

Mechanization, Automation and Robotics in Mining



Conference Newsletter



WISŁA, 21-23.06.2017

MARG 2017 Conference

Organizers

- AGH University of Science and Technology, Department of Mining, Dressing and Transport Machines, Department of Power Electronics and Energy Control Systems
- The Research and Supervisory Centre of Underground Mining Co. Ltd
- Wrocław University of Technology, Department of Working Machines Engineering and Industrial Vehicles, Technical and Engineering Department
- "Club Paragraph 34" - Association of technical safety
- Cert Partner Co. Ltd

Conference Topics

- Machines Construction and exploitation
- Automation, robotization and informatics in mining
- Underground and open cast mining
- Safety aspects in construction and exploitation of mining machines
- Electronics and power engineering in mining
- Vertical and horizontal transport
- Mechanical processing of minerals

About Conference

Participants submit their work in the form of summaries, then present them during the thematic sessions. Presented papers can be submitted in the form of an article which, after the necessary review, will be published in one of two forms: monothematic monograph or conference materials monograph.

Guidelines for authors are posted on the conference website.

Application

The participants are required to apply via the conference website or sending attached registration form.

Conference website:

www.cbidgp.pl/marg-2017

Important dates

- **07.04.2017** – submission of abstracts
- **08.05.2017** – submission of full text of articles
- **12.06.2017** – deadline for application
- **14.06.2017** – payment for the conference

Conference venue



Hotel STOK in Wisła is located in the heart of Beskid Śląski, in a picturesque Valley of Jawornik. It is a perfect place to admire mountain nature, search for marks of regional history and highlander tradition. Culture lovers shall be satisfied to discover interesting museums, ethnographic exhibition and architectural facilities in Wisła and around. Proximity of the border encourages to make hotel STOK a staging area for trips to Czech Republic and Slovakia. Hotel STOK is the Best place to Rest, escape from stress and restore harmony of mind and body.

www.hotelstok.pl



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Entry word

You hold in your hands newsletter, in which we have included a summary of the International Conference Mechanization, Automation and Robotics in Mining. Its third edition was held in June 2016 in Wisła. Lets remind that the conference is organized since 2009 and the first five editions was called "Problems of safety in the construction and operation of machinery and equipment for underground mining." Our goal is to develop the conference formula by touching important and accurate issues, so in 2014 we have broaden the field of conference about automation and robotics, as crucial problems in the era of the 4th industrial revolution. This is especially important at a time when organizational and financial difficulties occurred in the mining industry. The aim of the MARG Conference is a multilevel presentation of achievements and technological solutions for the development and exploitation of machines and equipment used in mining, with particular emphasis on issues of their safe operation. An important objective of the Conference is to create a neutral forum for discussion to exchange opinions and experiences between research and development institutions, technical supervision authorities, and in particular, producers and end users of mining machinery and equipment. Therefore, an important idea of this conference is the initiative of joining other conferences, related to mining and its mechanization, automation and robotics. The guiding objective is to emphasize the role and development of automation and robotics in mining, which are more developed in other industries, and in mining – due to its specificity – are introduced very slowly and timidly. In 2014, for the first time it was proposed to extend the scope of the conference about the issues related to automation and robotics of mining processes and equipment. It was accepted with understanding, which resulted in application of a large number of papers on these issues. What is more, euRobotics meeting incorporated in the formula of the conference, where numerous guests from the European Union presented their achievements in this field as well as future challenges that must be addressed. Thanks to this approach, conference becomes a place where we can look to the future by observing and creating trends in development of existing and new mining companies in Poland, as well as in the world. We make sure that the conference is a place where crossing the existing barriers in the mining industry is more important than creating them.

MARG Conference is growing, gaining supporters, as can be seen in every year increase in the number of participants and participation of European Commission representative responsible for automation and robotics.

We strongly encourage You to read the Bulletin, in particular report from the previous Conference. We hope that this will allow MARG 2016 conference participants recall positive memories and encourage them to participate again. And for those of You who do not yet know about our Conference let this newsletter be a special form of effective promotion and encouragement. We gathered here some information related to themes of the conference, in particular related to mechanization, automation and robotics mining industry. We believe that reading this Bulletin will encourage readers to propose their own solutions, which They may want to share with us at the next MARG conference in 2017. It will be held in June, in Wisła.

Organizers

SUMMARY OF THE MARG 2016 CONFERENCE



Vast range of topics of International Conference MARG 2016 again surprised the participants. Among 140 participants there were representatives of the government and supervisory authorities, universities and research institutes, machinery industry and mines. Such diversity of the participants guaranteed very interesting and productive discussion.



On the first day of the Conference, all the participants have the opportunity to attend the plenary session, which was entitled **"Prospects for the Polish mining industry"**. In the opening paper Mr. Henryk Paszcza presented the current situation of Polish hard coal mining in terms of conducted restructuring and organizational processes. Especially the issue of coal production, its sales volume and prices on the global markets and in the country. The use of the Mines Restructuration Company SA in transition and taking over of unprofitable mines was an important element to which attention was drawn.

In the next paper Mr. Henryk Karas introduced the prospects for new solutions to ensure security of raw materials supply as well as safe and more effective production of commodities in the EU member states. According to the speaker, such a tool to support these expectations are EU innovative programs (H2020) as well as national programs of the EU countries, which support the development of innovative technologies in the industry. One of these important initiatives are both innovative partnership program in the mineral raw materials (EIP on Raw Materials) and program for the development of robotics (SPARC), launched in 2013. Both of these programs provide many opportunities to implement more efficient and safe methods of raw materials exploitation in Europe. Actions, taken in Poland in 2014, for the development of robotics for underground mining, by partners representing Polish science and industry, allowed to implement vast cooperation at national and EU level. EU program "Digital Europe", announced officially on 19 April 2016, is a further step to organize a number of initiatives in this field at national and European level (Industrie 4.0 in Germany, Smart Industry in the Netherlands and Slovakia, FabbricaIntelligente in Italy, Industrie du Futur, France). Participating in the EU initiative

"Digital Europe" will have a significant impact on "Mine of the Future" program, launched by a number of the world's mining companies (Rio Tinto, Codelco, Boliden, LKAB, BHP). By developing new information technologies, rapid and more efficient data transmission systems, implementing continuous monitoring and ongoing optimization of the production process, we should expect significant progress in the field of mines real time management. Due to the vast range of subject presented in other papers, more information can be found in the monograph published after the conference.

In the second part of the plenary session four papers on various subjects were presented. One summed KGHM ZANAM 50 years.

After the plenary session meeting of the euRobotics Topic Group: Robotics in Mining Association was held. The report is presented on page 11.

Due to the great interest and involvement of the participants the second day of the MARG 2016 Conference was divided in four parallel sessions:

On the last day of the conference the annual session of selected student works was organized. Students of AGH UST in Krakow and Wroclaw University of Technology presented six papers at a very good level, which met with great interest of the Conference participants.

We would like to cordially invite our last year guests as well as all those who could not visit MARG 2016 to attend the next – MARG 2017 – Conference.

- ***The latest requirements in the machinery industry*** (11 papers)
- ***General problems of the mining industry*** (17 papers)
- ***Shaft transport*** (9 papers).
- ***Mechanical processing in the mining industry*** (4 papers)



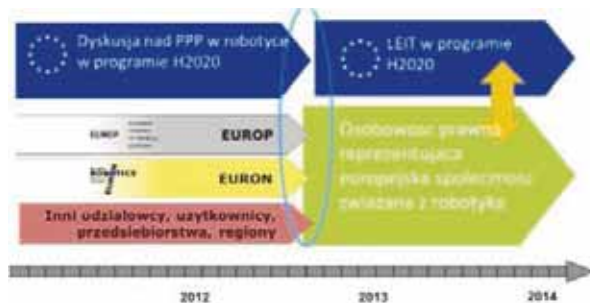
PhD Eng. **Marcin Nawrocki**
Department of Mining, Dressing and Transport Machines

EUROBOTICS - AGH AS THE COORDINATOR OF TOPIC GROUP: MINING



Genesis

Encouraged by the success of EUROP and EURON, two earlier organization representing European industry and European research separately, the European Commission on one side (the “public” side), and European industry and academia on the other (the “private” side), had agreed in early 2012 to launch a Public-Private Partnership (PPP) in Robotics under Horizon 2020, to motivate Europe-based companies take a larger share of the rapidly growing global robotics market.



euRobotics builds upon the success of the European Robotics Technology Platform (EUROP) and the academic network of EURON, and will not only continue the cooperation but will also strengthen the bond between members of these two community driven organizations.

One of the association's main missions is to collaborate with the European Commission (EC) to develop and implement a strategy and a roadmap for research, technological development and innovation in robotics, in view of the launch of the next framework program Horizon 2020. The association has been nurtured by the partners of euRobotics, a Coordination Action funded by the EC under FP7 which started in 2010 and ended in December 2012.

The great success was the announcement of the SPARC initiative on June 3, 2014 during the official opening of AUTOMATION 2014 fair, in Munich. Inauguration was made by the Vice-President of the European Commission, Ms Neelie Kroes.

Role of the association

The partnership leverages more than €700 million of public investments to be allocated through calls for proposals under Horizon 2020, the new EU programme for research and innovation. Each euro of public funding is expected to trigger additional investments of three or more Euro to develop new robotic technologies, products and services which will give European industry a leading position on world markets.

Europe starts from a strong position in robotics, having a 32% of current world markets. Industrial robotics has around one third of the world market, while in the smaller professional service robot market European manufacturers produce 63% of the non-military robots. The European position in the domestic and service robot market represents a market share of 14% and, due to its current size,

this is also a much smaller area of economic activity in Europe than the other two areas.

of approximately €44bn (cumulated over years 2014-2020). Growth rates and market shares are cumulated for the entire robotics domain from industrial, professional (without defense-related applications) and domestic service robotics.

One of the main tasks of the association is to cooperate with European Commission (EC) to develop and implement a strategy and action plan for research, technological development and innovation in the field of robotics, in connection with introduction of the next Horizon 2020 framework program.



The scope of R&D&I is also defined by European social challenges that can be included in robotic technology. SPARC initiative strategy goes hand in hand with these challenges, and maximizes the impact of robotics as the best possible solution. It is important for economic and social interests of Europe, to meet these challenges through an appropriate choice of research and development priorities and innovation. SPARC is dedicated to ensure openness, transparency and fair representation of all stakeholders. It is important to note that SPARC is not laid out for a “closed shop”, but on the contrary will be open to new stakeholders having access to the activities organized and funded under this programme.

Role of AGH University of Science and Technology in euRobotics

In 2014 AGH in Kraków took the initiative to create a new working group within the structures of euRobotics association for the field of mining (Robotics in Mining). The idea of such an action was established during the First International MARG Conference. At that time, Mr. Henryk Karaś presented a paper on the mine of the future and European programs dedicated to this activity. After less than a year, in March 2015, during the European Robotics Forum, TG Mining was officially appointed, and as its coordinator AGH was chosen. In the first year we organized series of meetings for prospective new members of TG Mining. As a result of this activity AGH in Kraków, as a coordinator, defined the Multi Annual Roadmap for the mining industry in coming years, and this document was submitted to the euRobotics association and the European Commission.

On 21-23 March 2016 in the Congress Centre Cankarjev Dom in Ljubljana was held the European Robotics Forum (ERF 2016).



One of the ERF 2016 points was thematic panel: Robotics - The Way to the Mining Future, which was led by PhD Eng. Piotr Kasza - TG Mining Coordinator on behalf of the AGH University.

During the panel the following papers were presented:

- Introduction to Mining TG, AGH UST, Poland
- The outlook for the copper mining robotics – KGHM Polska Miedź, Poland
- Sensing in harsh conditions for dependable robotics, RWTH Aachen, Germany
- Integrating mechanical, mechatronics and telecommunication techniques for application in mining – Wrocław UoT, Poland
- Ultra Wide Band Localization as key enabling technology for Robotics in Mining, LTU, Sweden



The discussion panel, which took place after presenting all the papers, was full of interesting discussions, the result of which was establishing new contacts between research and development agencies, manufacturers and end users of robotic systems that can be implemented in the mining industry.

At the meeting in Ljubljana the general assembly of all members of the euRobotics was held. The work continued on the new statute of the organization and admission of new

members was voted. From Poland the following organizations were accepted:

- Wrocław University of Science and Technology
- Military University of Technology
- KOPEXS.A.
- Industrial Research Institute for Automation and Measurements

Upcoming events

European Robotics Forum, Edinburg 22-24 March 2017 r.

Since 2010, this annual event has quickly become the most influential meeting of the European community of robotics. They meet to discuss topics and contents that have a direct impact on the process of creating plans for robotics in Europe.

This 3-day event is expected to attract over 600 delegates. This audience will comprise researchers, engineers, managers, entrepreneurs, and public and private sector investors in robotics R&D.

The objectives of the forum are to:

- Identify the potential of robotics applications for business, the creation of jobs, and meeting societal needs.
- Discuss the state of the art and most recent breakthroughs in applications.
- Learn about new robotic business opportunities, including those arising through establishment of spin-offs, and ongoing initiatives in robotics within Europe.
- Influence decision makers and strengthen collaboration between stakeholders in the robotics community

During the ERF 2017 in Edinburgh meeting of TG Mining, under the leadership of AGH, will be held. Organizers kindly invite anyone interested in implementation robotics in the mining industry to attend our meeting.

Meeting of Polish euRobotics members associated in the topic group TG Mining during International MARG Conference on 21-23 June 2017 r.

The purpose of the meeting is to continue work on updating the MAR (Multi Annual Roadmap), develop a common strategy for the group's activities in the field of cooperation with European organizations affiliated to euRobotics, and to integrate TG Mining society.

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The article uses materials of euRobotics

SMART MINE

Current situation of underground mining related to shortages of qualified staff and the high cost of work enforces use of new machines and technologies. Thus, in the best interest of mining companies and research and development centers is the idea to develop a concept of "Intelligent mine." The aim of this program is to define the project, full documentation and start running an example of smart mine. This is of course a proposal that should be discussed at various forums in order to find the best solution. The structure of the smart mine, which is based on digitalized management and communications processes, is shown in the scheme below.

Structure of management and communications processes:

1. Machinery, equipment, sensors, people working in the mine
- ↓
2. Communicators and controllers
- ↓
3. Communication networks
- ↓
4. Data processing platforms
- ↓
5. Users interfaces
- ↓
6. External process management

Process management should take place after obtaining the relevant information from the mine excavations through: instant messages, controllers, communication networks, platforms, data processing and user interfaces. This way of collecting information requires efficient communication structure.

The program proposes a two-way approach in order to specificity of different mine excavations of coal and copper, different tasks and costs associated. In principle, scheme described above does not change for different types of mine, except for the basic structure at the minerals extraction level.

Any program based on the concept of "smart mine" should include research and development part, implemented by the Polish universities (research centers), research and development institutes and manufacturers of machinery and equipment, in order to develop:

- design and construction of a hybrid communication system using wireless techniques of data transferring and fiber optics,
 - functionally integrated mining, administrative and business processes management system, from strategic to operational level,
 - mining data acquisition, classification and assessment system in order to apply functions to technological and transport infrastructure,
 - automated mining and transport solutions,
- and the deployment part, implemented by selected mines and research institutes, in order to launch:
- pilot project, in which choice and installation of reliable, configurable and efficient mechatronics systems will be made, to support technology, technical infrastructure (machines) and communication systems, based on the digitization process, tailored to the specific needs of the particular mine,
 - pilot project of fully operational smart mine.

Implementation of these issues will enable introduction of full mechanization, automation and robotics in technological processes related to extraction of useful minerals, while increasing safety and reducing costs at the same time.

Prof. PhD Eng. **Elżbieta Bereś-Pawlik**

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INFORMATION FOR AUTHORS

In order to meet the requirements of the monograph, the Editorial Committee asks authors to follow recommended guidelines when preparing papers for printing:

- Each article should contain data on author(s): name, name of the organization he represents, and e-mail.
- Article should be prepared in electronic form (MS Office Word) and delivered via e-mail **until 08 of May 2017**, e-mail: j.salwierak@cbidgp.pl
- The required size of the article published in the monograph is a **minimally ½ of publishing sheet, or 20 000 characters including drawings (about 12 pages)**. Font: **Arial 11**, single space between lines. Page Setup: standard (margins: 2.5 cm).

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Conditions of the publication:

- sending an article corresponding to the conference range of topics that meets the content (reviewer assessment) and editorial requirements,
- sending "Author Statement" available at: www.cbidgp.pl/marg-2017 to e-mail: j.salwierak@cbidgp.pl

Organizers reserve the right to refuse publication of papers which:

- the content is out of scope of the conference range of topics,
- content does not meet content requirements of scientific publications,
- do not meet formal and editing requirements described above,
- are sent after the deadline for submitting finished papers,
- authors, despite meeting content and formal requirements, fail the obligation to pay the conference fee.



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