Presentation of the module "Hardware for Embedded Systems"

Mykhailo Poliakov, PhD, associate professor of Electrical and electronic apparatuses and Radio engineering and telecommunications departments .

Zaporizhzhya National Technical University, Ukraine

DESCRIPTION OF THE MODULE

- Module name: Hardware for Embedded Systems
- Course name: Digital units and microprocessors
- Teacher: Mykhailo Poliakov, PhD, Associate Professor of EEA and RT departments
- Study cycle: BA
- Level of the module: BA
- Type of the module: compulsory
- Form of delivery: a blended learning style
- Duration: 14 weeks
- Languages: Ukrainian, English (march 2017)
- Credits of the module: 3
- Total/Contact/Individual work hours: 90/42/48

Place the module in the educational process

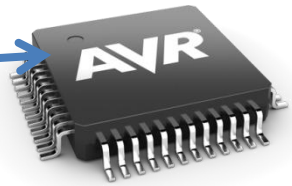
Previous modules	**My module**	Next modules
Digital units, digital systems	**Hardware for Embedded Systems** 	Programming microprocessors assembler languages and C.

Time

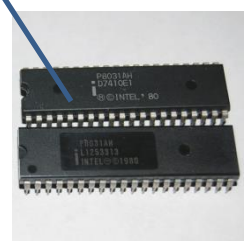
The concept of the course

The complexity of the material

AVR controllers: memory, interrupts, peripherals for real-time interfaces, system commands



I8051 controllers: architecture and programming in Assembly language task of interfacing with the control object



Arduino: ports and programming in C

Industrial controllers: architecture, programming languages according to IEC61131

Time

Topics of lectures

1. Hardware for Embedded Systems: introduction
2. Industrial controllers: architecture, programming languages according to IEC 61131
3. The controller Board Arduino: architecture, ports and programming in C
4. I8051 controllers: architecture and programming in Assembly language task of interfacing with the control object
5. AVR controllers: memory, interrupts, peripherals for real-time interfaces (timers with CCS and PWM, Ports, USART, PSI, I^2C, USB, CAN interface), instructions system

Borrowing materials from courses DesIRE

In my module were used materials of other modules

The theme	The module's name	The author
The AVR RISC Microcontroller architecture	Microcontrollers Hardware for Embedded Systems (Digital systems design)	Dr.-Ing. Heinz-Dietrich Wuttke, Dr.-Ing. Karsten Henke, Ilmenau University of Technology
Serial communications and the ATmega328P SPI subsystem	Embedded Communication	Bart Tanghe

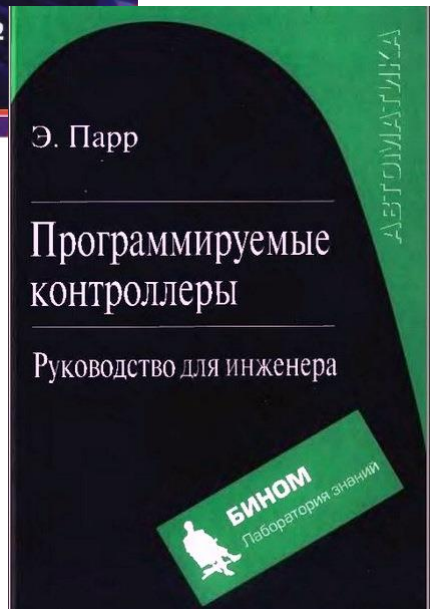
Themes/place of laboratory works

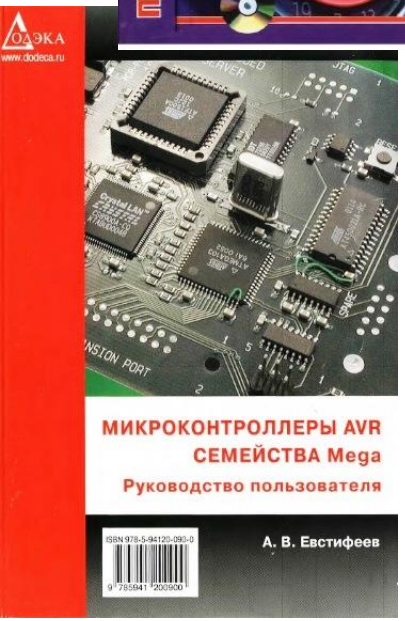
- Programming environment RS Logix , ladder diagram language, Man Machine interface /computer class the EEA department.
- Programming of controllers SLC500 (Allen Bradley Corp., USA)/computer class the Department of information technologies of electronic devices
- Programming Arduino boards/computer class the RT department.

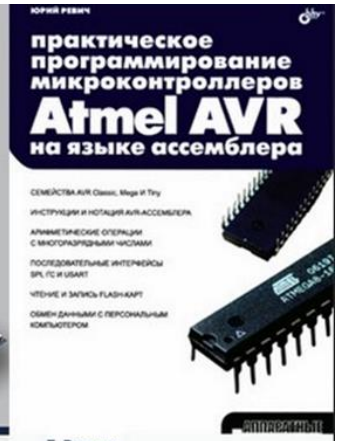
Themes of practical works

- The address space of the microcontroller
- Configuring timers
- Determination of parameters of the PWM
- Analysis of the protocols of serial interfaces
- Instructions system microcontroller

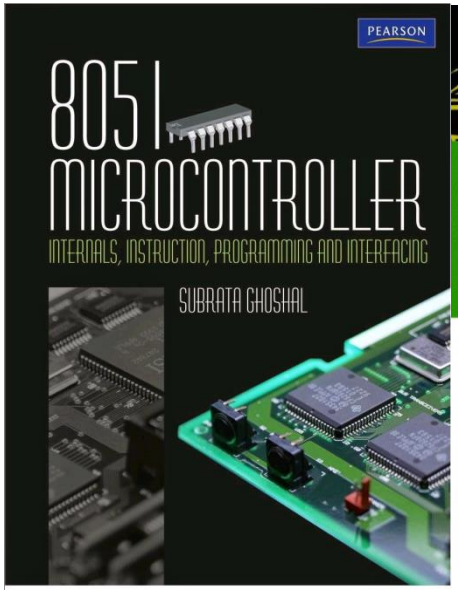
Literature (Russian language)

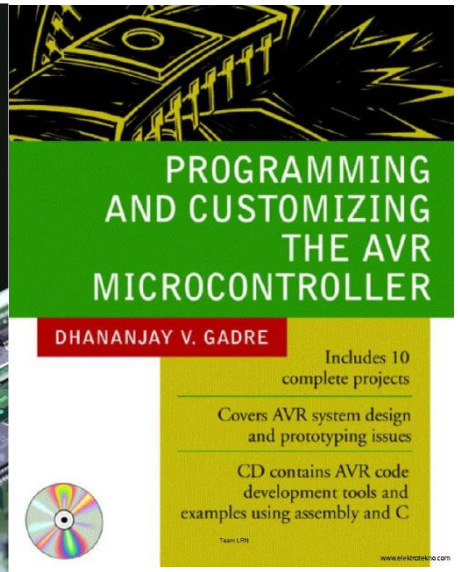


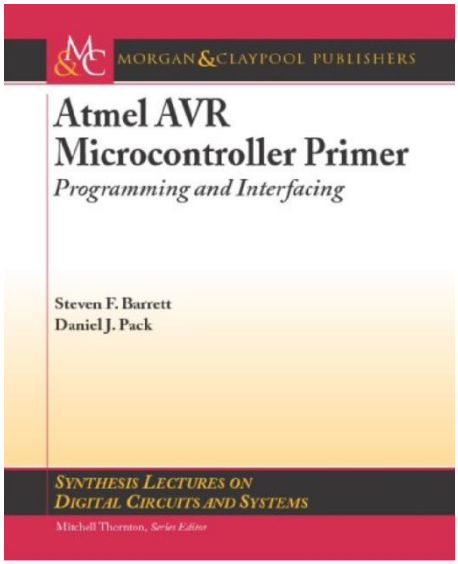


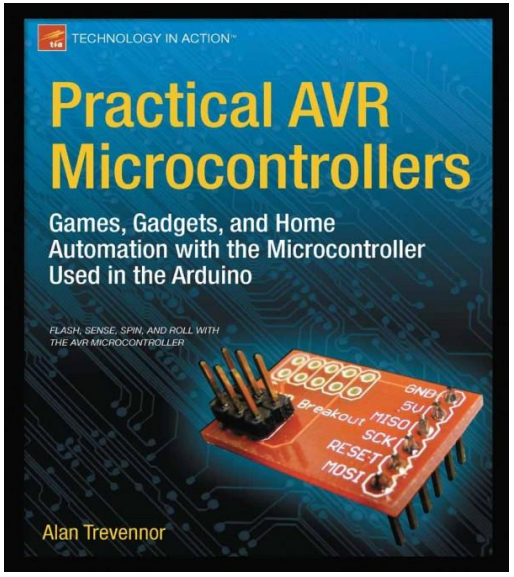


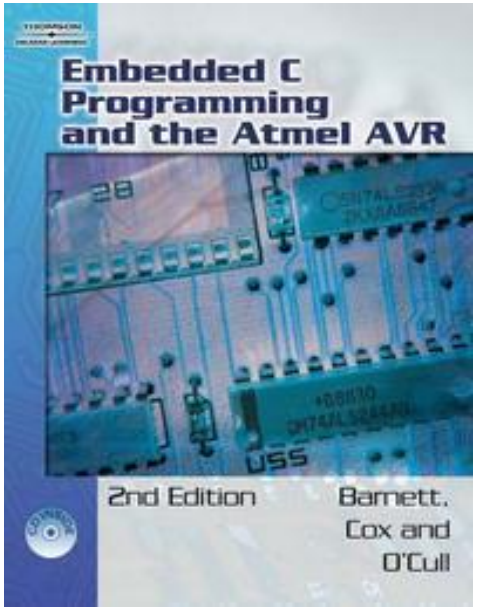
Literature (English language)

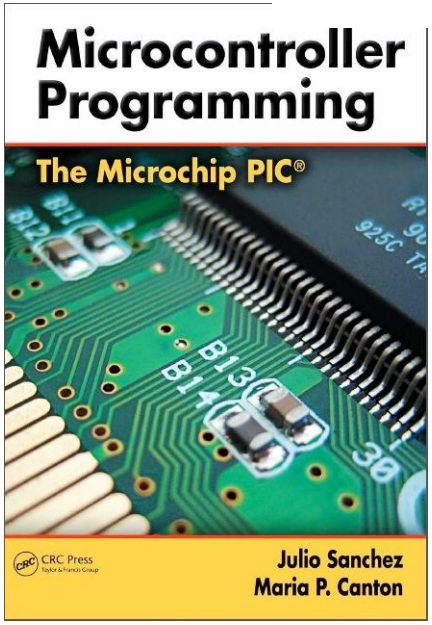












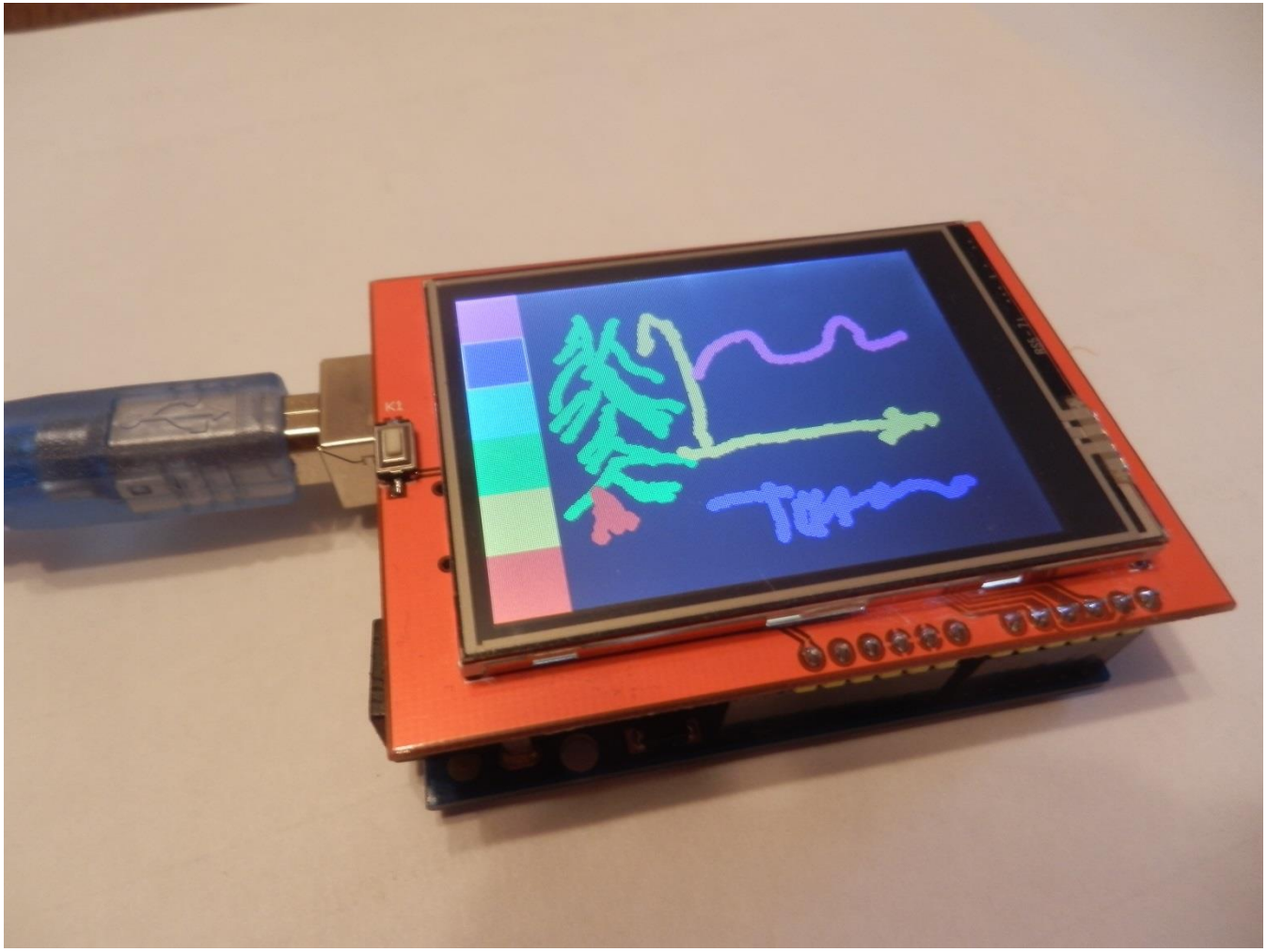
The pilot training module

The pilot training module is currently in progress with students of the specialty "radio engineering and telecommunications"

- Dates: 05.09.16 - 10.12.16
- Population: students of the specialty "radio engineering and telecommunications", the level of a bachelor, ZNTU.
- The number of students -12

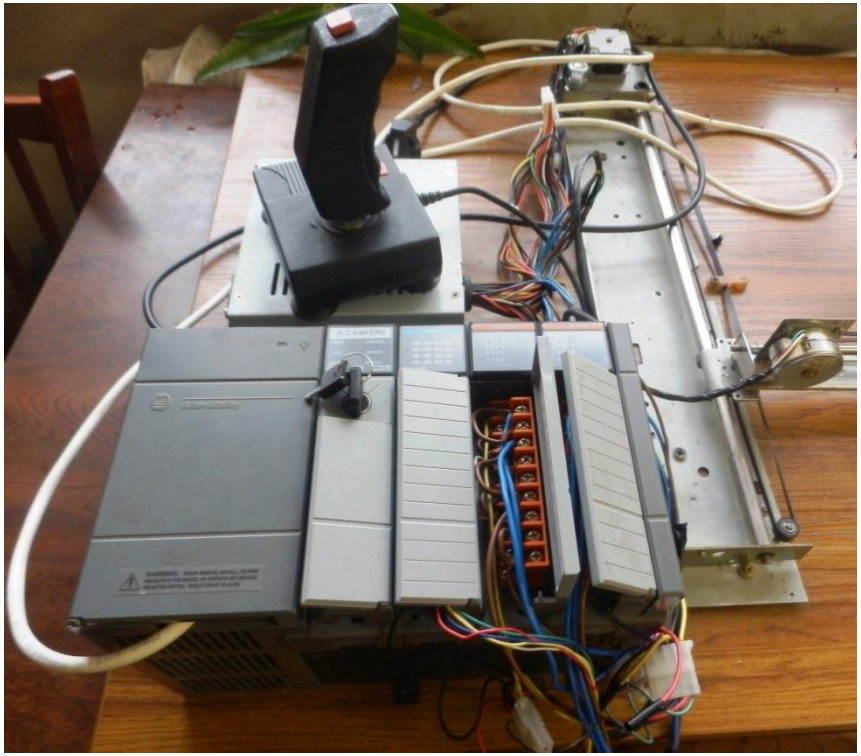
- Dates: 20.02.17 - 27.05.17
- Population: students of the specialty «electrical machines and apparatuses'", the level of a bachelor, ZNTU.
- The number of students -10

Themes of practical works: Graphic display with touch input based on Arduino Board



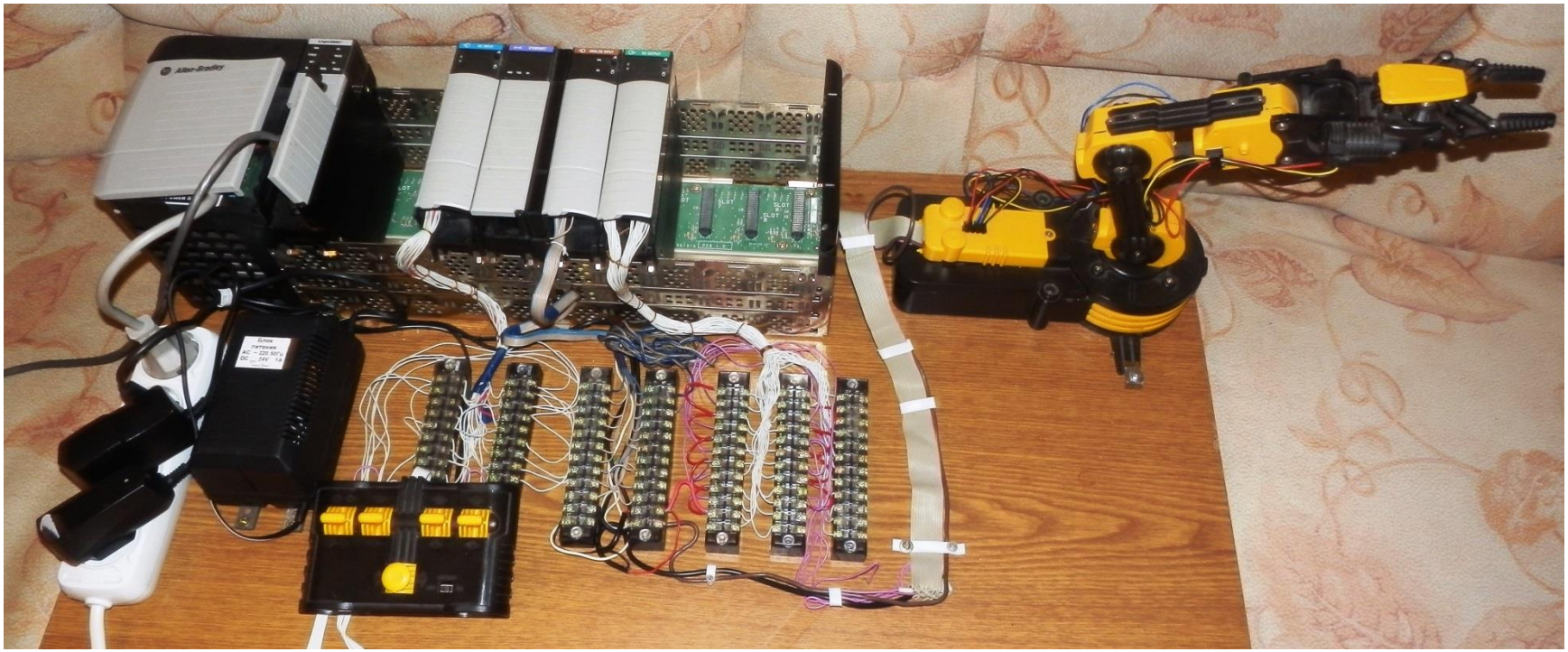
Themes of practical works:

“The control of Electromechanical devices with a controller SLC (Rockwell Automation)”

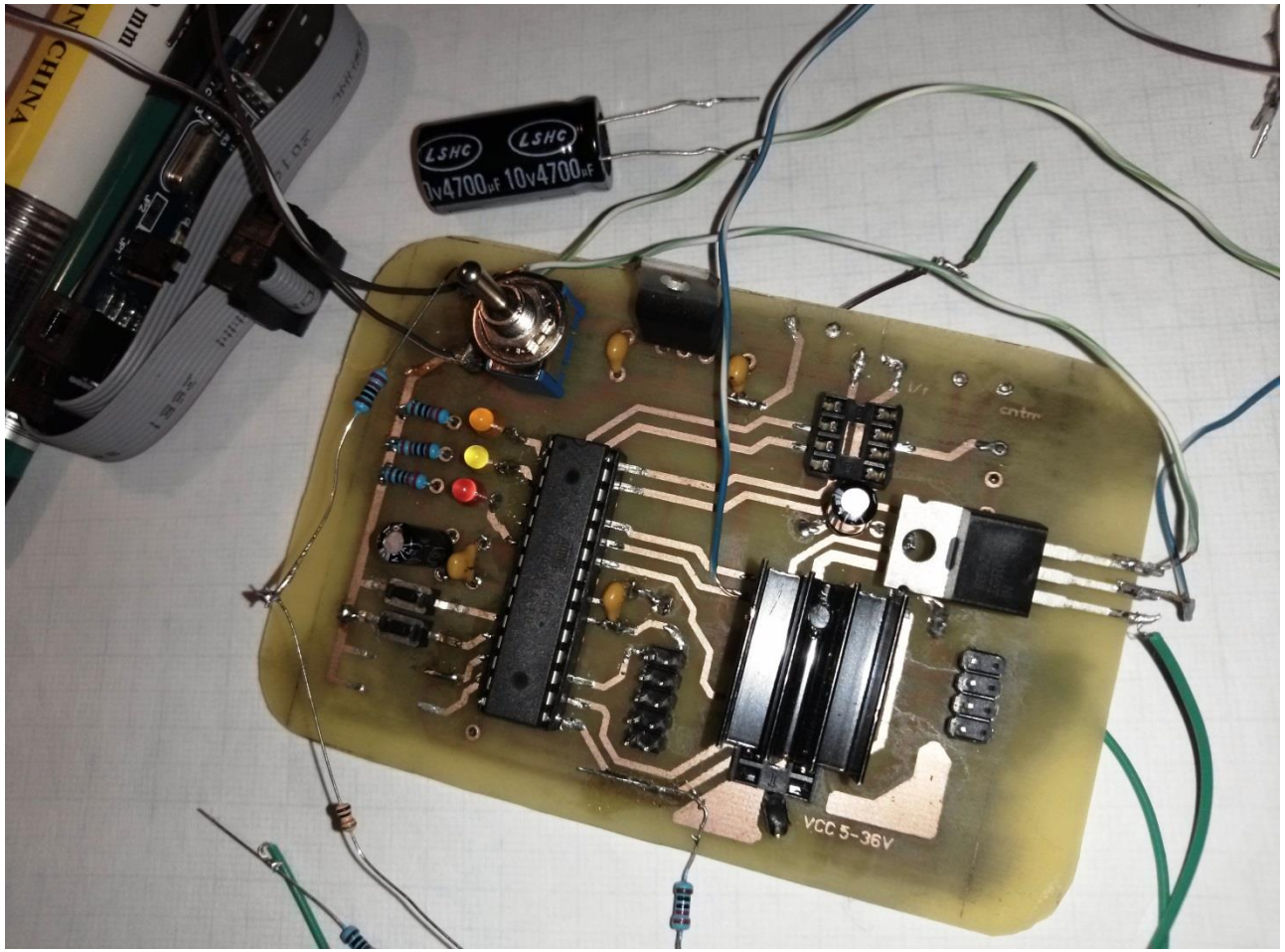


Themes of practical works:

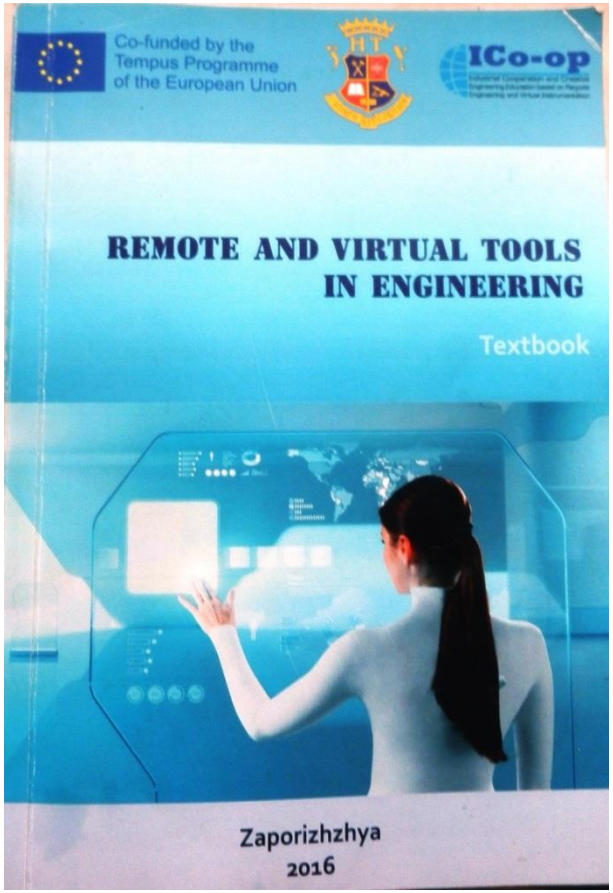
“The manipulator control with a controller Controllogix (Rockwell Automation)”



A study of the efficiency of the dc-dc Converter control circuit Board from Arduino (master work)



Publications on the topic of the project: Control systems with programmable logic controllers



M. Poliakov, T. Larionova. Part 2 Control systems with programmable logic controllers // Remote and virtual tools in engineering: student textbook / general editorship Dr.Ing.Karsten Henke. – Zaporizhzhya: Dike Pole, 2016. – pp. 250. ISBN 978-966-2752-93-9

IJOE publication №09(2016) pp. 7-13

iJOE International Journal of Online Engineering

Hybrid Models of Studied Objects Using Remote Laboratories for Teaching Design of Control Systems

Mykhailo Poliakov, Tetiana Larionova, Galyna Tabunshchyk, Anzhelika Parkhomenko, Karsten Henke

Abstract

This paper present models of studied objects with the help of remote laboratories containing physical and software components. These hybrid models were described as an integrated system with a hierarchy of controls. The functional structure of hybrid models was formalized using set theory. There are described examples of hybrid models, which software component contains subsystems of virtual models, models of the "hidden" part, the technical state models and environment models of the studied object. There are considered teaching scenarios of hybrid models application. It was given an example of design teaching scenario of diagnostic subsystem of a traffic light.

M. Poliakov, T.Larionova, G. Tabunshchyk, A. Parkhomenko and Karsten Henke. «Hybrid Models of Studied Objects Using Remote Laboratories for Teaching Design of Control Systems» in: International Journal of Online Engineering (iJOE), Vol.9(2016), Vienna, IAOE, pp. 7-13. http://dx.doi.org/10.3991/ijoe.v12i09.6128

iMCL International Conference on Interactive Mobile Communication, Technologies and Learning

17-19 October 2016, San Diego, USA

Automated testing physical models in remote laboratories by control event streams

Wuttke Heinz-Dietrich(1), Henke, Karsten (1); Poliakov, Mykhailo (2); Larionova, Tetiana (2).

Organization(s):
1:: Ilmenau University of Technology, Germany
2:: Zaporizhzhya National Technical University, Ukraine;

Publication: Automated testing physical models in remote laboratories by control event streams

- Mykhailo Poliakov, Tetiana Larionova, Heinz-Dietrich Wuttke, Karsten Henke. Automated testing of physical models in remote laboratories by control event streams. pp. 10-13. //International Conference on Interactive Mobile Communication, Technologies and Learning (IMCL) 17-19 October 2016, San Diego, CA, USA , 978-1-5090-1197-1/16/$31.00 ©2016 IEEE

13th International Conference on Remote Engineering and Virtual Instrumentation

Mykhailo Poliakov, Tetiana Larionova; Galyna Tabunshchyk; Anzhelika Parkhomenko; Karsten Henke. “Remote laboratory for teaching of control systems design as an integrated system”. 2016 13th International Conference on Remote Engineering and Virtual Instrumentation (REV), 24-26 Feb. 2016, IEEE, 339-346 pp.

MODERN PROBLEMS AND ACHIEVEMENTS IN THE INDUSTRY OF RADIO ENGINEERING , TELECOMMUNICATIONS AND INFORMATION TECHNOLOGY (From 21 to 23 September 2016, ZNTU, Zaporozhye)

Poliakov M.A. Cyber social system "Smart ZNTU“, pp. 172-174.

Conceptual and technological approaches to the construction of the vital functions of the university management system based on IoT culture and ideas of building relationships in the digitized space of regulatory rules with active monitoring and ciber control addressable components of scientific and educational processes.

MODERN PROBLEMS AND ACHIEVEMENTS IN THE INDUSTRY OF RADIO ENGINEERING , TELECOMMUNICATIONS AND INFORMATION TECHNOLOGY (From 21 to 23 September 2016, ZNTU, Zaporozhye)

Poliakov M.O. Cyber-physical systems are objects of study for remote laboratories, pp. 301-303.

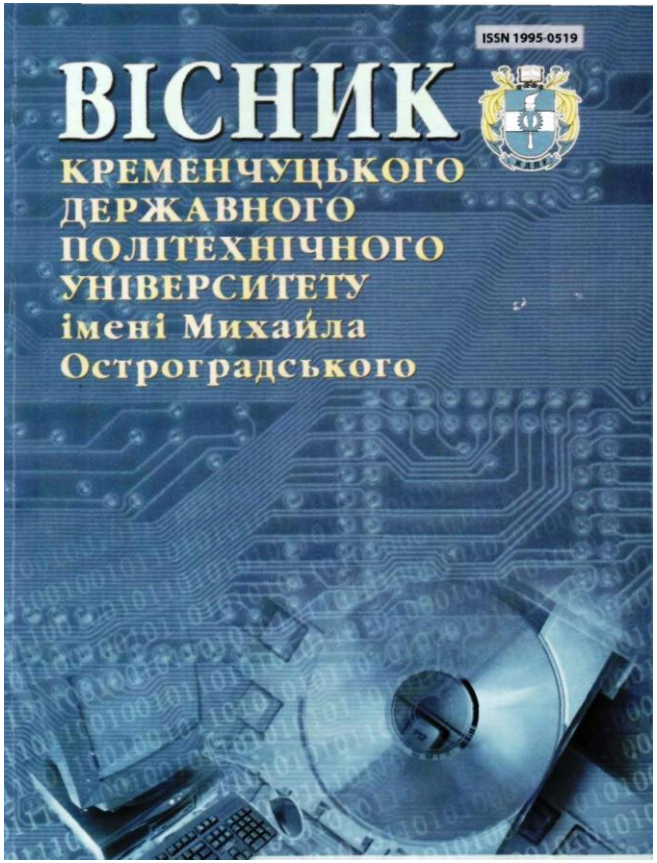
The object of the study model for the remote laboratory is described as cyber physical system in which the physical model is supplemented by software components. These components implement a hierarchy of controls and allow you to add media and behavior in the process of interaction between the laboratory and the student. As a result, we are increasing the range and quality of the experiments with the model

Сучасні проблеми і досягнення в галузі радіотехніки, телекомунікацій та інформаційних технологій:

тези доповідей VIII Міжнародної науково-практичної конференції (21–23 вересня 2016 р., м. Запоріжжя). – Запоріжжя : ЗНТУ, 2016. – 344 с. ISBN 978-617-529-152-8

- Поляков М.А. КИБЕРСОЦИАЛЬНАЯ СИСТЕМА «УМНЫЙ ЗНТУ» с. 172-174.
- Поляков М.А. КИБЕР-ФИЗИЧЕСКИЕ СИСТЕМЫ ОБЪЕКТОВ ИЗУЧЕНИЯ ДЛЯ УДАЛЕННЫХ ЛАБОРАТОРИЙ с. 301-303.

Other Publications



Поляков М. А., Ларионова Т. Ю. Методика оценки эффективности использования полупроводниковых преобразователей в системе электроснабжения. // Вісник Кременчуцького державного університету імені Михайла Остроградського. – Кременчук: КДУ, 2016. – №5. – С. 23-28

Міжнародний симпозіум «Проблеми електроенергетики, електротехніки та електромеханіки» SIEMA'2016 (27-28 жовтня 2016, м. Харків, НТУ «ХПІ»)

Эффективность автономной системы электропитания при стохастическом изменении нагрузки
Доклад

Т.Ю. Ларионова, М.А. Поляков
Запорожский национальный технический университет

Publication: Electrical Engineering & Electromechanics №5, 2016, pp. 23-28

Електротехніка і Електромеханіка №5 2016

Electrotechnical Complexes and Systems. Power Electronics

UDC 621.314.1:621.3.017 **doi: 10.20998/2074-272X.2016.5.03**

M.A. Polyakov, T.Y. Larionova

EFFICIENCY EVALUATION TECHNIQUE OF THE SEMICONDUCTOR DC-DC CONVERTER APPLICATION IN THE POWER-SUPPLY SYSTEM

Purpose. To specify efficiency evaluation of the DC-DC power semiconductor converter application in the power-supply system. Methodology. We have chosen application version of converter and then used the statistical modeling of DC-DC converter for its efficiency evaluation at varied input voltage according to proposed technique. We have compared the simulated result with the data presented in reference literature. Results. We have proposed the efficiency evaluation technique of converter application.

Future: REV2017

REV International Conference on Remote Engineering and Virtual Instrumentation

STRUCTURED ABSTRACT

REV CONFERENCE

"The Augmented Functionality of the Physical Models of Studied Objects for Remote Laboratories"

Contact Information

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