DEPARTMENT OF CONTROL AND INFORMATION SYSTEMS

General Information

Department of Control and Information Systems (DCIS) provides education and research in the field of transport and industrial process control on the process, operational and management level where, besides usual optimization criteria, the safety criteria is required. This includes topics related to reliability and security of information manipulation with advanced artificial intelligence methods. The department guarantees four accredited study programmes in the field of study Automation: the study programme Automation in Bachelor degree, study programme Process Control Engineering and Applied Telematics in Master degree and study programme Process Control Engineering in the Doctoral degree.

The research activities of DCIS are oriented in the field of information and safety-related system analysis and synthesis ranging from solution of theoretical models to practical projects of operation including implementation. DCIS is developing automated control methods by applying the latest knowledge from artificial intelligence, intelligent sensorics, robotics, computer-vision, intelligent human-machine communication, machine-learning, secure communication and so on, which also creates room for modern cloud solutions and the IoT concept.

There are many sectors of activities in which the DCIS has an exclusive position in the Slovak Republic, especially in expertise activities in the field of analysis and synthesis of railway interlocking systems. The area of reliable and safe information transmission and processing in control of selected critical processes both in safety-related systems for all kinds of transport, complex technologies and in security systems for protection of humans and property provides dynamic incentive for all the staff.

The activities of DCIS are integrated within national and international cooperation with academic and industrial domains in distinct forms – from research projects to students and experts exchange.

In 2018, the staff of the DCIS consisted of 15 pedagogical staff, 2 technicians and administrative support and 8 full-time postgraduate students. The pedagogical staff consisted of 4 professors, 1 guest professor, 4 associate professors, 6 senior lecturers with PhD. degree, and 3 research fellows with a PhD. degree.

Staff of the Department

Head of the Department:	Juraj Spalek
Vice-head of the Department:	Aleš Janota
Secretary:	Rastislav Pirník
Study Consultant:	Peter Nagy
Administrative Support:	Klára Berešíková (until 29.6.2018)
Technical Support	Kamila Kršíková
Research Fellows:	Michal Gregor, Marián Hruboš, Dušan Nemec (from 1.9.2018)

Sections of the Department

Section of Automation and Signalling Systems

Head of the Section:	Karol Rástočný
Professors:	Aleš Janota, Karol Rástočný, Juraj Spalek, Pavel Přibyl
Associate Professors:	Juraj Ždánsky

Senior Lecturers (with PhD):	Jozef Hrbček, Vojtech Šimák, Peter Nagy

Section of Communication and Information Systems

Head of the Section:	Mária Franeková (until 28.9.2018) Rastislav Pirník (from 1.11.2018)
Professors:	Mária Franeková (until 28.9.2018)
Associate Professors:	Peter Vestenický, Peter Peniak, Rastislav Pirník (from 1.12.2018)
Senior Lecturers (with PhD):	Emília Bubeníková, Peter Holečko, Alžbeta Kanáliková

Postgraduate Students

Internal (full-time):	Jozef Valigurský, Peter Ždánsky (until 1.12.2018), Jozef Balák (until 23.8.2018), Dušan Nemec, (until 23.8.2018), Peter Kello, (until 23.8.2018), Milan Medvedík, Roman Michalík, Matej Guráň

Education

Courses in Bachelor, Master and Doctoral Degree Programmes

Bachelor Degree Programmes

Code	Title	Sem.	Hours/Week
			L-S-LE*
Courses at the Faculty of Electrical Engineering			
3B0102	Algorithmisation and programming	1	2 - 2 - 0
3B1100	Professional praxis	1	0 - 0 - 0
3B0203	Programming in C++	2	2 - 2 - 0
3B1200	Professional praxis	2	0 - 0 - 0
3B0304	Theory of information and signals	3	3 - 2 - 1
3B1300	Professional praxis	3	1 - 0 - 2
3B1301	Information and communication networks	3	0 - 0 - 0
3B1400	Theory of automated control	4	3 - 1 - 1
3B1401	Logical systems	4	2 - 1 - 1
3B1402	Distributed control systems	4	3 - 1 - 1
3B1403	Sensor technology	4	3 - 0 - 1
3B0401	Computer technical environment	4	1 - 0 - 1
3B1404	Professional praxis	4	0 - 0 - 0
3B1504	Bachelor project 1 A	5	0 - 0 - 5
3B1503	Communication security	5	3 - 1 - 1
3B1501	Single-chip controllers programming	5	2 - 0 - 2
3B7403	Sensor technology	5	3 - 1 - 1
3B1502	Reliability and safety of control systems	5	3 - 2 - 0
3B1500	Control Systems	5	2 – 1 - 2
3B1606	Professional praxis	6	0 - 0 - 0
3B1602	Information systems in process control	6	4 - 0 - 4

Code	Title		Sem.	Hours/Week
3B1600	Actuators and their control		6	5 – 2 - 2
3B1604	State exam subject		6	0 - 4 - 0
3B1605	Bachelor thesis and its presentation		6	4 - 4 - 0
3B1603	Bachelor project 2 A		6	0 - 0 - 10
3B1601	Control systems programming		6	2 - 0 - 2

*(L) lessons - (S) seminars - (LE) laboratory exercises

Master Degree Programmes

Code	Title	Sem.	Hours/Week
			L-S-LE*
Courses at the Faculty of Electrical Engineering			
3I0101	Advanced methods of automated control	1	3 - 1 - 1
3I0102	Communication networks	1	3 - 1 - 1
3I0103	Signal processing theory in process control	1	2 - 1 - 1
3I1100	Telematic systems modelling	1	3 - 1 - 1
3I7100	Control systems with Safety PLC	1	2 - 0 - 2
3I0104	Interlocking and signalling systems components	1	3 - 0 - 2
3I0115	Information systems security	1	3 - 0 - 2
3I1101	Professional praxis (60 hours)	1	0 - 0 - 0
3I7101	Professional praxis (60 hours)	1	0 - 0 - 0
3I0200	Application of information systems in process control	2	2 - 0 - 2
3I0201	Secure system communication	2	3 - 1 - 1
3I0202	Control systems safety analysis	2	3 - 2 - 0
3I0203	Artificial intelligence 1	2	2 - 0 - 2
3I0204	Higher programming languages applications	2	2 - 0 - 2
3I0205	Interlocking systems	2	3 - 1 - 1
3I1200	Professional praxis	2	0 - 0 - 0
3I7200	Professional praxis	2	0 - 0 - 0
3I0300	Artificial intelligence 2	3	3 - 0 - 2
3I0301	Visualisation of processes	3	2 - 0 - 2
3I0318	Object-oriented system development	3	2 - 0 - 2
3I1300	Transport processes control	3	3 - 1 - 1
3I1301	Applied telematics diploma project 1	3	0 - 0 - 5
3I7300	Process control diploma project 1	3	0 - 0 - 5
3I0302	Interlocking systems applications	3	2 - 0 - 2
3I0303	Information systems security	3	3 - 0 - 2
3I1303	Professional praxis	3	0 - 0 - 0
3I7301	Professional praxis	3	0 - 0 - 0
3I0401	Automated identification	4	2 - 1 - 1
3I0402	Safety systems	4	2 – 0 - 2
3I1402	Elaboration and presentation of diploma thesis	4	0 - 10 - 0
3I1403	State exam subject	4	0 - 2 - 0
3I7400	Process control diploma project 2	4	0 - 0 - 5
3I7401	Elaboration and presentation of diploma thesis	4	0 - 10 - 0
3I1401	Applied telematics diploma project 2	4	0 – 0 - 5

Code	Title	Sem.	Hours/Week
3I7402	State exam subject	4	0 - 2 - 0
3I0400	Robotic systems	4	2 - 0 - 2
3I1400	Telematic applications	4	4 - 2 - 2
3I7403	Intelligent transportation systems	4	6 - 4 - 0
3I1404	Professional praxis	4	0 - 0 - 0
3I7404	Professional praxis	4	0 - 0 - 0

*(L) lessons - (S) seminars - (LE) laboratory exercises

Doctoral Degree Programmes

Code	Title	Sem.	Hours/Week
			L-S-LE*
Courses at the Faculty of Electrical Engineering			
3D3100	World language	1	2 - 0 - 0
3D3101	Secure system communication	1	2 - 0 - 0
3D3102	Logical and event systems	1	2 - 0 - 0
3D3104	Process control	1	2 - 0 - 0
3D3105	Control systems	1	2 - 0 - 0
3D3109	Selected chapters from mathematics	1	2 - 0 - 0
3D3103	Modelling and simulation of control systems	2	2 - 0 - 0
3D3106	Reliability and safety of control systems	2	2 - 0 - 0
3D3107	Theory of automated control	2	2 - 0 - 0
3D3108	Signal processing theory in process control	2	2 - 0 - 0
3D3110	Written exam for dissertation exam and defence	3	0 - 0 - 0
3D3111	Dissertation thesis and dissertation thesis defence	6	0 - 0 - 0

*(L) lessons - (S) seminars - (LE) laboratory exercises

Research & Development

The scientific-research and development activities of department are focused on the area of control tasks algorithmisation, automation of control on process, operational and management levels, while utilising modern artificial intelligence approaches, and on the area of reliable, safe and secure communication and information processing in control of selected critical processes, above all the ones which imply the criterion of safety besides usual optimisation criteria. For reasons given there is a large number of research projects and cooperation projects with praxis and industry directed into the area of applied telematics and intelligent control and safety systems in transport and industry.

Laboratory of industrial processes control

The laboratory is oriented on development and simulation of algorithms for industrial processes control. The fundamentals of equipment are PCs, Siemens PLCs, extension modules for sensors and actuators connection, modules for remote inputs and outputs, visualisation panels, frequency converters and programming and configuration software. The interconnection of components and positions is realised by industrial networks. Actual models of industrial processes support the operation of this technology.

Laboratory of safety critical control systems

The laboratory focuses on development of safety related control systems mainly utilised for railway traffic control. The fundamentals of technology equipment are PCs and Siemens PLCs with software support. The laboratory provides real interlocking systems by Scheidt&Bachmann (BUES2000 electronic railway crossing devices and ZBS2000 electronic safe traffic control for auxiliary tracks). The devices also include railway interlocking devices building components (distinct relay constructions used in interlocking technology, signalling lights, switching locks, …).

Laboratory of traffic processes control

The laboratory is focused on the area of system identification, design and implementation of control algorithms for traffic and industrial systems. It is equipped with programmable logical automata by Bernecker + Rainer (B&R), safety PLCs, I/O modules, converters, traffic and industrial systems models, CNC multifunctional machine. Specialised computers and software include Automation Studio, Safe Designer, MATLAB, Simulink, Atmel Studio.

Laboratory of IoT technologies

The laboratory is built within the cooperation between DCIS and IBM a is focusing on the area of intelligent transport, intelligent cities and Internet of Things (IoT) from the sensors level through data acquisition, analysis, presentation, including security aspects. The technologies available include IBM (Intelligent Operation Center, Bluemix cloud, Big Data, analytical and prediction tools), sensor networks technologies (Libelium) and information systems security devices and software (Pwnie Plug R4 penetration testing tool).

Laboratory Betamont and tunnel systems

The laboratory aims on experimental works of PhD. students and final degree students of bachelor and master programmes. The focus is the area of development, customisation and realisation of experimental communication subsystem of Intelligent Transportation Systems (ITS). The development heads towards display appliances in the function of dynamic traffic signs, information panels and similar, primarily in the

direction ITS infrastructure – driver. The development in laboratory also includes applications of distinct communication standards, primarily intended for the communication between vehicles, vehicles and infrastructure and between ITS infrastructure objects.

The laboratory is built within the following projects: „Centre of excellence for intelligent transportation systems and services I", „Centre of excellence for intelligent transportation systems and services II" and „New methods for measuring dynamic properties of motor vehicle and its interaction with roadway" (in cooperation with BETAMONT), which have been acquired in the operational programme Research and development by the EU Structural funds agency of Slovak Department of Education.

Laboratory of modelling and simulation

The laboratory is aimed on education of specialised subjects requiring support of software tools. It is mainly intended for modelling of functional properties of control systems (UML; Rhapsody software tool), reliability and safety attributes (CARE software tool), control procedures and control structures (Matlab and LabView environments). In case of need, it is available for other applications – design and work with database systems, expert systems and so on. The laboratory includes technology utilised in objects protection (alarm systems, electric fire signalisation, camera surveillance systems). The laboratory can also be utilised for students' individual work during working out the semester projects and diploma theses.

Laboratory of automated control and signal processing

The laboratory is aimed on testing of theoretical fundamentals from the area of automated control theory (continuous and discrete systems), theory of information and signals and digital signal processing with custom programs and MATLAB with its specialised toolboxes (Simulink, Control Toolbox, Signal Processing Toolbox). It includes actual educational models by Humusoft CE 151 (ball on plane) with accessories (Extended Real Time Toolbox and Real Time Windows Target) and appliances by IMFsoft (motor rpm regulator, temperature regulation), SICK industrial camera and bachelor and master projects appliances.

Laboratory of information technologies

The laboratory is oriented on information systems (databases, web technologies, virtualisation), computer networks (modelling, simulation, monitoring) and its safety (penetration testing, intrusion detection, firewalls, cryptanalysis, antimalware). The hardware equipment consists of Juniper IDP 75 – intrusion detection system; Fluke Networks Time Machine Express NTM - EX2 – network traffic monitoring device; wireless technologies. The software equipment consists of Riverbed Modeler + Wireless Suite – network modelling, simulation and emulation environment; Riverbed Modeler Academic Edition – academic edition of environment; PRTG Paessler Network Monitor – network traffic monitoring tool, Pwnie Plug R4 – network penetration testing appliance.

Laboratory of microcomputers and robotics

The laboratory is intended for research and development in the area of robotics and microcomputers. It is equipped with computers and programmable interfaces for ATMEL microcomputers and ABB industrial robots. It is an exact copy of a real software controlling a production robot and enables realistic simulations with the use of real robotic programs and configuration files. The laboratory hosts the research of mobile sensor platform for robots navigation. The laboratory disposes of a CNC machine with B&R control system for the realization of bachelor and diploma works. The equipment also consists of E-puck robots with Webots

environment enabling testing of robotic swarm algorithms. The equipment includes a collaborative robot ABB IRB 14000, DC and AC electric motors and Mitsubishi frequency converters.

Laboratory of computer networks and secure communications

The laboratory is focused on the area of LANs including wireless communication technologies. The technical equipment for computer networks includes basic PCs, structural cabling distributor, switches and routers 3com, Linksys and Cisco, IEEE 802.11 wireless networks analyser. The technical equipment for industrial communication networks includes PROFIBUS and CAN protocol analysers. The area of radio-frequency identification (RFID) is covered by the ELATEC demonstration kits for ISO 14443, ISO 15693, ISO 18092, MIFARE Classic, MIFARE Desfire, Unique, EPC Global transponders.

Projects of International Programmes

HORIZON 2020

H2020-MSCA-RISE-2016 - 734331: SENSors and Intelligence in BuiLt Environment	
Summary:	The goal of this project is to develop novel information sensing research and innovation approaches for acquiring, communicating and processing a large volume of heterogeneous datasets in the context of smart buildings, by building an international, inter-disciplinary and inter-sectoral collaboration network through research and innovation staff exchanges and seamless exchange of ideas, expertise, data, testbeds, and know-how.
Realization:	01/2017 – 12/2020
Coordinator:	Ivan Glesk, (University of Strathclyde, Glasgow, UK)
Sub-Coordinator from FEE:	Juraj Machaj
Co-operators:	Peter Holečko, Michal Gregor, Vojtech Šimák

COST Projects

TU 1305: Social networks and travel behaviour	
Summary:	COST Action TU1305 aims to initiate a new collaboration framework for the various EU research groups that develops a new transport paradigm based upon ICT social networks and their subsequent travel behaviour in the urban environment. Our goals are to explore ways in which social activities become mobilised in space, identify how social ties affect the integration of local public transport into urban patterns, and develop a rigorous conceptual framework for new ideas and methodologies.
Realization:	03/2014 – 03/2018
Coordinator:	Pnina Plaut, Technion (Israel Institute of Technology, Haifa, Izrael)
Co-operators:	Peter Holečko, Rein Ahas, Sven Kesselring, Isabelle Thomas, Lucia Cristea, ...

CA17124: Digital forensics: evidence analysis via intelligent systems and practices	
Summary:	The objective of the COST action is to form a network for the exploration of artificial intelligence and automated reasoning applications in the field of digital forensics and creating a synergy between these areas.
Realization:	09/2018 – 09/2022

Coordinator:	prof. Jesus Medina (Facultad de Ciencias, Campus Río San Pedro, Spain)
Co-operators:	Peter Holečko

Other International Research Projects

AO8673: SALSA - Stratospheric Autonomous Landing System Application	
Summary:	The objective of this "SALSA" project is to define, develop and test an autonomous landing system of our stratospheric probe, making use of on-board GPS receivers (and other motion sensors such as gyroscopes and accelerometers), a gliding parachute driven by servomotors and an on-board computer with proper controlling software. Such a system would significantly shorten payload recovery times and most importantly reduce the risk of landing in danger zones (e.g. lakes, mountains, densely populated areas, etc.), allowing stratospheric flights to be conducted with increased safety and applicability to time-sensitive payloads.
Realization:	03/2018 – 12/2020
Coordinator:	GOSPACE Ltd.
Co-operators:	Benedikt Badánik, DAT, FPEDAS
	Vojtech Šimák, DCIS
	Branislav Kandera, DAT, FPEDAS, Filip Škultéty, DAT, FPEDAS

Projects of National Programmes

Projects Funded by the Cultural & Education Grant Agency (KEGA)

014ŽU-4/2018: Broadening the content in a field of study with respect to the current requirements of the industry as regards artificial intelligence methods and IT	
Summary:	The objective of the project is to facilitate implementation of high-quality education it these areas – i.e. in the area of AI, ML and IT – with regard to the actual requirements of the industry. The second goal is to promote the transfer of progressive and innovative methods into industrial practice. The project reflects a feedback from the commercial sector (primarily within the Ready for Continental initiative and from other department industrial partners) and the feedback from international academic partners such as University of Patras, Greece; UC Berkeley, California, USA; Tongji University, Shanghai and others. The output of the project include new study materials, proper HW/SW education support and a catalogue of AI tasks and methods.
Realization:	01/2018 – 12/2020
Coordinator:	Aleš Janota
Co-operators:	Michal Gregor, (vice-coordinator), Juraj Spalek, Alžbeta Kanáliková, Emília Bubeníková, Vojtech Šimák, Jozef Hrbček, Peter Kello (until 23.8.2018), Marián Hruboš, Rastislav Pirník. Kamila Kršíková

034ŽU-4/2016: Implementation of modern technologies into education with focus on safety PLC control	
Summary:	The project is focused on bridging the shortcomings resulting from the growing demands of industry for the theoretical knowledge and practical experiences in deployment of control systems with safety PLC. The project aim is to build a laboratory in which control systems with safety PLC will be together with the physical models allowing simulation of real situations in industry. The laboratory will

	allow the emergence of a new subject "Control systems with safety PLC" and subsequent solution of bachelor's thesis, master's thesis and dissertations. Under the project will be developed the teaching materials supported by examples. This allows to make studying more attractive and to train students for the practical needs and finally to develop cooperation with practice primarily in the area of consultation about achieving the required safety integrity level (SIL - Safety Integrity Level) of realized applications.
Realization:	01/2016 – 12/2018
Coordinator:	Juraj Ždánsky
Co-operators:	Karol Rástočný (vice-coordinator), Jozef Hrbček, Peter Holečko, Peter Nagy, Vojtech Šimák

016ŽU-4/2018: Modernization of teaching methods of management of industrial processes based on the concept of Industry 4.0

Summary:	The project is primarily focusing on the modernisation of education in the field of automation a process control with the use of the Industry 4.0 concept. A workplace will be created integrating the latest object identification technologies used in industrial praxis and object scanning technologies based not only on classic sensors, but also on image information. Using object identification and by providing the data to cloud, it will be possible to evaluate the data from distinct aspects.
Realization:	01/2018 – 12/2020
Coordinator:	Emília Bubeníková
Co-operators:	Mária Franeková, (until 28.9.2018), Karol Rástočný, Aleš Janota, Juraj Spalek, Peter Holečko, Alžbeta Kanáliková, Rastislav Pirník, Dušan Nemec

038ŽU-4/2017: Laboratory education methods of automatic identification and localization using radiofrequency identification technology

Summary:	Automatic identification systems currently represent an irreplaceable role in the automation of industrial production, transport, logistics and trade. Among the technical means allowing automatic identification of persons, objects or animals a radio frequency identification (RFID) dominates. Taking the importance of this technology into account it is necessary that graduates of the study field "Automation" and "Telecommunication and Radio Communication Engineering" that are accredited on the Faculty of Electrical Engineering, University of Žilina, have gained deep knowledge of the principles and applications of this modern technology. The presented project sets a number of scientific and pedagogical objectives. In the scientific objectives the mathematical modelling of RFID systems and their data channels, and also the development of digital signal processing algorithms in the field of RFID are dominant. The dominant educational objectives are the building of several laboratory workplaces enabling to demonstrate the basic physical principles of identification and localization of the RFID tags and to demonstrate the data structures of most commonly used identification cards such as Mifare and Desfire.
Realization:	01/2017 – 12/2019
Coordinator:	Peter Vestenický
Co-operators:	Martin Vestenický, (KMaIKT), Jozef Balák (until 31. 8. 2018), Michal Gregor, Peter Kello (until 31. 8. 2018), Peter Nagy, Dušan Nemec, Juraj Ždánsky, Michal Kuba, (KMaIKT), Matej Guráň (from 3. 9. 2018), Jozef Valigurský (from 3. 9. 2018)

Research Projects Funded by the Slovak Research and Development Agency (APVV)

APVV-17-0014: Smart tunnel: telematic support for emergencies in the traffic tunnel	
Summary:	The objective of the project is to design of a unique and competitive system, which will enable to decrease safety risks resulting from the operation of a road tunnel. The system design and functional specification will be provided in a proper form for realisation of commercial solutions. The consumer will be provided by a integrated UML software specification with focus on identification and classification of safety critical events in tunnels.
Realization:	07/2018 – 12/2021
Coordinator:	Rastislav Pirník
Vice-coordinator	Jozef Svetlík
Co-operators:	Emília Bubeníková, Stanislava Gašpercová, Peter Holečko, Aleš Janota, Tomáš Loveček, Vladimír Mózer, Peter Nagy, Lenka Siváková, Juraj Spalek, Kamila Kršíková.

APVV-15-0441: Measurement system with optical sensor for the Weight In Motion systems	
Summary:	Proposed project of applied research will be focused on design, optimization and creation of a device for weight measurement of a vehicle (or its axle) in movement according to the currently valid traffic regulations on the road or highway. Project will discuss the selection of proper sensor hardware for the system, its mounting into existing solutions Measure-in-Motion® previously designed by project partner and compatibility of the used optical sensor output with the interface of the existing processing unit.
Realization:	7/2016 – 6/2020
Coordinator:	Daniel Káčik
Co-operators:	Aleš Janota, Juraj Spalek, Marián Hruboš, Rastislav Pirník, Peter Vestenický, Vojtech Šimák, Dušan Nemec, Jozef Hrbček

APVV-16-0006: Automated robotic assembly cell as an instrument of concept Industry 4.0	
Summary:	Global aim of the project is design of new modern concept of automated robotic assembly cell consisted of mobile manipulator, whereby manipulation task is performed by compliant manipulator. This aim is divided into partial tasks - design of mobile platform with capability of autonomous movement in unknown environment, concept of compliant manipulator with enhanced sensorial systems, which allows the manipulator better modelling of environment and interactions with human, and finally mutual cooperation of both modules to ensure the safe and stabile manipulation with objects also during the movement of robot. A suitable design of hardware and development of software will lead to construction of such unique concept, which combines actual trends in R&D in robotics.
Realization:	07/2017 – 06/2020
Coordinator:	František Duchoň (FEI STU)
Co-operators:	Aleš Janota, Juraj Spalek, Vojtech Šimák, Emília Bubeníková, Michal Gregor, Dušan Nemec, Jozef Hrbček

Projects of European Structural Funds

ITMS 313011B765: Universal virtual intelligent space for transport systems	
Summary:	The research objective is in creating a system environment of information sources based on IoE, its advanced processing, connection to other life areas, searching for correlations between things, processes (information), seemingly unrelated, using these discovered dependencies in technological innovations, decision making and process control in transport and in standard living of citizens.
Realization:	09/2017 – 08/2022
Coordinator (UNIZA):	Rastislav Pirník
Project manager (UNIZA)	Rastislav Pirník
Co-operators:	Aleš Janota, Juraj Spalek, Mária Franeková, Pavel Přibyl, Peter Vestenický, Marian Hruboš, Peter Holečko, Emília Bubeníková, Vojtech Šimák, Jozef Hrbček, Michal Gregor, Alžbeta Kanáliková, Dušan Nemec

ITMS2014+313011B738: Research and development of a wireless system for prediction of potential savings of heating energy in large buildings	
Summary:	The project is focusing on research and development of a wireless monitoring system WHEMS (Wireless Heating Efficiency Monitoring System) consisting of wireless agents monitoring physical quantities (heat supplied, interior and exterior temperatures, humidity, external effects, heat gains from other sources and other) at the level of individual rooms and a supervisory ICT infrastructure able to archive and process the gathered data in order to predict potential savings of heating energy in large buildings achievable by deploying an optimal regulation system. A successful development of an innovative system enables to incorporate a new service in the energy producing area, providing the possibility to design an optimal regulation system for a specific building including the definition of its return of investment. The accompanying effect of this service is the reduction of heating costs and environment protection. The project activities include research and development of wireless agents and wireless infrastructure, form the hardware and software aspect, development of software for the supervisory ICT infrastructure, as well as the basic research for energy saving algorithms. The target group consists mainly of state administration buildings, schools, hospitals. The project solution will be enabled by a tight cooperation of Amicus SK (Skalica) and University of Žilina development teams, thus contributing and deepening of inter-regional cooperation of these institutions to achieve new knowledge in construction, production and operation of wireless agents and ICT infrastructure used within the heating and cooling sector.
Realization:	09/2017 – 02/2023, project currently suspended
Coordinator:	Martin Vestenický, (EF-KMaIKT)
Co-operators:	Peter Vestenický

Other National Research Projects

IBM-10/2016: Exploration of Smart City Services with IBM within UNIZA Campus	
Summary:	The aim of the project is to follow up the IOT activities within UNIZA Campus, bring new solutions & innovations and help more students to get familiar with IBM technology in this area (IOT, BigData, Analysis). It will also deepen the relation between IBM and UNIZA.

Realization:	10/2016 – 10/2018
Coordinator:	Peter Holečko
Co-operators:	Aleš Janota, Juraj Spalek

Other National Non-research Projects

312011F057 – National project IT academy	
Summary:	Creating a model for education and preparation of young people for the current and perspective needs of knowledge oriented society and labour market with focus on informatics and ICT.
Realization:	09/2016 – 10/2020
Coordinator:	Michal Varga, FMI
Co-operators:	Alžbeta Kanáliková, Emil Kršák, Michal Varga, Norbert Adamko, (FMI)

Outputs from Solved Research Tasks

Publication activities at the FEE (based on registration at the University Library up to February 2019)

Kategória	**Názov kategórie (podľa UK)** Sumárnu tabuľku nevypĺňať, pripraví dekanát za celú EF podľa evidencie v Univerzitnej knižnici	**Počet**
AAA		
AAB		
ACA		
ACB		
ADC		
ADD		
ADE		
ADF		
ADM		
ADN		
AEC		
AED		
ADE		
ADF		
AGJ		
BCI		
…		

Monographs

[1]	PRIEZVISKO, Meno – PRIEZVISKO, Meno: *Názov publikácie*, vydavateľstvo, rok vydania, ISBN, počet strán.
[2]	NAISBITT, John – ABURDENOVÁ, Patricia: *Megatrends 2000*, Žilina: EDIS, 2018 ISBN 80-xxxx-xxxx-x, 325 pp.

Books and textbooks

[1]	PRIEZVISKO, Meno – PRIEZVISKO, Meno: *Názov publikácie*, vydavateľstvo, rok vydania, ISBN, počet strán.

[2]	NAISBITT, John – ABURDENOVÁ, Patricia: *Megatrends 2000*, Žilina: EDIS, 2018 ISBN 80-xxxx-xxxx-x, 325 pp.

Lecture Notes

[1]	Analogicky
[2]	…

Current Content Journals

[1]	RÁSTOČNÝ Karol – ŽDÁNSKY Juraj – FRANEKOVÁ Mária – ZOLOTOVÁ Iveta: Modelling of diagnostics influence on control system safety. In: COMPUTING AND INFORMATICS. Vol. 37, No. 2, 2018, ISSN 1335-9150, p. 457-475. DOI: 10.4149/cai_2018_2_457

Patents, Industrial Designs, Author's Certificates and Discoveries

Submitted in 2018:

[1]	Analogicky, uvádzať: Category: Application number: Date of publication of the application: Available to the public: Authors: Title: Granted by the office:
[2]	…

Granted in 2018:

[1]	Analogicky, uvádzať: Category: Application number: Date of publication of the application: Available to the public:)]Authors: .]Title: Granted by the office:
[2]	…

Co-operation

Co-operation Partners in Slovakia

- ABB, s.r.o. Banská Bystrica
- Aliga, s.r.o. Martin
- AŽD Slovakia, Bratislava
- B+R automatizace, s.r.o. Nové Mesto nad Váhom
- Betamont, s.r.o. Zvolen
- Continental Matador Rubber, s.r.o., Púchov-Horné Kočkovce
- Department of cybernetics and artificial intelligence, FEI TU Košice
- ELTODO SK, s.r.o. Bratislava

- FMach, s.r.o., Žilina
- IBM Slovensko, Bratislava
- Institute of robotics and cybernetics, FEI STU Bratislava
- National highway company, Bratislava
- PPA INŽINIERING, s.r.o., Bratislava
- Profibus SK association
- Scheidt & Bachmann Slovensko s. r. o., Žilina
- Siemens s. r. o., CEE RU-SK IC-MOL RA RA-COC
- Siemens s.r.o., Digital Factory/ Factory Automation/ Automation systems (IA&DT)
- SIMAP SK, s.r.o. Trenčín
- SOITRON, s.r.o., Bratislava
- ŽSR, Bratislava

International Co-operation Partners

- AŽD Praha s.r.o., CR
- B&R Industrial Automation GmbH, Austria
- DT – Výhybkárna a strojírna, a.s., CR
- První Signální, a.s., CR
- SIEMENS Mobility GmbH, Austria

Non-contractual Cooperation with Academic Institutions

- Berkeley Artificial Intelligence Research Laboratory, UC Berkeley, USA
- Department of Computer Science and Technology, Tongji Univesity, Shanghai
- FD ČVUT Prague, Czech Republic
- FEI STU Bratislava
- FEI VŠB -TU Ostrava, Czech Republic
- FEI TUKE Košice
- Laboratory for Automation and Robotics, University of Patras, Greece
- MTF STU Bratislava, detached in Trnava

Visitors to the Department

Name	Institution	Length of stay
Ondřej Přibyl	FD ČVUT, Prague, CR	2 days
Roman Danel	HGF VŠB-TU Ostrava, CR	2 days
Michal Řepka	HGF VŠB-TU Ostrava, CR	2 days
Anna Baranová	Continental AG, Hannover, Germany	2 days
Steffen Foerster	Continental AG, Hannover, Germany	1 day
Axel Hawner	Continental AG, Hannover, Germany	1 day
Sylvia Nietzachman	Continental AG, Hannover, Germany	1 day
Efim N. Rozenberg	JSC NIIAS Moscow, Russia	1 day
Viktor Belyakov	Russian Railways Moscow, Russia	1 day
Alexey Ozerov	Russian Railways Moscow, Russia	1 day
Michal Žák	DT – Výhybkárna a strojírna, a.s., CR	3 x 1 day
Jiří Žilka	První Signální, a.s., CR	2 x 1 day
Antonín Diviš	AŽD Praha s.r.o., CR	1 day

| Zdeněk Píchal | Signalbau, a.s., CR | 1 day |

Visits to Foreign Institutions

Name	Institution	Length of stay
Juraj Spalek	VŠT-TU Ostrava, CR	4 days
Karol Rástočný	AŽD Praha s.r.o., CR	1 day
Karol Rástočný	DT – Výhybkárna a strojírna, a.s., CR	1 day
Aleš Janota	Politechnika Śląska, Poland	1 day
Aleš Janota	ČVUT Prague, CR	1 day
Aleš Janota	UTH Radom, Poland	5 days
Aleš Janota	COST Brussels, Belgium	5 days
Michal Gregor	Tongji University, Shanghai, China	2 months
Michal Gregor	University of Strathclyde, Glasgow, UK	5 days
Michal Gregor	UC Berkeley, California, USA	4 months
Michal Gregor	MIT-IBM Watson AI Lab, Cambridge, MA, USA	1 day
Michal Gregor	Toyota Research Institute, Cambridge, MA, USA	1 day
Dušan Nemec	CIIRC, ČVUT Prague, CR	3 days
Peter Holečko	CIIRC, ČVUT Prague, CR	3 days
Peter Holečko	COST Association Brussels, Belgium	2 days
Peter Holečko	University of Strathclyde, Glasgow, UK	5 days
Peter Holečko	Panonit, Univerzity Novi Sad, Novi Sad, Serbia	31 days
Jozef Hrbček	B&R Industrial Automation GmbH, Austria	3 days

Contracts (Business Activities)

SOD 007/18/40: Cooperation at the development of the JAZZ system	
Customer:	AŽD Praha s.r.o.
Coordinator:	Karol Rástočný

S-103-0009/18: Safety appraisal of railway crossing safety system BUES2000 with axis counters type AZSB 300	
Customer:	Scheidt & Bachmann Slovensko, s.r.o.
Coordinator:	Karol Rástočný

P-103-002/2018: Elaboration of Safety appraisal report of MIREL RM2 integrated on-board system	
Customer:	HMH s.r.o., Bratislava
Coordinator:	Peter Nagy

P-103-002/2018: Overall appraisal of SIMIS W SK system – project stage 6	
Customer:	SIEMENS Mobility GmbH, Austria
Coordinator:	Karol Rástočný

Other Activities

Conferences, Workshops, Symposiums Organized by the Department

- Workshops: Presentation of safety PLC laboratory and study options of safety control systems within the automation study branch, organised for secondary schools students: 14.2.2018 – SOŠE Liptovský Hrádok, 19.4.2018 – SOŠ Trenčín, 20.9.2018 – SPŠ Martin and Gymnasium Púchov, organisers: Juraj Ždánsky, Peter Nagy
- Workshop „Ready for Conti 1": discussion meeting of the representation of German/Slovak division of Continental AG/Continental Matador Truck Tires, s.r.o., DCIS representation and 1st grade master degree students on IoT, cloud, big data, industry 4.0 and others: 26. 4. 2018 – DCIS FEE UNIZA, within the KEGA 014ŽU-4/2018 project
- Workshop „Ready for Conti 2": discussion meeting of the representation of German/Slovak division of Continental AG/Continental Matador Truck Tires, s.r.o., DCIS representation and 1st and 2nd grade master degree students on IoT, cloud, big data, industry 4.0 and others: 23. 10. 2018 – DCIS FEE UNIZA, within the KEGA 014ŽU-4/2018 project

Specialised Lectures and Courses Organized by the Department

Cryptography and its practical utilisation	
Customer:	Lecture for the students of Automation study programme (subject: Communication security)
Lecturer:	Martin Šuták, Aliga, s. r. o. Martin
Date:	16th December 2018

Biometry	
Customer:	Students of the Automation and Process control programmes
Lecturer:	Roman Danel, Institute of physics HGF VŠB-TU Ostrava
Date:	19th March 2018

Mobile robotics	
Customer:	Students of the Automation and Process control programmes
Lecturer:	Michal Řepka, Institute of physics HGF VŠB-TU Ostrava
Date:	17th April 2018

Technology equipment of road tunnels: project– realisation – operation – service	
Customer:	Students of the Automation and Process control programmes
Lecturer:	Igor Jamnický, PPA Inžiniering
Date:	11th April 2018

Information systems security management, penetration testing	
Customer:	Students of the Process control programme
Lecturer:	Martin Šuták, Aliga, s.r.o.
Date:	4th December 2018
Conventional and safe control of industrial processes using PLC-SIMATIC	
Customer:	SPŠ Poprad, Extrapolácie 2018

Lecturer:	Juraj Ždánsky
Date:	18th October 2018

Conventional and safe control of industrial processes using PLC-B&R	
Customer:	SPŠ Poprad, Extrapolácie 2018
Lecturer:	Jozef Hrbček
Date:	18th October 2018

Control systems based on PLCs, its programming and utilisation for control – Motor control.	
Customer:	Experimental exercises for the Middle industrial schools of Jozef Murgaš
Lecturer:	Jozef Hrbček
Date:	6th February 2018

New trends in industrial automation	
Customer:	Students of the Automation and Process control programmes
Lecturer:	Marek Mašláni, Michal Bors, B+R automatizace, s.r.o
Date:	16th October 2018

Development activities of AŽD Praha – the JAZZ system	
Customer:	Students of the Automation and Process control programmes
Lecturer:	Antonín Diviš, AŽD Praha s.r.o.
Date:	22nd November 2018

Image processing in industrial applications	
Customer:	Students of the Automation and Process control programmes
Lecturer:	Marián Križovič, FMach s.r.o, Žilina
Date:	23rd, 24th April 2018

Image processing in industry and introduction of Cognex industrial cameras	
Customer:	Students of the Automation and Process control programmes
Lecturer:	Michal Tuhý, MTS s r. o. Krivá
Date:	19th, 20th April 2018

Automation of industrial processes	
Customer:	Students of the Automation and Process control programmes
Lecturer:	Continental Matador Púchov workers
Date:	5th April 2018

Electronic interlocking systems: AŽD ESA 11, Siemens SIMIS W, AŽD ESA 44 and SZZ	
Customer:	Students of the Automation and Process control programmes
Lecturer:	Pracovníci ŽSR, Peter Nagy
Date:	15th May 2018, 17th May 2018, 27th November 2018, 12th November 2018, 28th November 2018, 14th December 2018

Invited Lectures/Papers

Technological equipment of town tunnels	
Lecturer:	Rastislav Pirník
Where:	ČVUT Faculty of transport, CR
Date:	16th April 2018

Operational states and technological equipment of tunnels	
Lecturer:	Rastislav Pirník
Where:	ČVUT Faculty of transport, CR
Date:	17th April 2018

Acoustic-driven Vehicle Adaptation to Improve Driver's Comfort	
Lecturer:	Michal Gregor
Where:	MIT-IBM Watson AI Lab, Cambridge, MA, USA
Date:	12th December 2018

Acoustic-driven Vehicle Adaptation to Improve Driver's Comfort	
Lecturer:	Michal Gregor
Where:	Toyota Research Institute, Cambridge, MA, USA
Date:	13th December 2018

Membership in International Institutions/Committees

Membership of the Department in international organizations	Membership since
Slovak society for cybernetics and informatics at SAV (SSKI)	2000

Individual membership of employees of international organizations		Function
Aleš Janota	Polish Academy of Sciences (PAN) – Transportation Committee, Katowice, Poland	member
Aleš Janota	International Institute of Informatics and Systemics, USA	member
Aleš Janota	Association for Computing Machinery (ACM), USA	member
Rastislav Pirník	Cooperative systems (SDT), CR	member of workgroup

Individual membership of employees in scientific committees of international journals		Function
Juraj Spalek	Annals of Faculty Engineering Hunedoara – Journal of Engineering, ISSN 1584-2665, ISSN 1584-2673, indexed in Index Copernicus – Journal Master List, Romania	member of editorial board
Juraj Spalek	Acta Technica Corviniensis – Bulletin of Engineering, e-ISSN: 2067-3809, Edited by Faculty of Engineering Hunedoara University Politehnica Timisoara, Romania	member of scientific board
Juraj Spalek	Archives of Transport Systems Telematics, Polish Association of Transport Telematics, ISSN 1899-8208, Poland	member of international

		programme committee
Karol Rástočný	Archives of Transport System Telematics, Polish Association of Transport Telematics, ISSN 1899-8208, Poland	member of editorial board
Karol Rástočný	Advances in Electrical and Electronic Engineering, ISSN 1804-3119, CR	member of editorial board
Karol Rástočný	Wspolczesne systemy transportowe, ISSN 2449-7851, Poland	member of editorial board
Karol Rástočný	Railway Reports, ISSN 0552-2145, Poland	member of editorial board
Aleš Janota	Archives of Transport System Telematics, ISSN 1899-8208, Poland	chair of scientific board
Aleš Janota	TransNav International Journal on Marine Navigation and Safety of Sea Transportation, ISSN 2083-6473, Poland	member of programme board
Juraj Ždánsky	Archives of Transport System Telematics, Polish Association of Transport Telematics, ISSN 1899-8208, Poland	member of programme board
Michal Gregor	Applied Computer Science, ISSN 2353-6977	member of scientific board

Individual membership of employees in the scientific committees of international conferences		Function
Juraj Spalek	XIII-th International Scientific and Technical Conference Computer Science and Information Technologies CSIT 2018, Lviv, Ukraine	member of scientific board
Juraj Spalek	World Symposium on Digital Intelligence for Systems and Machines DISA 2018 – 23-25 August 2018, Košice, SR	member of scientific board
Juraj Spalek	18th International Conference on Transport Systems Telematics, TST 2017, Krakow, Poland	member of scientific board
Juraj Spalek	29th International Conference 2018 CYBERNETICS AND INFORMATICS (K&I), 31 . 1. – 3. 2. 2018, Lazy pod Makytou, SR	member of scientific board
Karol Rástočný	International Conference „ELEKTRO 2018", CR	member of scientific board
Karol Rástočný	International Conference „Applied Electronics", AE 2019, CR	member of scientific board
Karol Rástočný	19th International Conference „Transport Systems Telematics", TST 2019, Poland	member of scientific board
Karol Rástočný	14th International Conference „Railway Telecommunication and Interlocking Systems", SR	member of programme board
Aleš Janota	16th IEEE World Symposium on Applied Machine Intelligence and Informatics SAMI 2018, Herľany, February 7-10, 2018, SR	member of technical programme board
Aleš Janota	18th International Conference on Transport System Telematics TST 2018, Krakow, Poland, March 20-23, 2018	member of programme board
Aleš Janota	XXII. international conference TransComp 2018, Zakopané, 3-6.12.2018, Poland	member of scientific board
Michal Gregor	Cybernetics & Informatics 2018, SR	member of programme board

| Michal Gregor | 12th International Conference ELEKTRO 2018, CR | member of organisation board |
| Peter Holečko | 2nd EAI International Conference on Intelligent Transport Systems (INTSYS 2018), Portugal | member of programme board |

Individual membership of employees in scientific boards and trade committees abroad		Function
Juraj Spalek	VŠB-TU Ostrava, HGF, CR	member of branch committee
Aleš Janota	Publication scientific board of UTH Radom (University Publishing Scientific Council of the Kazimierz Pułaski University of Technology and Humanities in Radom), Poland	member
Peter Vestenický	VŠB-TU Ostrava, HGF, CR	member of branch committee

Membership in National Institutions/Committees

Membership of the Department in organizations of the SR	Membership since
Slovak society for cybernetics and informatics at SAV (SSKI)	2000

Individual membership of employees in organizations of the SR		Function
Aleš Janota	National robotics centre, Bratislava	honorary member
Aleš Janota	Scientific-technical association at UNIZA, Žilina	member
Aleš Janota	Technical standardisation committee TK104 Control of industrial processes, Slovak office of standards, metrology and testing, Bratislava	member
Aleš Janota	Slovak society for cybernetics and informatics at SAV (SSKI), SR	member of main board
Karol Rástočný	Technical standardisation committee TK 83, SÚTN Bratislava	member
Peter Holečko	Profibus SK association	member

Individual membership of employees in editorial boards of national journals		Function
Karol Rástočný	AT&P Journal, ISSN 1335-2237	member of editorial board
Juraj Spalek	AT&P Journal, ISSN 1335-2237	member of editorial board
Rastislav Pirník	Acta Technología, ISSN 2453-675X	member of editorial board

Individual membership of employees in the scientific committees of national conferences		Function
Rastislav Pirník	Automation and control in theory and praxis ARTEP 2018 SR	member of programme board

Individual membership of employees in scientific boards and trade committees outside of FEE UNIZA		Function
Juraj Spalek	UNIZA FMI	member of branch committee
Juraj Spalek	UNIZA FSE	member of scientific board
Juraj Spalek	UNIZA	member of scientific board
Aleš Janota	Branch committee study programme 9.2.9 Applied informatics, Faculty of management and informatics, UNIZA, Žilina	member
Emília Bubeníková	VTS association at UNIZA	member

Awards

Pavel Přibyl	Memorial medal of the FEE UNIZA dean on the occasion of 65th UNIZA anniversary

Contact Address

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SK

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