



ICCECIP 2021

International Conference on Central European Critical Infrastructure Protection

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ABSTRACT BOOK

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Greetings from Professor Miklós Maróth

President of the Eötvös Loránd Research Network

3rd International Conference on Central European Critical Infrastructure Protection “Kinetic and cyber tools in the critical infrastructure protection”



A year ago, we could not have predicted the continuously emerging new challenges related to the COVID-19 pandemic, which affected almost every aspect of our lives. At the core of the challenges were new security demands related to the urgency of remote or hybrid work. This environment has entailed a new range of issues including targeted cyber threats, data breaches, network, cloud and data risks and related challenges.

There is one thing that remained unchanged and that is the voice of science, which is critical to be heard and respected.

The cyber security of critical infrastructures has gained even more importance and some members of the Eötvös Loránd Research Network have competencies in various fields enabling them to address security related issues. The **Institute for Computer Science and Control (SZTAKI)** for example, has the expertise to contribute to mitigating risks related to cyber-attacks. SZTAKI has a long tradition of excellence in R&I, they conduct basic and applied research and are active in technology transfer. This past July they also joined the newly launched '**Innovation Cluster for Digital Society**' project as consortium partners, an initiative that concentrates on R&D in e-government and e-public services. Vital for scientific progress, young SZTAKI researchers are piloting innovative solutions in areas of distributed production systems, effective stochastic optimization methods in online machine learning and the application of Fluid Computing in Cyber-Physical Productions Systems.

Equally, other ELKH institutes and their highly skilled researchers facilitate different value-added platforms in this sector. Researchers from the **Centre for Energy Research** have recently examined the 70-year-old historical dataset of the Hungarian power grid to perform complex network analysis and evaluation. Furthermore, **the Centre for Social Sciences, Institute of Legal Studies** and the **Research Centre for the Humanities, Institute of Philosophy** are currently analyzing the challenges of cybercrimes, AI, and other critical sector findings.

It is fair to say that ELKH serves as an interface between science and policy and science is undoubtedly a major contributor to protecting our critical infrastructures.

I wish the organizers and the participants of the ***3rd International Conference on Central European Critical Infrastructure Protection “Kinetic and cyber tools in the critical infrastructure protection”*** an exciting and fruitful discussion that may contribute to the tackling of the challenges our critical infrastructure is exposed to.

Greetings from Col. Attila Ferenc Varga, PhD.

Head of department of the MOD Department of Defense Administration, Hungary

Dear Professors, fellow Researchers, Participants and Guests,

I respectfully welcome you at the International Conference on Central European Critical Infrastructure Protection, being either on the spot, or following this event by video-teleconference.

It is my great honour to greet you on behalf of the Hungarian Ministry of Defence, which, within its competence and capacity, also plays an important role in critical infrastructure protection. Contemporary societies can be examined as complex systems, in which individual systems and their subsystems are interdependent and in close interaction. A possible change in any system can have a potential effect on the other systems that may cause a chain reaction. It also means that if a malfunction of a system occurs – would it be caused intentionally, accidentally, or due to omission -, it can generate a series of harmful effects on the systems' systems. As a result of all these, indispensable components of the system insuring critical social tasks may become totally or partially inoperable, and therefore, preventive and increased protection of them is necessary in order to guarantee their operational safety and continuity. The totality of these planning, coordinating and defending tasks can be called critical infrastructure protection.

The national legal background of the critical infrastructure protection in Hungary, which is based on a European Union's directive, was created in 2012. Since then, the detection and designation of critical infrastructure systems and their components, as well as the creation of their full protection, and also to guarantee their operational safety have become possible.

We have to pay attention not only to the adaptation of the EU's rules, but to other obligations originated from our NATO membership, as well. It can be realised that due to the spread of hybrid warfare in our modern age, non-conventional and non-military tools are increasingly emphasised, compared to conventional military tools, and military objectives can easily be reached by the combination of these non-conventional and non-military tools, because of the interconnection and interdependency of the systems. By using unlimited warfare tools, the politics, the economy, the healthcare system, the culture and the cyber space may also become the scene of the fight.

It means that, in order to counter possible sources of conflicts, threats and attacks, the combination of military and non-military tools, the capacity of the governmental and civil organizations and other forms of „national power” must be used. To prepare ourselves for the future conflicts, the physical and cyber protection of the system components must be enhanced, and we must increase their resilience, as complete as possible, against any attacks. At this point, it is important to clarify what we exactly mean under hybrid threat, and what does hybrid warfare mean, since critical infrastructures are highly endangered by non-conventional attacks carried out by hybrid threat's perpetrators.

From defence administration point of view, we can declare that hybrid threat is, although not new, but quite complex, highly coordinated or even synchronized application of different civil and military capabilities, forces, tools, procedures and techniques, in order to reach a precisely determined goal. I believe that hybrid warfare can be efficient because tools are extremely widespread and threats or even attacks seem to be coming from separate locations and direction, however, these threats or attacks are carried out in a planned, synchronised and focused manner. This is the way, how hybrid threats or attacks can cause unusual, novel, challenging situation for the attacked opponent, although those methods have already been applied also in earlier times.

We must realize a general tendency that critical infrastructures have become primary potential targets that can be attacked by armed and non-armed (for example cyber) tools and methods during hybrid warfare. Both NATO and EU believe that the most effective method against hybrid warfare is strengthening of national resilience. Resilience is the ability of a society to

protect itself by a combined application of civil and military efforts against any negative impacts on its security, and also to be able to restore the operability of the systems and subsystems in a very short time.

According to the Allies' opinion, creating, maintaining and strengthening of the resilience is one of the central pillars of the collective defence, however, it is first and foremost a national responsibility. This national responsibility was also emphasized consistently in NATO doctrines and in other related documents declaring that increased resilience of member states can decrease the vulnerability of NATO, as a whole, and coordination of these member states' activities at allied level is essential.

Examining several parts of strengthening national resilience, we can experience that there is a significant coincidence between protection of critical infrastructure and the tasks of maintaining national resilience. Both of them have the objective to ensure and strengthen the operational safety, the operational continuity and the resilience of the critical infrastructures of a country (for example transport, energy, healthcare, info-communication infrastructures). In general, the difference between them is that critical infrastructure protection is based on sectors and aiming to strengthen the protection across a special sector's logic and professional background, on the other hand, national resilience can rather be interpreted in a "whole-of-nation" context and appears to be a cross-sectoral strategy.

Also, the National Security Strategy of Hungary mentions hybrid threats as extremely important security risks and declares that the response must be coordinated and based on the close cooperation of the national bodies. Although reaching the national resilience is estimated latest by 2030 by the National Security Strategy, the Government has already decided on the development of a "whole-of-government" approach in defence administration as the first step towards an overarching national resilience.

The experiences of COVID-19 pandemic confirmed that critical infrastructure protection has a significant importance in any major crises, even in the most different ones. Moreover, this task has appeared in a way that not only the operational capability and continuity of vital infrastructures has to be ensured in a coordinated manner, but in total, the operational capability of the whole country. We could see, how a primarily healthcare threat has become a severe economic problem and then a social problem all over the world. This process has also proved the interconnection and interdependency of different sectors.

So, one of the biggest questions in front of us is: how can we make critical infrastructure protection more effective? What kind of measures we have to take in order to promote operational capability?

In my opinion, from an effective defence point of view, it is essential to improve detecting and surveillance capability to explore possible threats. Second, critical infrastructure operators have to be made interested in investing into their own systems, procedures and manpower, in order to be equal partners of governmental agencies and authorities. And thirdly, we must continuously train ourselves to be prepared for taking appropriate and effective actions countering possible attacks threatening our critical infrastructure.

This conference is an excellent event to discuss all these issues, to promote better understanding and cooperation in this very important subject.

With all these in mind, I wish you fruitful discussions, effective work and useful experiences during the conference.

Thank you for your attention.

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CONFERENCE PROGRAM

08:30 - 09:00 Registration

09:00 - 09:30 **ICCECIP 2021 Opening Ceremony**

Tamás Dezső, PhD

President of the Batthyány Lajos Foundation, Hungary

Col. Attila Ferenc Varga, PhD

Head of department of the MOD Department of Defense Administration, Hungary

Prof. Zoltán Rajnai, PhD

Dean of Bánki Donát Faculty of Mechanical and Safety Engineering, Óbuda University,
Cyber Coordinator of Hungary Ministry of Interior, Hungary

János Perényi, PhD

Rector of Milton Friedman University, Hungary

Plenary

Chairs: **Tünde Anna Kovács, PhD.**, Óbuda University, Hungary
Zoltán Nyikes, PhD., Milton Friedman University, Hungary

09:30 - 09:55 **Prof. Alexis Rusinek PhD.**, French Institute in Hungary, France,
**ADVANCED CONSTITUTIVE RELATIONS AND ORIGINAL
EXPERIMENTS AT HIGH STRAIN RATES FOR STRUCTURAL
APPLICATIONS**

09:55 - 10:20 **Prof. Tibor Kovács, PhD.**, Óbuda University, Hungary,
**DIFFICULTIES OF FACE RECOGNITION: LIMITED NUMBER OF
PARAMETERS**

10:20 - 10:30 **Technical break**

10:30 - 10:55 **Kostiantyn Afanasenko, PhD.**, National University of Civil Defence of
Ukraine, Ukraine,
**ELECTRICAL IGNITION SOURCES FOR CRITICAL
INFRASTRUCTURE FACILITIES**

10:55 - 11:20 **Robert Castel, PhD.**, Israel National Parks Authority, Israel,
EMERGING SECURITY CHALLENGES IN THE BIG OUTDOORS
(online)

11:20 - 11:45 **Prof. Kornélia Lazányi, PhD.**, Óbuda University, Hungary
**CAN TRUST BE A FACTOR OF ORGANISATIONAL SAFETY AND
SECURITY?**

11:45 - 11:55 **Technical break**

**Section 1,
Individual Security of Critical Infrastructure**

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| Chairs: | Tamás Berek, PhD. , National University of Public Service, Hungary Vid Sebestyén Honfi, PhD. , Milton Friedman University, Hungary |
| 11:55 - 12:10 | Dalibor Dobrilovic, PhD. , University of Novi Sad Technical faculty "Mihajlo Pupin" Zrenjanin, Serbia, INVESTIGATION ON UAV PATH PLANNING IN CRITICAL INFRASTRUCTURE PROTECTION IN URBAN ENVIRONMENTS (online) |
| 12:10 - 12:25 | Amine Bendarma, PhD. , Universiapolis, International University of Agadir, Morocco, THE BEHAVIOUR OF ALUMINUM ALLOY AW5005 SHEET SUBJECTED TO IMPACT AND PERFORATION PROCESS: EXPERIMENTAL AND NUMERICAL APPROACH , invited speaker, (online) |
| 12:25 - 12:40 | Daria Dorosenko , National University of Civil Defence of Ukraine, Ukraine, ASSESSMENT OF THE PROBABILITY OF FORMING A FIRE-EXPLOSIVE CONCENTRATION IN THE ROOM , invited speaker |
| 12:40 - 12:55 | Viktor Huszár , National University of Public Service, Hungary, APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN HUMAN ACTIVITY RECOGNITION (online) |
| 12:55 - 13:10 | Yue Wu , Óbuda University, Hungary, THE AWARENESS OF A NEW FOOD PRODUCT: ORGANIC INSTANT FOOD IN HUNGARY AND CHINA. - DO WE TRUST IT? |
| 13:10 - 13:25 | Prof. Gyula Mester, PhD. , NextTechnologies Ltd. Complex Systems Research Institute, Hungary, ROBOTIKA 4.0 ATOMATED SELF-DRIVING ROBOTIC TOOLBOX , invited speaker, (online) |
| 13:25 - 14:00 | Lunch |

- Poster session**
- Irina Gabriela**, University Politehnica of Bucharest, Romania,
IDENTIFICATION AND RECOVERY OF LI AND MN FROM RESIDUAL SOLUTION USED TO RECOVER USEFUL METALS FROM SPENT LI-ION BATTERIES
- Milica Sikimić**, Óbuda University, Hungary,
Marko Ivanišević, University of Banja Luka, Bosnia and Herzegovina,
SOME CHARACTERISTICS OF THE SECURITY SYSTEM OF BOSNIA AND HERZEGOVINA: THE CREATORS OF CRITICAL INFRASTRUCTURE PROTECTION POLICY
- Yang Song**, Óbuda University, Hungary,
CURRENT ADVANCES OF ULTRASOUND DIAGNOSIS TECHNOLOGY ON SPORTS INJURY DETECTION AND HEALTH PROTECTION
- Xuanzhen Cen**, Óbuda University, Hungary,
APPLICATION OF TRACKLESS DIGITAL TECHNOLOGY IN THE SPECIALIZED STRENGTH TRAINING OF PARA SNOWBOARD ATHLETES
- Döniz Borsos**, Óbuda University, Hungary,
LORAWAN NETWORKS TEST ASPECTS OF CRITICAL INFRASTRUCTURES
- Géza Dévényi**, Óbuda University, Hungary,
CHALLENGES IN INFOTAINMENT SYSTEM DEVELOPMENT FOR AUTONOMOUS VEHICLES
- Abdallah Kafi**, Óbuda University, Hungary,
COLLABORATIVE WELDER ROBOT FLEXIBLE SAFETY ZONES DETERMINATION
- Tóth Gábor**, Óbuda University, Hungary
TAXIVITY FOR THE FUTURE

**Section 2,
Cyber Security of Critical Infrastructure**

- Chairs:** **Sándor Magyar, PhD.** National University of Public Service, Hungary
Igor Fürstner, PhD. Subotica Tech - College of Applied Sciences, Serbia
- 14:00 - 14:15** **András Tóth, PhD.,** National University of Public Service, Hungary
CLOUD OF THINGS SOLUTION IN CRITICAL INFRASTRUCTURES
- 14:15 - 14:25** **Pál Fehér-Polgár,** Óbuda University, Hungary,
BYOD SECURITY CHALLENGES IN THE TIMES OF LOCKDOWN
(online)
- 14:25 - 14:40** **Tamás Somogyi,** Óbuda University, Hungary,
CYBER SECURITY IN THE FINANCIAL SECTOR
- 14:40 - 14:55** **Technical break**
- 14:55 - 15:10** **Annamária Edegbeme-Beláz,** Óbuda University, Hungary,
A NEW APPROACH TO INFORMATION SECURITY AUDITING IN THE PUBLIC ADMINISTRATION
- 15:10 - 15:20** **Technical break**

**Section 3,
Physical Protection of Critical Infrastructure**

- Chairs:** **László Tóth, PhD.**, Óbuda University, Hungary
Prof. Valeriu Gabriel Ghica, PhD., University Politehnica of Bucharest, Romania
- 15:20 - 15:35** **Chiara Bedon, PhD.**, University of Trieste, Italy
POST-BREAKAGE SAFETY LEVELS FOR GLASS STRUCTURES - AN EXPERIMENTAL STUDY, Invited speaker, (online)
- 15:35 - 15:50** **Nada El Yasmine Aichaoui**, Óbuda University, Hungary,
COLLABORATIVE ROBOTS
- 15:50 - 16:05** **Márton Schramkó**, Óbuda University, Hungary,
SAFETY QUESTIONS DISSIMILAR ULTRASONIC SPOT WELDING WITH COPPER AND AUSTENITE STAIN STEEL
- 16:05 - 16:20** **József Kertészker**, Óbuda University, Hungary,
VEHICLE SAFETY (online)
- 16:20 - 16:35** **Mariam Shbanah**, Óbuda University, Hungary,
ADVANCED MATERIALS FOR ELECTROMAGNETIC SHIELDING
- 16:35 - 16:45** **Technical break**

**Section 4,
Political Security of Critical Infrastructure**

- Chairs:** János Besenyő, PhD., Óbuda University, Hungary
Robert Castel, PhD., Israel National Parks Authority, Israel
- 16:45 - 17:00** Gábor Sinkó, Óbuda University, Hungary,
***AL-SHABAAB'S ATTACKS AGAINST KENYAN CRITICAL
INFRASTRUCTURES*** (online)
- 17:00 - 17:15** Jordán Petrőcz, Óbuda University, Hungary,
***PROTECTION AGAINST THE ATTACKS ON TURKISH CRITICAL
INFRASTRUCTURE***
- 17:15 - 17:30** Éva Kovács, Óbuda University, Hungary,
***IDENTIFICATION AND AUTHENTICATION POTENTIALS BASED ON
LIMITED BIOMETRIC DATA***
- 17:30 - 17:45** Gabriella Ürmösné Simon, Óbuda University, Hungary,
***THE EFFECTS OF ONLINE HIGHER EDUCATIONAL OPERATION
ON STUDENTS AND PROFESSORS: THE PRESENTATION OF THE
RESULTS OF A QUANTITATIVE***
- 17:45 - 18:00** József Tisóczy, Óbuda University, Hungary,
***IMPACTS OF THE SARS-COV-2 PANDEMIC ON HEALTHCARE IT
OPERATION AND DATA SECURITY***
- 18:00 - 18:05** **ICCECIP 2021 Closing Ceremony**
Prof. Zoltán Rajnai, PhD.
Dean of Bánki Donát Faculty of Mechanical and Safety Engineering, Óbuda University,
Cyber Coordinator of Hungary Ministry of Interior, Hungary

ABSTRACTS

Plenary session

Prof. Alexis Rusinek PhD.,
French Institute in Hungary, France
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Professor Alexis Rusinek, is working in the field of the dynamic behaviour of materials and structures for more than 20 years at Lorraine University (France). He is co-author of more than 130 international publications related to the previous topics. Prof. Alexis Rusinek is a researcher in LEM3-UMR CNRS (Laboratory of Microstructure Studies and Mechanics of Materials) and was teaching at Lorraine University until July 2021. The materials considered in his research works are related to Metals, Polymers and Composites. From 2017 to July 2021, he was the Director of the laboratory LCP-DUF related to polymers characterization. Prof. A. Rusinek, is also co-editor of the journal Engineering Transactions, a member of the scientific editorial board of the Bulletin of the Military University of technology and a member of the scientific boarding of International Journal of Impact Engineering and since July 2021 is the Attache for science and academic cooperation at the French Embassy in Budapest.

ADVANCED CONSTITUTIVE RELATIONS AND ORIGINAL EXPERIMENTS AT HIGH STRAIN RATES FOR STRUCTURAL APPLICATIONS

Abstract:

In this seminar, the dynamic behavior of materials in term of strain rate and temperature sensitivity will be discussed. To analyze it for a wide range of strain rates and temperatures, experimental tests are frequently performed. It consists generally of using different loading paths as tension, compression, shear It has to be noticed that the last one is the most complicated to perform. Indeed, the specimen design for shear does not allow reaching real shearing but it is a combination of shear and tension or shear and compression. Therefore, the material behavior is related to the specimen geometry used. To reach high strain rates, all these tests are done using Split Hopkinson Pressure Bars (SHPB). This technique is well known but may induce some problems related to the design set-up itself. Therefore, inverse methods are necessary to have a better understanding of experimental measurements. In addition, based on experiments, constitutive relations will be developed and proposed taking into account some physical aspects. The constitutive relation is the main key point to simulate complex problems.

Prof. Tibor Kovács, PhD.,
Óbuda University, Hungary
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Tibor Kovács is a professor at the Óbuda University. He is the Head of the Department of Security Technology at the Óbuda University, Bánki Donát Faculty of Mechanical and Safety Engineering. He has his CSc and PhD in Military Technological Science. Currently, he is working on the mission oriented application of biometric identification. He has been a member of the Hungarian Radiation Protection Association of the Lorand Eötvös Physical Society since 1996 and the Radiochemical Division of the Hungarian Academy of Sciences since 2000, as well as the Security Managers' Association in Hungary since 2013.

DIFFICULTIES OF FACE RECOGNITION: A LIMITED NUMBER OF PARAMETERS

Abstract

The success of face recognition is a more complex task than it first appears. Even in cases when it is in the interest of the user to execute a seamless procedure, face recognition may be hindered by a technical problem, such as insufficient illumination, mimics, make-up or glasses worn by the user. Various tech companies suggest that the time has come when virtually anybody is identifiable at any time or place. Is this really the case? What does personal identification with limited parameters mean? Should we be concerned about our shrinking privacy? In my presentation, I am going to provide the answers to these questions, which are all based on calculations done in an objective database.

Keywords: biometric identification, authentication-identification, face recognition, a limited number of minutiae

Kostiantyn Afanasenko, PhD.,

National University of Civil Defence of Ukraine, Ukraine

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Kostiantyn Afanasenko was born on December 20, 1981, in Kharkiv, Ukraine. He obtained an MSc and PhD in Fire Safety at National University of Civil Defence of Ukraine, Kharkiv, Ukraine in 2004 and 2017, respectively. In present – Senior lecturer at the Department of Fire and Technogenic Safety of Facilities and Technologies of the National University of Civil Defence of Ukraine.

Research interests: fire statistics, thermal radiation during fires, ignition sources

ELECTRICAL IGNITION SOURCES FOR CRITICAL INFRASTRUCTURE FACILITIES

Abstract:

Fires at critical infrastructure facilities usually have serious consequences. As a result, people can be injured, and serious damage can be caused to both businesses and the environment. At the same time, the causes (ignition sources) of fires at such objects can be divided into 4 groups: open fire, thermal manifestations of mechanical energy, thermal manifestations of chemical reactions, thermal manifestations of electrical energy. The latter, according to statistics, can reach up to 25% of the total.

The paper studies the possibility of various substances ignition with an electric ignition source, namely, a short circuit, depending on different parameters.

Keywords: statistic, ignition sources, short circuit,

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EMERGING SECURITY CHALLENGES IN THE BIG OUTDOORS

Abstract:

Terrorism is usually considered a profoundly urban phenomenon. However, the COVID panemics and the subsequent limitations on indoor activities generated significant changes in our recreational habits. The large crowds that usually served as the most lucrative targets of terrorist attacks abandoned the urban areas and moved to the big outdoors.

With this migration of the assets it is unrealistic to assume that the terrorism will be left behind in the urban theater. It is more than plausible to assume that threats will follow the assets, and along the way they will adapt to this new environment.

During the last century and half we have developed a fairly large toolbox of countermeasures optimized for the urban environment. We will soon find that our existing concepts and tools are woefully inadequate for dealing with the terrorist threats in the big outdoors.

This lecture will present a sketch of the Israeli angle on these challenges from a practitioner's perspective.

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Former dean of Keleti Faculty of Business and Management at Óbuda University, founder of the Center for Entrepreneurship Development, qualified psycho-oncologist and cognitive therapist, researcher organisational behaviour, organisational psychology, security culture and human-robot interaction. Editorial board member of various international journals.

Education: MSc in business administration and defence economics, Ph.D. in management and business administration

CAN TRUST BE A FACTOR OF ORGANISATIONAL SAFETY AND SECURITY?

Kornélia Lazányi (Obuda University), Adela Danaj (European University of Tirana)

Abstract:

Safety and security are of increasing importance to all business ventures, but first and foremost for organisations operating as parts of critical infrastructure. Kinetic and cyber tools are being developed and employed, in order to decrease security risks that - in the case of critical infrastructure organisations – would have far fetched consequences not only on a company but on a national level as well. In the present paper, we endeavour to address the human side of this problem, namely the control function of managers in critical infrastructure organisations. Trust will be addressed as a proxy for an external locus of control and described, how a strong and stable superior-subordinate relation can substantially contribute not only to the wellbeing of the employees but to organisational safety and security. What is more, if managers can trust their employees to consciously search for, identify and handle organisational risks, then there is less need for regulations (concerning safety & security), which saves a lot of money for the organisation decreasing the need for constant surveillance and operation of a strict system of SOPs.

**Section 1,
Individual Security of Critical Infrastructure**

INVESTIGATION ON UAV PATH PLANNING FOR CRITICAL INFRASTRUCTURE PROTECTION IN URBAN ENVIRONMENTS

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Abstract:

We are witnesses of a growing appliance of UAVs in a variety of scenarios including the area of critical infrastructure protection. With the parallel growth of UAV-based smart city implementations comes the need for investigation of various issues in UAV urban deployment. Considering these two topics, the idea of utilization of UAVs in urban environments becomes particularly important, especially for monitoring and surveillance of critical infrastructure. The possible areas in which this research could be conducted can be numerous. Because of the complexity and configuration of obstacles in urban environments, this paper is focused on the investigation of UAV path planning automation.

This paper approaches this investigation with the analyses of possible application of various path planning algorithms as well as the research trends in related areas. For the analyses of the research trends, four digital library databases are searched. The collected data are analyzed considering the year of publishing, the type of research paper, content, and area of research. The description of the specific and representative research related to the given topics and selected path planning algorithms are presented in this paper as well. The possible application of presented path planning algorithms particularly for UAV critical infrastructure monitoring is analyzed.

THE BEHAVIOUR OF ALUMINIUM ALLOY AW5005 SHEET SUBJECTED TO IMPACT AND PERFORATION PROCESSEXPERIMENTAL AND NUMERICAL APPROACH

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Maciek Klosak, PhD.

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Abstract:

The analysis of the mechanical characteristics and dynamic behavior of aluminum alloy sheet based on the experimental tests with the numerical simulation was presented. Good correlation of experimental and numerical results was achieved comparing to the theoretical approach.

In this work the perforation process of aluminum sheet has been analyzed using a wide range of impact velocities from 40 to 180 m/s and at high and low strain rates with temperatures ranging from 21 to 300 °C. Experimental and numerical analysis have been carried out to analyze the mechanical behavior of the studied aluminum alloy.

The energy absorbed by the aluminum sheet was reported taking into account of the ballistic. The mass of the projectile is 30 g and its diameter 12 mm. The thickness of the aluminum sheet is equal to 1 mm.

The Abaqus/Explicit finite element code was used to simulate the perforation tests. The comparison of the ballistic curve obtained numerically and experimentally. The failure patterns is presented using the optimal mesh which provides the stability of the results without mesh dependency. A good correlation was observed between numerical simulations and experiments

ASSESSMENT OF THE PROBABILITY OF FORMING A FIRE-EXPLOSIVE CONCENTRATION IN THE ROOM,

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Yuriy Klyuchka, DrSC

National university of Civil Defence of Ukraine, Ukraine

Abstract:

Today carbohydrate gases are widely used in everyday life. Though they are widely used, the question of explosion and fire safety remains open. During the months of July and November 2021, there were explosions in residential buildings in European countries. They led to the deaths and injuries of lots of people. The largest of them were in Georgia, where 4 persons died and more than 30 persons were injured, in Italy, as a result of the explosion one person died and 3 people were injured. There were also two explosions on the territory of Ukraine. In Dnipro, two people died and Poltava, where 1 person was injured. Therefore, in order to analyze the causes of gas-air mixtures explosions and to assess their consequences, it is necessary to investigate the probability of establishing fire and explosion-proof concentrations in buildings. In order to assess the risks of gas-air mixtures explosion, it is necessary to know the probability of such mixtures creation. For this purpose, the work carried out a study of the permissibility of the formation of gas-air mixtures. It was obtained the permissibility of the simulativity in dependence on the initial parameters. The dependence of the distribution function on the speed of gas flow was established.

APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN HUMAN ACTIVITY RECOGNITION

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Abstract:

Law enforcements more and more often use face recognition globally. The reason why the face has been chosen as a popular biometric trait to identify a person, is based on the distinguished characteristics of the human face. However, the pandemics influenced wearable objects covering the face, as wearing a face mask became a requirement by law in many countries. Studies revealed that the accuracy of face recognition significantly dropped because of the face masks. In this abstract, the intention is to present a novel field of research based on artificial intelligence and deep neural network teachings, namely, Human Activity Recognition (HAR). HAR has been used in several applications ranging from motion driven virtual games to automated video surveillance systems. The different military and law enforcement applications of use still need to be explored in more details, and the research must focus on spoof detection of such detection systems, as it is essential to prevent anomalies and false alarms. To this end, a deep learning based approach can be proposed to detect spoof cases from video data.

Keywords: artificial intelligence, computer vision, human activity recognition (HAR)

THE AWARENESS OF A NEW FOOD PRODUCT: ORGANIC INSTANT FOOD IN HUNGARY AND CHINA. - DO WE TRUST IT?

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Abstract:

With the increasing awareness of healthy and nutritional food, the rapid urbanization and globalization, and the increasing general income, the demand for organic food and instant food are required more and more. The organic food market and instant food market are well developed in Europe, better than it is in China. It is proved that even the demand for both food products is growing, they have disadvantages. So can consumers trust the new food product, organic instant food, which can complete the shortcomings of both organic food and instant food? In this research, 581 consumers were interviewed for their trust in organic instant food in Hungary and China. The primary and secondary research was used, and the research method is descriptive. The statistics result of the survey conclude that Chinese respondents experienced more in buying organic instant food than Hungarian ones, but still some consumers in both countries never knew about this new food product. The most welcoming product in Hungary is organic instant noodles, while it is organic instant oatmeal for the Chinese. Hungarian consumers know about organic instant food mainly via social media, families and friends and the advertisement from the stores, while it is social media and the advertisement from stores for Chinese. Most Hungarian and Chinese consumers hold a positive attitude to buy and recommend organic instant food to others, but the percentage is not significantly high. The correlation result indicated that the variance between the experience of purchase and the buying willingness of organic instant food in the future is significant in both countries. And the variance between marketing tools and the buying willingness of organic instant food in the future is also significant in both countries. The consumers' trust in safe organic instant food can be a topic for further research from the point of view of the role of media in healthy nutrition.

ROBOTIKA 4.0 ATOMATED SELF-DRIVING ROBOTIC TOOLBOX

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Abstract:

Automotive engineers use MATLAB® and Simulink® to design automated driving system functionality including sensing, path planning, and sensor fusion and controls. With MATLAB and Simulink, you can develop perception systems using prebuilt algorithms, sensor models, and apps for computer vision, lidar and radar processing, and sensor fusion. Design control systems and model vehicle dynamics in a 3D environment using fully assembled reference applications. Test and verify systems by authoring driving scenarios using synthetic sensor models. Use automated driving-specific visualizations. Plan driving paths by designing and using vehicle cost maps, and motion-planning algorithms. Reduce the engineering effort needed to comply with ISO 26262. Automatically generate C code for rapid prototyping and HIL testing using code generation products.

Gyula Mester, Full Professor, Ph.D., received his D. Sc. Degree in Engineering from the University of Novi Sad in 1977, author of 304 research papers, the number of citations 3147, h-index = 41, g-index = 47, author of the chapters in 4 Springer monographs. His professional activities contain different fields of robotics and intelligent systems, unmanned autonomous systems, self-driving cars, flying cars, autonomous mobile robots, industrial robots, smart cities, citation analysis, scientometrics. Gyula Mester is a member of the Editorial Boards/Associate Editorship of 21 and invited reviewer for 31 scientific journals. He was 30 times plenary, keynote, invited lecturer and he participated in organizing the 54 international conferences. He is the supervisor for 3 Ph.D. students at the Doctoral School on Safety and Security Sciences at the Óbudai University, Budapest. He was the supervisor, external examiner of 22 Ph.D. Thesis. Gyula Mester was elected the Man of the Year 1997 and 2011 by the American Biographical Institute. He is a member of the Public Body of the Hungarian Academy of Sciences. Since 2013, he is a full member of the Hungarian Academy of Engineering. Since 2019 he is a Full Member of the American Romanian Academy of Arts and Sciences and the Member of the World Academy of Science, Engineering, and Technology WASET. Since 1994 he is a member of the New York Academy of Sciences, His CV was published in the Marquis 'Who's Who in the World 1997'.

**Section 2,
Cyber Security of Critical Infrastructure**

CLOUD OF THINGS SOLUTION IN CRITICAL INFRASTRUCTURES

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Abstract:

IoT devices and cloud solutions connected to them, collectively known as the Cloud of Things, are becoming increasingly common in critical infrastructures. These solutions bring many benefits, but as in any other sector, whether private or public, there are also many risks associated with systems and services developed with CoT solutions.

In this manuscript, the author examines the potential services provided by these solutions and analyses the risks and threats they pose. In order to achieve the best results, the author analyses the relevant literature and professional reports to draw conclusions about critical infrastructures and the critical information infrastructures that support them.

BYOD SECURITY CHALLENGES IN THE TIMES OF LOCKDOWN

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Abstract:

Throughout the last months of 2019 and the first months of 2021, our world has changed greatly. The usage and acceptance of working in a home office have risen to levels never seen before. Large numbers of employees had to develop new skills and use methods to keep up the level of work while working from distance. While the idea of a home office and distant working was introduced in many fields of the economy before, this scenario was something new for most of the firms and peculiar. In this paper, I use a literature review and my advisor's and my earlier research results to describe the new and rising risks of the usage of self-owned smart devices (BYOD) in the home office.

CYBER SECURITY IN THE FINANCIAL SECTOR

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Abstract:

Trust, big money, confidential data, non-stop working - just a few words that come into one's mind when picturing banks and insurance companies. Over the years, an enormous amount of studies have been addressed the issue of cyber security in general, however, less attention has been paid to the security solutions of the financial sector.

The aim of this study is to describe the current sector-specific cyber threats and examine the widely used answers of the financial sector. A reasonably comprehensive overview of the recently applied security solutions is being provided while business secrets are

A NEW APPROACH TO INFORMATION SECURITY AUDITING IN THE PUBLIC ADMINISTRATION

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Abstract:

Due to the rapid pace of globalization and digitalization and the better usage of ICT technology, cybercrime is also rising. Hence, controlling and auditing information systems' secure operation is fundamental in both the private and public sectors. It is generally accepted in the private sector that companies seek an independent third-party's assistance to carry out information security audits. However, how do information security audits work in public administration?

**Section 3,
Physical Protection of Critical Infrastructure**

POST-BREAKAGE SAFETY LEVELS FOR GLASS STRUCTURES - AN EXPERIMENTAL STUDY

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Assistant Professor at University of Trieste, Department of Engineering and Architecture, Italy, where she is the principal instructor for the course of 'Structural Analysis'. PhD degree in 2012, since 2009 she is involved in international research projects and European networks (JRC-ERNICIP, NATO-SPS, COST, etc.). Editorial board member for ISI international journals.

"Top Scientist" in 2019 (Stanford 2020), "Top Italian Scientist (TIS) since 2021, she collected several research grants and awards ("Buildings 2020 Young Investigator Award", etc.)

Abstract:

The post-breakage performance assessment of structural glass systems is a crucial aspect of design, with direct consequences on safety levels for customers. In this study, a multi-performance approach is taken into account for safety level estimates, with the support of a case-study pedestrian system made of laminated glass. Based on experimental measurements and numerical simulations for fractured components of the examined walkway, the attention is focused on the characterization and quantification of mechanical parameters for the post-fracture stage. The attention is then focused on typical performance indicators, such as ultimate resistance, serviceability deformations and vibrations under walking occupants. The comparative analysis of performance indicators is thus discussed with respect to mechanical parameters and performances, as well as residual safety levels for pedestrians. The use of simplified equivalent parameters is then discussed to realistically account for post-breakage capacities.

HUMAN-ROBOT COLLABORATION IN MANUFACTURING

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Abstract:

Over years, the concept of human-machine interaction has received new trends in the field of industrial and service robotics as a part of the strategy Industry 4.0 in order to achieve hybrid automation in manufacturing. The requirement of flexibility, adaptability, obedience to humans and safety in the workspace of Human-Robot makes the design of these systems a complex and prone to error process. The main goal of this research is to design and build up a collaborative environment where safety would be a major purpose. This paper explores the technological development in virtual reality for testing and validation thus easing the design of complex HRC systems. The simulation of creating a virtual robot included the estimating of the human-robot cycle times, developing process-plan, layout optimization and real robot control program.

DISSIMILAR ULTRASONIC SPOT WELDING WITH COPPER AND AUSTENITE STAINLESS STEEL

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Abstract:

Welding of various materials has always been a major challenge in manufacturing technologies, and over time, a few procedures have become widespread to perform these tasks, which have had positive and negative effects on the bonding zone. The ultrasonic process is an excellent way to carry out this process, for example, due to its easy handling and smaller heat-affected zone.

The process is occurring more and more common in industrial applications. Nowadays, it is most commonly used for joining/manufacturing plastics, batteries, and cable ends and cables. In these cases, the possibility of combining different metals, which can be easily applied within certain frameworks by the ultrasonic welding process, is a common problem. There have been several attempts in the technology to weld different materials, but still, there are a lot of open questions and research areas. In our experiments we combined an X5CrNi18-10 type stainless steel and a pure (99.5%) copper plate, in these experiments we observed interesting results during the heat transfer of the metal, some heat concentration points appeared. To earn suitable results and find a relationship between the ultrasonic welding effect and the heat concentration cause it needs several investigations.

Overall, it can conclude that the understanding of ultrasonic welding effects several questions while suggesting new test areas that are worth investigating further.

OPTIMIZED BRAKING ASSISTANT TO REDUCE THE EFFECT OF THE REAR-END COLLISIONS

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Abstract:

Owing to the urbanization and the significant increment of the number of vehicles results in fully crowded roads. The impatient, careless and uptight behaviour of the drivers generates a growing tendency for the rear-end collision. The effects of the rear-end accident are influenced by the difference in the kinematics energy of the participant vehicles. According to this energy dissimilarity, the most common injured bodyworks of the vehicles will be divided into three main groups in this study.

The personal injuries of an accident can be reduced, with the decreasing of the impact caused by acceleration and deceleration of the participant vehicles. The distinction is made between the active and passive safety systems of the vehicles whiches are suiting to reduce the effect of the collisions. However, some technical solutions combine the features them resulting in an integrated safety system and working on the principle of the natural protection reflex. When the radars in the rear-end bumper detect the possibility of the real impact, it blocks the wheel by activating the brakes with helping of the brake assistant. Owing to this, the front vehicles won't be loaded by suddenly acceleration impact force results in reducing personal injury effect. Furthermore, with the blocking brakes, the secondary impact by the third vehicle can be avoided.

The prevention safety system provides a higher safety level for the front vehicle's occupants, however, in accordance with the law of energy conservation a significant part of impact energy will be converted into bodywork deformation and declaration of the back vehicles. The aim of our research is to create a technical solution that can bring not only the passengers of one vehicle but all participants in the transport to enhanced safety.

The investigation is about an optimized prevention safety system based on the operation of the brake assistant. With our technical suggestion, serious bodily injuries and fractures can be avoided and the risk of serious personal injury in the rear vehicle can be significantly reduced.

ADVANCED MATERIALS FOR ELECTROMAGNETIC SHIELDING**Mariam Shbanah**

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Abstract:

A shield is coated with Faraday fabric to completely block the signals and insert a device in it to block the signals of tracking, hacking, and sometimes to protect EMP. Therefore, I studied electromagnetic shielding to design and prepare useful and new composite materials that we can use to protect different types of electronic devices because of the electromagnetic radiation and radiation coming from other electronic units in the environment. EMI shielding is found in all modern vehicles, so engineers use metals because they are excellent electrical conductors and can absorb, reflect and transmit electromagnetic interference. The rapid advancement in compact mobile electronic and telecommunication devices has caused serious electromagnetic interference issues, such as malfunctioning for devices data loss or data misinterpretation due to the strong electromagnetic induction effect in proximity. These highly integrated devices demand EMI shielding materials with lightweight, easy processability, and minimal thickness along with improved shielding efficiency. Generally, efficient EMI shielding materials require high electrical conductivity. However, the most used conducting non-magnetic shielding materials, such as metals and carbon-based nanomaterials. The analysis stage includes establishing the shielding demands and studying the properties of the materials that can be used to build the shield. For instance, polymer nanocomposites give effective shielding. These materials have optical, electrical, thermal, and mechanical properties. Therefore, we can obtain many benefits compared to other materials. In addition, the materials that will be chosen to have a very good advantage in creating a functional shield for a specific application. In this research, I studied composite technology and production methods. Define the mechanical properties requirements on the base of the loads and prepare a mechanical model for the planned Faraday cage. I have studied the Faraday cage properties, how it works, the best material for good shielding, and the material that gives us perfect protection. The material that I have used is conductive. The stiffness of the conclusive material is defined by the volume of the fiber of the Lamina. In addition to that, the properties are going to be determined by how much of each material will be used and the fiber volume fraction, and this fiber volume fraction is essentially the volume of the fibers over the total volume of the laminate. Plies are stacked together at different angles to create a Laminate. Each lamina is stacked at different angles to the laminate coordinate system. For instance, we may have laminate and we have some plies that are positive and negative 45 degrees some 90 degrees. Several types of material are good for electromagnetic shielings like ferromagnetic material, ferrite material, and superconducting material. I have chosen the material that I used for the Faraday cage. Therefore, I chose composite material, which is copper mesh and polymer and the second material that I used is aluminium. I designed a composite model and I tested sample preparation and mechanical properties and the final stage is the Implementation of a Faraday cage and EMI tests and control of the effect. Based on the test results, modification, and development.

**Section 4,
Political Security of Critical Infrastructure**

AL-SHABAAB'S ATTACKS AGAINST KENYAN CRITICAL INFRASTRUCTURES

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Abstract:

Since the 2011 incursion of Kenyan troops into Somalia, security has deteriorated significantly in Kenya, exposing the vulnerability of the country's soft targets on several occasions. In my presentation, I examine al-Shabaab's attacks on critical infrastructure in Kenya with special emphasis on the communications, transportation and energy sectors. As the northeast is most affected by terrorist activities, I begin with a historical account of the area and then move on to identifying the sixteen critical infrastructure sectors. In the next sections, recent attacks on communication masts, buses and aircrafts are analyzed as well as potential attacks on oil pipelines are taken into consideration. I argue that attacks against critical infrastructure have demonstrated that al-Shabaab is working towards causing a rift between locals living mainly in the northeast and the Kenyan government. Besides, due to the strategic importance and vulnerabilities of energy resources, it is crucial to protect oil pipelines in Kenya from potential al-Shabaab attacks.

PROTECTION AGAINST THE ATTACKS ON TURKISH CRITICAL INFRASTRUCTURE

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Abstract:

Turkey lies in a crucial geographic and geopolitical region. That is why the country must protect its infrastructure, because it affects not only its internal safety but also the safety and stability of the whole region. A problem in Turkey can cause a domino effect that can cause trouble in whole Europe. (Consider for example the migrant crowds in Turkey who are taken care of by the Turkish government but who are heading to Europe.) So what is the critical infrastructure that Turkey have to protect? How does the country protect the critical infrastructure against terrorist attacks? How does the structure of the Turkish military industry and military institutes as part of the critical infrastructure look like? What kind of attacks does the Turkish government face against its military infrastructure?

Keywords: Turkey, critical infrastructure, military industry, terror attacks

IDENTIFICATION AND AUTHENTICATION POTENTIALS BASED ON LIMITED BIOMETRIC DATA

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Abstract:

Primary template acquisition is a key element in the success of biometric authentication and identification. During the years and several waves of the pandemic in 2020 and 2021, we witnessed an increased necessity to examine how we may determine the identity of a person based on very few biometric features. In other words, while most of the face is covered with a facemask, hands are dressed in gloves, characteristic body movement is hidden under protective gear, plus detectors are forbidden to touch, we are encountered with multiple technological challenges in executing a successful identification or authentication procedure. Institutions of critical infrastructure, such as hospitals or military bases need a solution to this problem, since identifying the staff or patients with assurance must happen without the removal of personal protective gear. In my presentation, I examine and offer potential solutions based on a theoretical analysis.

Keywords: biometric identification and authentication with limited data amount, pandemic, template acquisition

THE EFFECTS OF ONLINE HIGHER EDUCATIONAL OPERATION ON STUDENTS AND PROFESSORS: THE PRESENTATION OF THE RESULTS OF A QUANTITATIVE

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Abstract:

The years 2020 and 2021 have inseparably been welded with health, social and educational challenges induced by the COVID-19 pandemic on both domestic and international fields. In Hungary, emergency distant digital education was executed for the longest period at tertiary level in the education system. The students and professors of the Faculty of Law Enforcement at the University of Public Service in Hungary represent a unique segment of the population of higher education, as both tutors and students were commanded to serve duty at border crossing points or institutions of critical infrastructure, such as hospitals. The presenters, Gabriella Simon Dr. Ürmösné, Head of Department for Foreign Languages for Specific Purposes, and Éva Kovács, language teacher and doctoral student discovered in their research how students and professors handled online learning and teaching at their faculty. This presentation demonstrates the survey conducted at the faculty in the spring semester in 2021, where the attitudes towards general professional online and specific language of law enforcement teaching were mapped, regarding both students and professors. This two-faced approach to attitude measurement is unique in this research field. We asked and answered questions, set up hypotheses regarding positive and negative incoming opinions. To what extent do our conclusions differ from those drawn in other national and international research results? Putting our survey in a broader context, we have found the answers which we present.

IMPACTS OF THE SARS-COV-2 PANDEMIC ON HEALTHCARE IT OPERATION AND DATA SECURITY

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Abstract:

The SARS-CoV-2 pandemic is having a significant impact on conventional health practices to date. The focus is on the man in care, the citizen. The range of personal health data appearing in inpatient care processes is among the special personal data. Healthcare providers must handle this data in the legitimate interest. The data is typically processed in digitized form, supported by computer systems. Applying the principle of necessary and sufficient data access, we need to make the necessary platforms available to actors. The possibility of secure data manipulation must be implemented. In our study, we review the changes that can be associated with the processing of digitally processed personal health data. We pay special attention to the security awareness attitudes of the actors on the user and operator side, and their effects on data security indicators.

Keywords: Critical Infrastructure, Data security, EESZT, Patient safety, SARS-CoV-2, Special data

Poster Session

IDENTIFICATION AND RECOVERY OF LI AND MN FROM RESIDUAL SOLUTION USED TO RECOVER USEFUL METALS FROM SPENT LI-ION BATTERIES**Irina Gabriela Scarlat, PhD**

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Ana Vasile, PhD

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Abstract:

Li-ion batteries are in the spotlight for manufacturers of phones, tablets, laptops, camcorders, and electric vehicles. Starting in 1991, Sony launched the first Li-ion batteries, which have since been continuously diversified (LiCoO₂ / LCO, LiMn₂O₄ / LMO, LiNiMnCoO₂ or NMC, LiFePO₄ / LFP, LiNiCoAlO₂ / NCA and Li₄Ti₅O₁₂ / LTO). In 2018, the amount of batteries, which reached recycling, was estimated at 97,000 tons; over 67,000 tons were processed in China and 18,000 tons in South Korea. More than 14,000 tons of cobalt (the equivalent of more than 10 percent of mining extraction) were obtained from these Li-ion batteries. From Li-ion batteries, we can recover in addition to Cobalt (whose content continues to decrease in active paste, being replaced by Ni and Ti) lithium salts, composed of manganese, nickel, titanium. The tests performed in the Hydrometallurgy laboratory of the Faculty of Materials Science and Engineering within the Polytechnic University of Bucharest, seek to develop cheap and ecological technologies for recovering useful metals from used Li-ion batteries. For the recovery of the active paste from the aluminium cathode, the ultrasonic method was chosen in citric, acetic, or lactic acid medium. The present paper presents the results obtained by identifying the metals from the residual solutions resulting from the process of ultrasonic recovery in acid medium of the cathodic paste (with Co, Ni content) from used Li-ion batteries. The instruments used for this purpose were Waters Ion Chromatographs (with conductivity detector) and the specific column for cations.

SOME CHARACTERISTICS OF THE SECURITY SYSTEM OF BOSNIA AND HERZEGOVINA (BIH): THE CREATORS OF CRITICAL INFRASTRUCTURE PROTECTION POLICY

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Abstract:

Critical infrastructure protection (CIP) is national interest and a constituent of security policy in European Union (EU) Member States. Achieving and implementing of common standards from CIP policy is main goal and open question for national security systems in countries which are candidates for membership such as Western Balkan state Bosnia and Herzegovina (BIH). BIH is composed of two entities and one district, with an extremely complex security system in which the overlapping of competencies between state and entity bodies causes major problems. The paper strives to identify institutions, actions and legal provisions on each level of authority in BIH, which are called to establish unique framework for CIP. There is no determination of CI on the state level in BIH, but function of security is responsibility of the entities also. Afterwards, situation in one of the entities, Federation of Bosnia and Herzegovina (FBiH), as well as in Brčko District of BIH is shaped by absence of unique determination and specific law for CIP. Nevertheless, one entity has made the step forward regarding incorporation of EU provisions governing CIP. In July 2019, the National Assembly of the Republika Srpska adopted the “Law on Security of Critical Infrastructures of Republika Srpska,”. There is practical need for harmonization of CI sectors, standards for risk assessment and overall CIP within the state.

CURRENT ADVANCES OF ULTRASOUND DIAGNOSIS TECHNOLOGY ON SPORTS INJURY DETECTION AND HEALTH PROTECTION

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Abstract:

Ultrasound as a medical diagnosis tool, comprising the strengths of noninvasive, portable and cost-effective, and it allows assessment of soft tissue pathology. Through previous related studies, we found that sonography technology is used for the detection and prevention of injuries of upper and lower limbs, mainly including elbow, shoulder, knee and ankle joints in the sports medicine fields.

In terms of ultrasound evaluation of the upper-limb sports injuries, this technology could be used for the diagnosis of lateral epicondylitis, providing the information of the severity of disease. Specifically, tendon compressibility and compressibility of intra-tendinous vessels are identified as the main factors for the sonographic assessment of lateral epicondylitis. Besides, sonography was also an effective imaging tool for shoulder subacromial bursitis injections and aspirations. In terms of lower-limb sports injuries, studies has demonstrated that ultrasound can offer the real time monitoring regarding the muscle injury healing by visualizing the change of echogenicity and perimysium in the injured muscles. In addition, with the help of ultrasound, any alteration in blood flow or echogenicity can be depicted so as to determine the possible tendon injuries. Although the ligament has a similar histology with the tendon, their ultrasound may usually present opposite echogenicity (hyper-echoic for the tendon while hypo-echoic for the ligament). In addition, for some deep or intra-articular ligaments, it may not possible for ultrasound to provide direct evaluation due to the physical obstacle. Nevertheless, ligaments around knee and ankle joints were the focus for previous studies regarding the ultrasound examination of lower-limb sports injuries.

Overall, sonographic image evaluation is a reliable and handy method for initial examination of acute or chronic sports injuries. Most muscle injuries can be assessed and graded using ultrasound apparatus. Nevertheless, diversified tools, such as magnetic resonance imaging, should be combined together for further and comprehensive sports injury assessment and health management.

Key words: Ultrasound; Sports; Injury Detection; Health

APPLICATION OF TRACKLESS DIGITAL TECHNOLOGY IN THE SPECIALIZED STRENGTH TRAINING OF PARA SNOWBOARD ATHLETES

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Abstract:

The 4-week special strength training based on the trackless digital training system can promote the improvement of the special strength quality indicators of the male athletes of the Chinese National Paralympic Snowboard Team during the starting movement. Especially for UL-level athletes, the peak/average power and peak/average speed indicators for the centripetal phase of the “door sliding” action have been significantly improved, and the load of the athletes to complete the action is significantly higher than before the special strength training. The secondary-developed trackless digital training system can meet the personalized training needs and digital load monitoring of different disability levels of disabled athletes, and effectively reduce the risk of injury caused by training. However, due to the limitations of the sample size of the subjects and the short training period in this study, whether the trackless digital training system can replace the traditional weight equipment and be applied to the special training of athletes in winter sports for the disabled requires further in-depth research.

Keywords: full dimension, servo drive technology, training system, Para snowboarder

LORAWAN NETWORKS TEST ASPECTS OF CRITICAL INFRASTRUCTURES

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Abstract:

IoT technologies are increasingly being used for critical infrastructures as well. One of the most frequently used IoT communication technology is LoRaWAN. The technology provides opportunities for developing long-range, low-power systems. Due to the robustness of communication, this is specifically suitable for providing stable communication with extreme terrain and environmental parameters. Our research aims to determine the data transmission distance for different LoRaWAN communication modules and gateways. In addition, our goals include the examination of communication parameters. Based on the measurement results, we improve the cases where LoRaWAN technology can be used in the critical infrastructure aspect.

CHALLENGES IN INFOTAINMENT SYSTEM DEVELOPMENT FOR AUTONOMOUS VEHICLES

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Abstract:

This poster outlines the development challenges of the autonomous road vehicle infotainment systems. The complexity and the performance of the In-Vehicle-Infotainment (IVI) systems are continuously increasing. The road vehicles in series production implement more and more automated driving features. The IVI systems are connected to the automated driving functions and are in interaction with the driver. Also, the IVI systems of autonomous cars will be connected to external communication networks. IVI system malfunctions may have the potential to have effect on the traffic or transportation infrastructures. Compromising the connected IT infrastructure may have the potential to lead to the malfunction of the IVI systems. The future development of autonomous road vehicle IVI systems has to take into account several development aspects to keep up in this complex business, legal and technical environment.

COLLABORATIVE WELDER ROBOT FLEXIBLE SAFETY ZONES DETERMINATION

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Abstract:

Welding is a very important part of industrial works. Unfortunately, the gas metal arc welding (GMAW) establish some unhealthy effects, like smoke, UV light radiation, spattering and heat. These effects cause different health damages. In this research, the authors focus on the UV heath effect and want to determine a flexible safety zone on the base of the limit of the unhealthy UV radiation level. The collaborative robots are working now behind walls, but the walls hinder their movement between the workplaces. When the goal is to tear down the walls and do the moving of the collaborative robots faster, it needs to install virtual walls to assure the human workers' safety.

During the GMAW the UV radiation level depends on the used power and the used shielding gas. The authors wanted the determine a flexible safety zone as a function of the welding parameters focused on the gas chemical composition and the power.

TAXIVITY FOR THE FUTURE

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Abstract:

Based on data gained from behavioural economics experiments carried out by the authors in order to measure willingness to pay taxes, we examined participants' decisions regarding paying taxes. With the extension of the examined sample, we performed an econometrical modelling of tax evasion. Based on the measured data, the typical distribution function types were identified, and estimations of the parameters of the distribution functions were made with mathematical-statistical tools to describe the typical patterns of tax evasion. Based on the measured data, the typical distribution function the gauss distribution characterizes players' behaviour independing on whether wanted/unwanted events took place independently or under certain circumstances. What we should do If well-known mathematics models from game theory don't working. By publishing our results, we can provide explain How do taxpayers think about paying taxes and what is the difference between thinking and decision making? So should we have described participants' choices with a type of the overweight distribution function.

Keywords: behavioural economy, tax evasion, economical model, distribution, (Non-) Cooperation, JEL Classification: 3 codes C72, H26, H30

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