liberec

Photos 14-21 show laboratory work at the Technical University of Sofia (Sofia, Bulgaria) in the construction of robots. This university was also a partner in the TEMPUS-MPAM project, and is also a coordinator for the Smart City project.

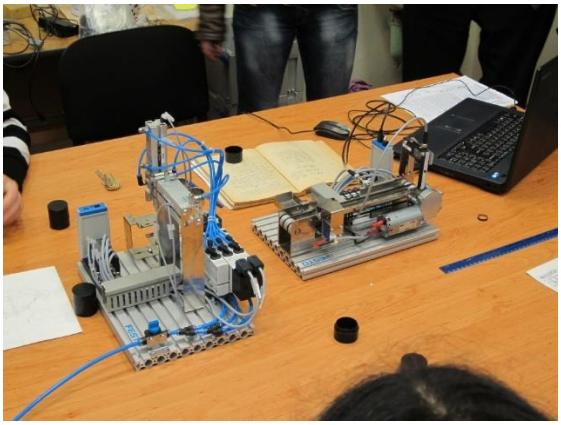

Photo 14. Robots constructed in TUS

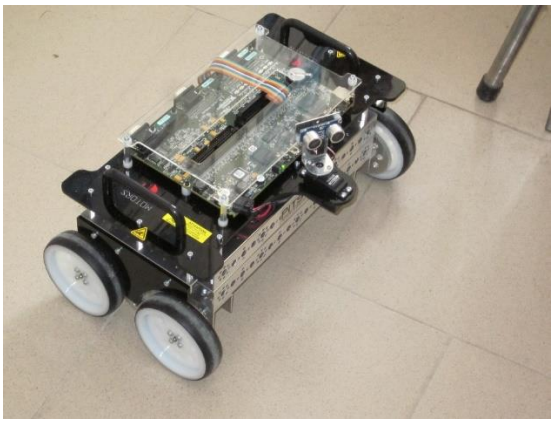

Photo 15. Robots constructed in TUS

Photo 16. Laboratory works on robotics in TUS

Photo 17. Laboratory works on robotics in TUS

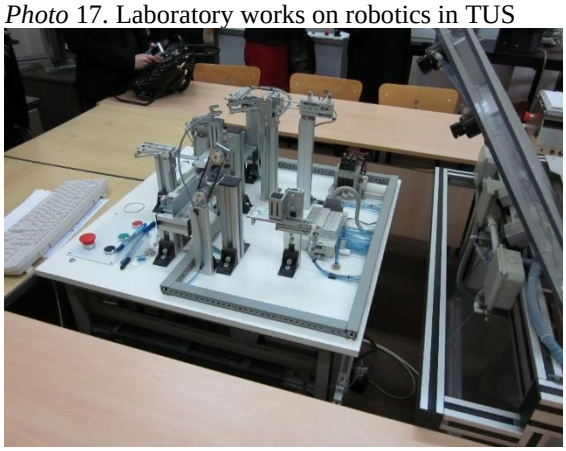

Photo 18. Robots constructed in TUS

Photo 19. Robots constructed in TUS

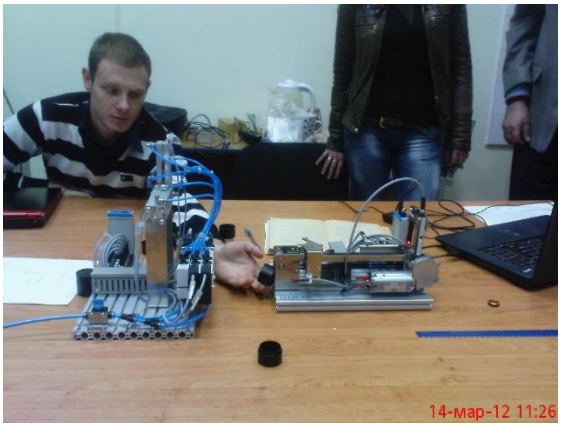

Photo 20. Laboratory works on robotics in TUS

Photo 21. Laboratory works on robotics in TUS

Conclusion

Information on the progress of the project is regularly published on the project website [11] and is updated monthly. You can also find out the latest news about the projects on the Facebook pages of the communities on the following pages:

Smart City Erasmus + Project https://www.facebook.com/groups/349998796335081

"Program of double diplomas of NSTU-TUL (RF-Czech Republic)" https://www.facebook.com/groups/1771296478083 72.

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Vadim Zhmud – Head of the Department of Automation in NSTU, Professor, Doctor of Technical Sciences.
E-mail: oao_nips@bk.ru

630073, Novosibirsk,
str. Prosp. K. Marksa, h. 20

Galina Frantsuzova, Doctor of Technical Sciences, Professor, Department of Automation, NSTU. The main direction of scientific research: the synthesis of systems of extreme regulation.
E-mail: frants@ac.cs.nstu.ru
Novosibirsk, prosp. Karl Marx, 20

Lubomir Dimitrov - Dr. of Techn. Sci., Professor.
Technical University of Sofia, Faculty of Mechanical Engineering, Bulgaria
Scientific Fields: Mechatronics, Adaptive and optimal control, Intelligent diagnostic and control systems, MEMS.
E-mail: lubomir_dimitrov@tu-sofia.bg

Wolfram Hardt - Vice-Dean on International Affairs, Director of University Computer Center, Professor on Technical Informatics, Technical University of Chemnitz, Germany
E-mail: hardt@cs.tu-chemnitz.de

Olga Dolinina - Dr. of Techn. Sciences, Professor, vice-rector in development & digital transformation, professor of the chair "Information systems & Technologies" Ulyanovsk State Technical University, Ulyanovsk, Russia.
E-mail: odolinina09@gmail.com

Uranchimeg Tudevdagva, Professor of Mongolian University of Science and Technology, Guest professor Researcher of Chemnitz University of Technology, Honour Doctor of Novosibirsk State Technical University.
E-mail: ranchimeg@must.edu.mn

Jaroslav Nosek - Professor of Faculty of Mechatronics, Informatics and Interdisciplinary Education in Czech Technical University, Liberets, Czech Republic.
E-mail: jaroslav.nosek@tul.cz

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On the Issue of Assessing the Quality of Information Systems

I. S. Kalytyuk, G. A. Frantsuzova, A.V. Gunko

Novosibirsk State Technical University, Novosibirsk, Russia

Abstract. This paper discusses the issue of assessing the quality of information systems. Often, quality is defined as "compliance" and "suitability for use". "Compliance" implies that the requirements must be so clearly defined that they can't be understood and interpreted incorrectly. Later, during the development phase, regular measurements of the developed product are made to determine compliance with the requirements. Any inconsistencies should be treated as defects. "Suitability for use" takes into account the requirements and expectations of the end users of the product, who expect that the product or service provided will be convenient for their needs. However, different users may use the product in different ways. This means that the product should have the most diverse use cases.

As can be seen from the above general definitions of quality, the task of evaluation is extremely difficult due to the diversity of user interests. Most often, it is impossible to offer a single universal measure of quality and you have to use a number of characteristics that cover the entire range of requirements. Software quality models are the closest to the tasks of assessing the quality of information systems. Currently, several abstract models of software quality are used. The paper considers some of them – the McCall model and the Boehm model. These models are conceptual and are suitable for evaluating the quality of any information systems.

In addition to the consideration of conceptual models, special attention is paid to the evaluation of the parameters of ready-made systems, such as the cost of development, time costs, and labor intensity. There are both linear approaches that use the simplest formulas, and various models that operate on empirical data – for example, SLIM and COCOMO. These models are often used in software packages such as Duvessa Estimate Easy UC and SoftStar SystemStar & Costar, also mentioned in this paper. In addition, it is necessary to mention various products for evaluating code size and complexity metrics.

Keywords: quality, McCall model, Boehm model, cost, labor intensity, time cost, SLIM, COCOMO.

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Ivan Sergeevich Kalytyuk, postgraduate student of the Department of Automation, NSTU. The main direction of scientific research: development and research of data collection and analysis systems.
E-mail: ivankalytyuk@yandex.ru
Novosibirsk, prosp. Karl Marx, 20

Galina Frantsuzova, Doctor of Technical Sciences, Professor, Department of Automation, NSTU. The main direction of scientific research: the synthesis of systems of extreme regulation.
E-mail: frants@ac.cs.nstu.ru
Novosibirsk, prosp. Karl Marx, 20

Andrey Vasilievich Gunko, Ph.D., Associate Professor of the Department of Automation, NSTU. The main direction of scientific research: the development of automated systems for collecting and processing results.
E-mail: gun@ait.cs.nstu.ru
Novosibirsk, prosp. Karl Marx, 20

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Destructive and Non-Destructive Testing

V.A. Zhmud [1, 2, 3, 4]

[1] Novosibirsk State Technical University, Russia
[2] Institute of Laser Physics SB RAS, Russia
[3] Siberian Branch of the Federal State Budgetary Institution of Science of the Geophysical Service of the SB RAS
[4] Novosibirsk Institute of Software Systems

Abstract. This article discusses the principles of destructive and non-destructive testing, testing, quality control of equipment and various products. Eight fundamental requirements for quality control or testing are proposed, which seem to be immutable. Rejection of any of these principles leads and has led many times to unnecessary losses, and sometimes to human sacrifice. Actual examples are given showing that non-observance of at least one of these principles will inevitably give only negative effects. Ignoring these principles can probably be considered permissible only in the production of computer games or in the creation of similar insignificant products, although in this case it is also desirable to follow these principles.

Key words: Testing, testing, control, reliability, quality.

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Vadim Zhmud – Head of the Department of Automation in NSTU, Professor, Doctor of Technical Sciences.
E-mail: oao_nips@bk.ru

630073, Novosibirsk,
str. Prosp. K. Marksa, h. 20

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On the Issue of Designing Multichannel Automatic Control Systems

V.A. Zhmud [1, 2, 3, 4]

[1] Novosibirsk State Technical University, Russia
[2] Institute of Laser Physics SB RAS, Russia
[3] Siberian Branch of the Federal State Budgetary Institution of Science of the Geophysical Service of the SB RAS
[4] Novosibirsk Institute of Software Systems

Abstract. Automatic control theory contains many technical terms and definitions. Arbitrary use of established terms in a different sense, groundless introduction of new terms or groundless expansion of established concepts, at first glance, is a harmless action. But in essence, such methods make it possible to form new defended provisions and to ascribe to oneself the latest achievements in the following ways: first, by calling known concepts new terms, one can assert the achievement of results that sound in a new way in the new terminology; secondly, such an unjustified renaming makes it possible to assert the achievement of such results that, in the case of correct use of the terminology, have not yet been achieved, or are even fundamentally unattainable. Thus, it is as important to fight for the purity of terminology as for the purity of science in general. This article is intended for students, postgraduates and young scientists carrying out research in the field of automatic control theory or using this theory.

Key words: Multichannel control systems, MIMO, MISO, SIMO, control, stabilization.

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Vadim Zhmud – Head of the Department of Automation in NSTU, Professor, Doctor of Technical Sciences.
E-mail: oao_nips@bk.ru

630073, Novosibirsk,
str. Prosp. K. Marksa, h. 20

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Automated Surface Temperature Monitoring System for Solar Panels

O.Kh. Kuldashov[1], *U.Zh. Nigmatov*[2]

[1]Ferghana branch of the Tashkent University of Information Technologies named after Muhammad al-Khwarizmi
[2]Fergana Polytechnic Institute

Abstract. The paper discusses the areas of application of the modern element base of microelectronics and telecommunications for the creation of automated devices for monitoring the temperature and operational characteristics of power plants. An automated system for monitoring the energy efficiency of a solar collector with a concentrator and the temperature of the working surface of a solar panel is proposed. It is revealed that monitoring the energy efficiency of solar collectors with concentrators is reduced to monitoring the temperature of the focal plane of the concentrator and measuring the flow rate of water heated by it. The proposed automated system for monitoring the temperature of the working surface of solar panels makes it possible to automate the process of monitoring the operating parameters of thermal and electric power solar installations and ensures the cyclicity and reproducibility of the measurement process. The results of the measurement process are accumulated in the system database. Remote access to the database via the Internet allows their simultaneous processing by several specialists. The proposed monitoring systems also allow minimizing the number of subjective factors when assessing the energy efficiency of a solar plant.

Key words: solar collector, concentrator, solar panel, temperature, control, automated system, monitoring.

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O. Kh. Kuldashov is PhD, associate Professor, Ferghana branch of the Tashkent University of Information Technologies named after Muhammad al-Khwarizmi, head of the Department "Information security". E-mail: kuldashov.abbos@mail.ru

U.Zh. Nigmatov is Fergana Polytechnic Institute, senior lecturer of the department "Production of building materials, products and structures".
E-mail: fernigmatov@mail.ru

The paper has been received on 20/07/2021.

Pedagogy in the View of the Theory of Automatic Control

E.T. Aberne

Nizhny Novgorod

Abstract. There is a process of mutual frustration between teachers and students. The author sees the growth tendencies of this process in the fact that, on the one hand, students are more interested in getting a diploma from the university, and not in the knowledge that should be obtained while studying at this university; on the other hand, the attitude of teachers towards students also began to contain a mercantile component to a greater extent, which was initiated by the introduction of a paid education system, the dependence of the teacher's actual income on the number of such paid students and the absence of an equally pronounced dependence on the quality of their training. The author believes that the learning process should contain, as an indispensable component, mutual respect of teachers and students, and as a highly desirable component - a sense of friendly and collegial disposition. The author believes that the teacher and the students are colleagues, since they have the same goal in their work, namely: getting students of the required level of education. On this basis, it can be argued that the attitude of either side to the other side as an enemy, and even more so as an enemy (opponents are in the game, and enemies are in war) is completely unacceptable. The reason for the emergence of antagonistic relations can be individual conflicts arising from the instability of feedbacks formed by a dynamic system containing all participants in the pedagogical process. This article is inspired by research on the applicability of automatic control theory to social systems [1], and the desire to write and publish it is dictated by the lack of such research in pedagogy.

Key words: pedagogy, teaching, automation, control, achievement of goals

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Eric Teodorovich Aberne
is self-employed, lives in Nizhny Novgorod.
E-mail: erikaberne@mail.ru

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