

Industry 4.0 and Robotics

SLOVENIAN DIGITAL CENTER
Technology for the People



**I FEEL
SLOVENIA**

INDUSTRY 4.0 AND ROBOTICS

Ljubljana, Slovenia, 2021

SLOVENIAN DIGITAL CENTER
Technology for the People



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The Digital Center of Slovenia - Technology for People is a key business event taking place during the Slovenian Presidency of the European Council. From 27th November to 22nd December, the Digital Center was full of events on the topic of Industry 4.0 and Robotics. More than 30 events were aimed at both general and professional audiences. A rich programme was put together under the auspices of SRIP Factories of the Future and the programme managers from TECOS and Jožef Stefan Institute. An extensive programme was prepared in cooperation with the Ministry of Economic Development and Technology, the Republic of Slovenia, SPIRIT Slovenia, DIH Slovenia and BTC Center Ljubljana, Slovenia.

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PREFACE

In front of you is a brochure summarizing the events that took place during the Slovenian Presidency of the European Council at the Digital Center of Slovenia - Technology for People. The month of December was dedicated to the topics of **Industry 4.0 and Robotics**. In the brochure we briefly present the emerging companies and institutions that actively participated at the events.

Under the auspices of the SRIP Factory of the Future (SRIP FoF), a rich programme of events was put together in cooperation with the Ministry of Economic Development and Technology (MGRT), public agency SPIRIT Slovenia, DIH Slovenia and the company BTC. Among other monthly topics that took place at the Digital Center of Slovenia (smart cities and communities, sustainable society and economy, artificial intelligence, cybersecurity and digitalization), Industry 4.0 and Robotics are of strategic importance for the future development of Slovenia.

The preparation of the programme started with a survey. In the survey, we asked Slovenian companies and institutions what they would like to present to the professional community and the general public and what they would like to hear. On this basis, in cooperation with our partners, we prepared a programme of over 30 events.

The purpose of the programme was to:

- **highlight the main achievements of Slovenian industry**, which are important for further development of Industry 4.0 and robotics, both in Slovenia and in Europe,
- **promote Slovenian knowledge** and achievements and create opportunities for internationalization,
- **bring together relevant stakeholders and knowledge** in order to facilitate collaboration,
- **draw attention to human resources and young talent**, which are crucial for the future development of the industry.

The content of the programme was divided into four sections under the sign of the knowledge triangle.

The first section was dedicated to **creation of business**, where companies presented their unique solutions in this field through short pitches. Some events, also aimed at companies, had an international character with appearances of foreign business associations and international institutions. By organizing business-to-business events, we provided participants with excellent opportunities to share experiences, network and establish new business relationships.

The second section was dedicated to **innovation and technology**, where research institutions, faculties, strategic research and innovation partnerships and European associations were presented. We have organized a congress, the main objective of which was to connect Industry 4.0 and Robotics with smart cities and communities, health and medicine, new materials and the circular economy. In this way, we have created fertile ground for new breakthroughs, particularly in cross-cutting areas that can achieve the greatest commercial impact and contribute positively to the added value by taking into account the elements of the transition to a green economy and a carbon-free society.

The third section was dedicated to **education**. Enthusiasm and career orientation towards engineering and science start in childhood. And this is what the hands-on workshops for children on Saturdays were all about. In their presentations, Slovenian educational and research institutions invited young people to select technical studies and work or study in this field.

At the end of the month, the round tables titled "Industry 4.0 and robotics in transition to green technologies and digital transformation" and "The needs

of industry and how decision makers can support them" were organized. This also concluded our monthly topics on Industry 4.0 and Robotics.

We presented the challenging topics of Industry 4.0 and Robotics in a simple and popular way to raise awareness among the widest possible audience through these events. We organized the events in a hybrid form, by holding them in the Digital Center of Slovenia at BTC Ljubljana, while broadcasting them remotely over the Internet. If you were not able to watch the events live, you can find the recordings on the website of the Digital Center of Slovenia.

Simona Knežević Vernon,
**TECOS, Slovenian Tool and
Die Development Centre**



Asst. Prof. Dr. Igor Kovač,
Jožef Stefan Institute



SLOVENIAN DIGITAL CENTER – TECHNOLOGY FOR THE PEOPLE

Digitalisation, artificial intelligence, robotics, society 5.0, cyber security, innovative technologies, innovations, mobility, energy, smart cities and communities, social sustainability and economy are some of the thematic areas that were presented during the Slovenian Presidency of the Council of EU from July 1st to December 31st 2021 in BTC City Ljubljana at SLOVENIAN DIGITAL CENTER – Technology for the People.

Slovenian Digital Center, the main economic event of the Slovenian Presidency of the Council of the EU, offered companies the opportunity to present innovative and technologically advanced solutions, products and/or services. In addition to the showroom, the event also offered lectures, trainings, conferences, workshops, hackathons, national and international business meetings and networking. As partners of the Slovenian Digital Center, the Slovenian Ministry of Economic Development and Technology, SPIRIT Slovenia, DIH Slovenia and BTC Company jointly pursued one of Slovenia's priorities during its Presidency of the Council of the EU in the second half of 2021, namely "The resilience, recovery and strategic autonomy of the European Union".

The Slovenian Digital Center worked in two dimensions, both physical and virtual. The partners designed a programme that was of interest to different target

groups – entrepreneurs, experts, students and families. In addition, the digital dimension of the Center enabled participating companies to present themselves in the Slovenian pavilion at Expo 2020 Dubai. By the end of November, Slovenian Digital Center reached more than 300,000 people and recorded nearly 58,000 visits to its location in Ljubljana's BTC City and on its online channels. During this period, 110 events were held, where more than 124 companies and organisations presented themselves and successfully addressed the above mentioned topics.

The Slovenian Digital Center inspired, raised awareness and efficiently contributed to the promotion and acceleration of digital transformation in Slovenia. With the Slovenian Digital Center, Slovenian companies, institutions and individuals gained a space where they were able to present their knowledge and achievements to the Slovenian and international public.

This most important economic event of the Slovenian Presidency of the Council of the EU is a unique European example of full-time economy promotion during a Presidency. With its uniqueness, Slovenian Digital Center underlines Slovenia's role on the international map of innovativeness. With the end of the Slovenian Presidency, the Slovenian Digital Center also comes to an end, but it has generated several opportunities for further cooperation. In the virtual dimension, it remains an indicator of exposed Slovenian development and economic progress. The partners strongly believe that the conclusion of the project is an announcement of new examples of cooperation and innovative achievements of Slovenian knowledge and economy.



“ Manufacturing was, is and shall remain the foundation of a strong economy. No other sector can replace it. Without a solid manufacturing base, the service and finance sectors will collapse. ”

Yoram Koren, Distinguished Professor Emeritus, Mechanical Engineering, University of Michigan

Vir: The Global Manufacturing Revolution book



IN BTC CITY LJUBLJANA, WE BRING NEW IDEAS AND TECHNOLOGIES TO LIFE

At BTC, we strive to create an environment where businesses thrive and progress. We believe in the use of technologies that can contribute greatly to economic and social change. In 2021, we have adopted a new development strategy entitled “BTC 5.0: Leading on Quality of Life: Multi-Dimensional Development Strategy for BTC 2021–2025.” With it, we are creating a unique environment for business excellence in our transition to Society 5.0.

Efficient and intelligent use of modern technologies is one of the core values of this strategy. To foster new developments and technological innovations, we offer companies the opportunity to demonstrate their advanced solutions and test their products and services in the real-life test environment of BTC Living Lab. This is an innovative ecosystem that welcomes both startups and large companies, and connects them to create great projects to reach their highest potential.

As a progressive and development-oriented company that supports development, digitalization, and innovation, we are very proud to host the Slovenian Digital Center, which we set up in the heart of BTC City Ljubljana for the period from July to December 2021. Together with our partners – the Ministry of Economic

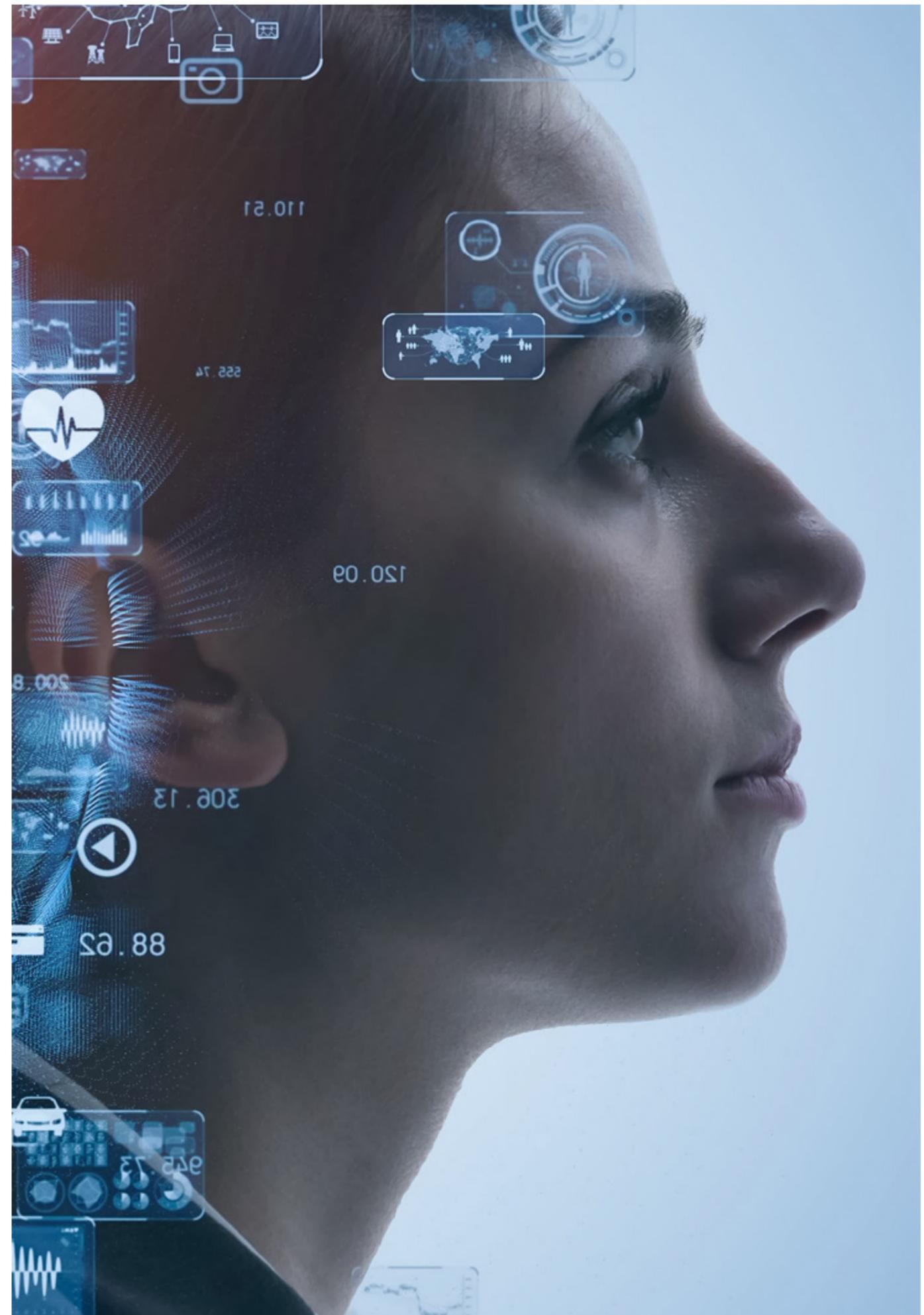
Development and Technology, SPIRIT Slovenia, a public agency, and DIH Slovenia – we hosted numerous events and gave Slovenian companies and organizations the opportunity to present themselves.

The December programme, sponsored by BTC and DIH Slovenia, was focused on Industry 4.0 and robotics. The world of robots and robotics has already marked the business environment of today, and there is no doubt that their added value and development will have an even greater impact on business in the future. Moreover, robots are becoming our companions in households and in the wider social environment. We believe that robotics is an area that will create new professions and jobs of the future. Therefore, we are very pleased to bring it closer to a wider audience at the Slovenian Digital Center.

At BTC, we walk the talk, also in terms of robotics. At our Logistics Center, the transport of goods is carefully monitored and supported by state-of-the-art information and communication technology. The Logistics Center also houses BTC’s first robot. It is an autonomous robotic vehicle that does not require inductive loops, and can move independently in space with the help of sensors and artificial intelligence. This is just one of our steps to bring new ideas and technologies to life in BTC City Ljubljana.

With the Slovenian Digital Center, we have proven that BTC City Ljubljana is truly the right place to test technologies of the future. We will continue to enhance our innovative ecosystem, strengthen the capabilities of our BTC Living Lab, establish IT Hub, and invite global and local players who are developing the most advanced technologies, services, and products – especially those that put people at the forefront and improve the quality of life – into our innovative ecosystem BTC City.

Damjan Kralj, M.Sc.
Chief Executive Officer
BTC, d. d.





Business Creation



YASKAWA

YASKAWA is the proud main Sponsor of the Month of Industry 4.0 and Robotics at Digital Exhibition – Technology for the People, as part of the Slovenian Presidency of the European Council.

Yaskawa started a successful journey in Slovenia in 1990 with a small group of young engineers. In 1996 Yaskawa decided to start an engineering operation in Ribnica, which would act as a solution provider and integrator with Yaskawa robots, supported by a team of 160 devoted employees, including a strong group of over 50 highly-skilled engineers.

The company acts as a supplier of robotics and automation of work processes in the industry. With 30 years of experience in the Slovenian market, countries of former Yugoslavia and all over the EU, we have a wide range of implemented solutions in various fields of automations, always introducing new scientific achievements in the development and production of industrial robotic technologies. That is why Yaskawa

Electric Corporation Japan entrusted us with the design of the first robot factory in Europe. The new Slovenian factory “Yaskawa Europe Robotics” in Kočevje is the first factory that manufactures robots for the needs of the EMEA region.

Production started in November 2018, with 155 highly-skilled employees, with the plan of manufacturing 5,000 robots and reaching approximately 50 mio EUR yearly turnover by 2022. The planned maximum production capacity is up to 10,000 robots per year.

Yaskawa European Robotics is part of the Yaskawa Electric Corporation, a leading robotics manufacturer that produces more than 40,000 industrial robots annually and has over 500,000 industrial robots, 10 million servomotors and 18 million inverter motors involved in various production processes. It is engaged in developing technological solutions for the automotive industry, metal processing, casting industry, food industry, construction, furniture industry, medi-

cine and cosmetics. With a constant implementation of new technologies, four quadrant operating inverter motors, solar and well-balanced energy-saving technologies, all included in the strategy of I cube mechatronics, Yaskawa is putting lots of effort into establishing a clean and sustainable future.

Yaskawa Slovenija is proud to announce that this November, the first robot type Gp20 designed and manufactured in Slovenia was launched onto the market.

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YASKAWA Europe Robotics, d. o. o.
Novomeška cesta 10
1330 Kočevje, Slovenia
ysl-info@yaskawa.eu.com
www.yaskawa.si

YASKAWA





DIH SLOVENIA – ENABLING DIGITAL TRANSFORMATION OF SLOVENIAN SMES

Digital Innovation Hub Slovenia (DIH Slovenia) enables digital transformation on the principle of one-stop-shop, in Slovenia and beyond. We raise awareness and provide services for the growth of digital competencies, exchange of digital experiences and examples of good practice at local, regional and international levels. Last but not least, DIH Slovenia proposes to the government and provides access to data to promote entrepreneurship.

DIH Slovenia is a central national point for providing, connecting and supporting business and technological knowledge, technologies, experimental and pilot environments, best practices, methodologies and other activities necessary to enable Slovenian industry to build digital competencies, model innovations and processes; support their digital transformation and raise their competitive advantages based on digitalisation. We are proud of building cross-sectoral and multidisciplinary partnerships with univer-

sities, research and business institutions, businesses, ICT providers, and business support organizations that represent an ecosystem for sustainable short-term and long-term support for our activities. On the other hand, DIH Slovenia provides connections with investors, facilitates access to financing digital transformation, connects users and providers of digital innovations, and enables synergies between digital and other key technologies.

With the Slovenian Ministry of Economic Development and Technology, SPIRIT Slovenia and BTC company we have designed a programme that is of interest to various target groups – entrepreneurs, expert public, and families. As a partner of the Slovenian Digital Center, we focused on another of the key activities to which we are committed - strengthening the digital competences of individuals, students, employees in Slovenian companies and other vulnerable groups, such as the elderly. Within the 6 monthly topics (July – Smart

cities and communities, August – Sustainable society and economy, September – Artificial intelligence, October – 5G and cyber security, November – digitalisation, December – Industry 4.0 and robotics) we paid special attention to trainings related to monthly topics, brought technology closer to users through practical examples, and inspired young people for the professions of the future.

Although the Slovenian Digital Center project is coming to an end, we believe the discussed topics as part of the accompanying events and the presented accomplishments of Slovenian companies will inspire, raise awareness and efficiently contribute to the encouragement and acceleration of digital transformation in Slovenia. Digitization is full of opportunities. The cooperation, as we managed to realize in the Slovenian Digital Center, is a good way to be even more successful in the realization of the mentioned opportunities in the future.

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Digital Innovation Hub Slovenia
Dimičeva ulica 13
1000 Ljubljana, Slovenia
info@dihslovenia.si
www.dihslovenia.si





INDUSTRY 4.0 AND ROBOTICS IN SLOVENIA - BEST PRACTICE EXAMPLES AND B2B MATCHMAKING WITH AUSTRIA

The event **Industry 4.0 and Robotics in Slovenia - Best Practice Examples and B2B Matchmaking with Austria** was held on the 1st of December 2021 at the Slovenian Digital Center (Ljubljana BTC).

The aim of the event was to present inspiring plenary sessions, best practice examples and targeted 1:1 meetings to establish new business contacts.

In the first part of the event, guest speakers from academia and experts on the topic of Transparency in production, presented an overview of Slovenian Industry 4.0, while the second part was dedicated to the overview of robotics research in Slovenia and examples of good practices from Slovenian companies.

The matchmaking session in the afternoon brought together companies (both buyers and suppliers) from Austria and Slovenia.

The event was a great success and a unique opportunity to generate new business contacts. The event was organized by the Smart Factories Cluster (SRIP Factories of the Future) at the Chamber of Commerce and Industry of Slovenia, Advantage Austria and SPIRIT Slovenia - Public Agency for Entrepreneurship, Internationalization, Foreign Investments and Technology.

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Chamber of Commerce and Industry of Slovenia
Smart Factories Cluster
Dimičeva 13
1000 Ljubljana, Slovenia
andreja.hlisc@gzs.si
www.gzs.si/pametnetovarne/



TECOS, SLOVENIAN TOOL AND DIE DEVELOPMENT CENTRE

TECOS, Slovenian Tool and Die Development Centre was founded in 1994 as a non-profit organisation to represent the collective interests of the Tool, Die & Mould-making and Processing Industries in support of the various manufacturing sectors that serve as key drivers for Slovenian economic development. TECOS was founded by the Government of Slovenia - Ministry for Economy, Chamber of Commerce - GZS and Municipality of Celje and thus has direct access to the most important policy makers in Slovenia.

TECOS today operates on three-dimensional assets, as International Business Cluster, R&D Centre and VET Institution, providing top level services not only for industry but also to all other manufacturing companies in Slovenia. TECOS's R&D focus areas are advanced manufacturing, robotics, nanotechnologies, packaging technologies and advancements for medical, home appliance, automotive and transportation industries.

TECOS operates as competent institutional support of Slovenian Manufacturing Industries in the transfer of this knowledge & technical support services, providing the latest information and advancements on the bioeconomy benefits and prosperous potentials for entering and conquering new global markets.

TECOS is actively promoting knowledge transfer and has till now collaborated in more than 90 National and European projects where we act as R&D partner or industrial association group (IAG). We have a dedicated team of experts to network and transfer innovations to the companies and are a key player in the digitalisation of the Slovenian industry. TECOS is one of four institutions recognised and endorsed by the Slovenian government to implement Industry 4.0 concept to Slovenian companies.

In the educational field TECOS transfers knowledge and innovations to markets, companies, professionals, student population through own developed services, as well as through national and international projects.

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TECOS, Slovenian Tool and Die Development Centre
Kidričeva 25
3000 Celje, Slovenia
info@tecos.si
www.tecos.si





EIT MANUFACTURING – MAKING INNOVATION HAPPEN IN SLOVENIA

This event is dedicated to the presentation of the European Knowledge and Innovation Community **EIT Manufacturing** and its wide range of activities in the so-called knowledge triangle: Innovation, Education and Business Creation.

EIT Manufacturing is supported by the European Institute of Innovation and Technology (EIT) and brings together European manufacturing actors to integrate innovation and education for an entrepreneurial and sustainable Europe.

The event programme focuses on Slovenia's role in the EIT Manufacturing community and how the countries of EIT Regional Innovation Scheme (RIS) including Slovenia can become true game-changers for the European manufacturing industry.

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The University of Ljubljana, Faculty of Mechanical Engineering, acts as a local contact point, a so-called hub for EIT Manufacturing in Slovenia. During the event, representatives of the hub discuss the role of digital and green manufacturing in Slovenia and how EIT Manufacturing contributes to achieving these goals.

EIT Manufacturing brings together a broad network of industrial corporations, universities, and research institutions. During the event, one of its members, the Jožef Stefan Institute, presents itself and its role in the unique pan-European innovation ecosystem of EIT Manufacturing.

To complement the event programme, various initiatives and programmes of EIT Manufacturing to address the industrial transformation are presented under the three pillars: Education, Innovation and Business Creation. These are demonstrated through practical examples and supported projects together with guest speakers from across Europe.

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EIT Manufacturing East GmbH
Christine-Touaillon-Straße 11/29
1220 Wien, Austria
east@eitmanufacturing.eu
www.eitmanufacturing.eu



Co-funded by the European Union



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HUMAN POTENTIALS IN ROBOTICS – ROBOTS ARE ALL ABOUT PEOPLE

The event Human Potentials in Robotics – Robots are All About People was held on the 2nd of December 2021 at the Slovenian Digital Center (Ljubljana BTC).

The focus of the event was mainly on HR challenges in Industry 4.0 and robotics. The event was very diverse, with best practice examples from Slovenian companies, but also an interactive workshop. The main topic was change, as well as in business as with employees. The workshop was held on the topic of motivation for change, while the business aspect of change was presented by Kolektor Digital. The event was concluded with a round table where interesting experts from different fields participated.

There was also a diverse and interesting parallel program at the Slovenian Digital Center where the Elec-

tronic and Electrical Engineering Association promoted careers in electronics, Industry 4.0 and metrology.

A short documentary about the restoration of the 1970s Senster robot was shown.

The event was organized by the Smart Factories Cluster (SRIP Factories of the Future) at the Chamber of Commerce and Industry of Slovenia.

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Smart Factories Cluster
Dimičeva 13
1000 Ljubljana, Slovenia
andreja.hlisc@gzs.si
www.gzs.si/pametnetovarne



Chamber of Commerce and Industry of Slovenia



Strategic Research Innovation Partnership
FACTORIES OF THE FUTURE



FINANCIAL MECHANISMS FOR EFFICIENT IMPLEMENTATION OF INDUSTRY 4.0

The event **Financial Mechanisms for Efficient Implementation of Industry 4.0** was held on the **29th of November 2021** at the Slovenian Digital Center (Ljubljana BTC).

Ms. Sibil Klančar from the Ministry of Economic Development and Technology presented the Recovery and resilience plan for Slovenia with a focus on industry in the context of the green and digital transition. Within the Recovery and resilience plan, we can expect € 1.8 billion available grants and € 666 million loans to be invested until 2026. Interested companies, research institutions and other organizations attended the event with the aim to plan and prepare for the upcoming calls and tenders. The Smart Factories Cluster (SRIP Factories of the Future) at the Chamber of Commerce and Industry of Slovenia will inform its members and help them achieve the best possible results when applying for funding.

The event was organized by the Smart Factories Cluster (SRIP Factories of the Future) at the Chamber of Commerce and Industry of Slovenia.

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Chamber of Commerce and Industry of Slovenia
Smart Factories Cluster
Dimičeva 13
1000 Ljubljana, Slovenia
andreja.hlisc@gzs.si
www.gzs.si/pametnetovarne



INDUSTRY 4.0 AND ROBOTICS – B2B ONLINE MEETING

Company representatives, researchers, solution providers, distributors and other stakeholders in the field of Industry 4.0 and robotics will have an opportunity to meet on 7th and 20th December 2021 at the B2B (Business-2-Business) online meetings at the platform **Industry 4.0 and Robotics bilateral meetings**.

These meetings will allow participants (1) to establish business and/or research contacts with other participants, (2) to present new technologies, products and services, (3) to receive information about the latest trends and (4) to search for other partners to submit proposals for calls together or to form consortiums for application to the calls, etc.

Online meetings present an efficient and time-saving option for participants to find new partners for cooperation, discuss technologies and exchange other relevant information. Each meeting takes up to 20

minutes and both participants can join the meeting from their office at the pre-scheduled time. Registration also allows all participants to showcase their expertise, company details, products, services and technologies, while also emphasizing which types of cooperation they are interested in. Participation at the event is free of charge.

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Jožef Stefan Institute
Center for Technology Transfer and Innovation
Jamova cesta 39
1000 Ljubljana, Slovenia
tehnologije@ijs.si
tehnologije.ijs.si



LET'S INNOVATE THE FUTURE

THE RIGHTS OF INTELLIGENT PEOPLE AND ORGANIZATIONS

The main focus of the lecture 'The rights of intelligent people and organizations' on 7th December 2021 will be the definition of intellectual property rights. **Matej Mrak**, an expert from the Center for Technology Transfer and Innovation at the Jožef Stefan Institute will present patents, models and trademarks more thoroughly with illustrative examples. Recommendations will be given on when to use the aforementioned intellectual property rights to properly protect innovations and technologies.

The largest research organization in Slovenia - the Jožef Stefan Institute - with its research departments and research fields will be presented. While researchers focus on research and development activities, the support they get from the field of intellectual property rights is among several essential activities at the

Center for Technology Transfer and Innovation. Due to diverse and versatile research and development activities at the Institute, many opportunities for cooperation with national and international companies arise. While companies often face different technology challenges, these can, in many cases, be solved with the knowledge and expertise of the researchers from the Institute.

The support to both researchers and companies that the Enterprise Europe Network can offer will be presented. Enterprise Europe Network is the world's largest network that provides support in finding business and/or research partners in more than 60 countries, while also providing assistance for business innovation and advice for international growth. The lecture will emphasize how fields like intellectual property rights, research and development, business networks and cooperation are crucial factors for success in a contemporary world, driven by people and organizations.

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Jožef Stefan Institute
Center for Technology Transfer and Innovation
Jamova cesta 39
1000 Ljubljana, Slovenia
tehnologije@ijs.si
tehnologije.ijs.si



TECHNOLOGY TRANSFER PIPELINE AND WHAT DOES JWP STAND FOR?

The lecture 'Technology transfer pipeline and what does JWP stand for?' on 10th December 2021 will present technology transfer at public research organizations. The lecture will be given by **dr. Marijan Leban** from the Centre for Technology Transfer and Innovation at the Jožef Stefan Institute.

The introduction will be centred around different forms of industrial property and how they are used to protect the interests of all parties involved in research and development activities. Since an important part of research takes place at public research organizations, the focus will also be on the overview of tasks connected to taking over inventions and how the Technology Transfer Offices became a recognized and important partner of researchers when dealing with the questions of intellectual property, technology com-

mercialization, negotiations, entrepreneurship and establishing connections with the business community, in Slovenia as well as internationally.

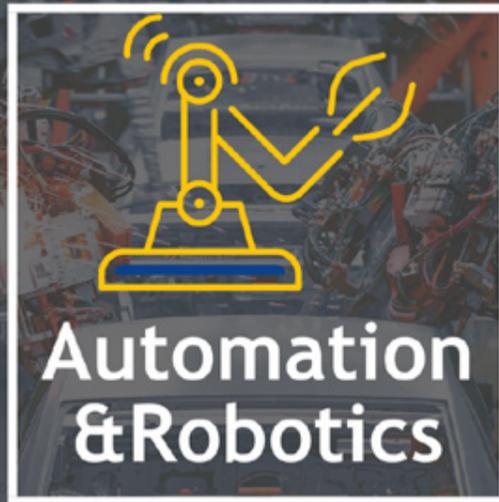
The technology transfer pipeline will be explained in more detail, as well as how experts at the Centre for Technology Transfer and Innovation make assessments of the potential a specific technology has. This part will provide an answer to the central question from the title of the lecture.

The Jožef Stefan Institute with its many fields of research provides a plethora of options for cooperation with the researchers, especially regarding the challenges companies encounter in their production, business or other processes. As experience showed, researchers sometimes also decide to establish a company that is closely connected to the public research organization from which it originates (spin-off company).

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Jožef Stefan Institute
Center for Technology Transfer and Innovation
Jamova cesta 39
1000 Ljubljana, Slovenia
tehnologije@ijs.si
tehnologije.ijs.si





CENTRAL EUROPE UPSTREAMS ADVANCED MANUFACTURING & INDUSTRY 4.0 TOWARDS 2030

Slovenia strives for excellence in policy making on Industry 4.0/Advanced Manufacturing in Central Europe.

Definitely expected, considering average **Digital Readiness Level 2** for Slovenian **SMEs**, we need to address policy stakeholders to co-develop an ecosystem of support that will boost digital transition of the industry with a special attention to 4 CAMI topics: **Automation and Robotics, Artificial Intelligence, New & Smart Materials** and **Intelligent Production Systems**.

Pomurje Technology Park and the consortium of CEUP 2030 project partners address very same upstreaming needs of the industry sector to raise new technologies **common understanding** among triple-helix partners, and at the same time looking for policy alignment among regions/countries.

We bring to Slovenia the perspectives of other EU regions and practices of the upstreaming process (based on **use cases/best practices**), all designed to meet the challenges & needs of high-quality **innovation**, to overcome the lacks in insufficient cooperation and innovation structure and to realize **added-value** at a policy-level, unleashing the competitive potential of **connected transnational** regions.

The conference is a unique opportunity to get information about the innovations in the field of industry 4.0 and advanced technologies offered by Slovenia as well as getting insights to **transfer good practices from abroad for decision-makers** trying to find the best solutions to overcome challenges we face in Slovenia. That way Pomurje Technology Park in association with the **CEUP2030** project's consortium contributes to faster adoption of novel technol-

ogies and supporting measures to reach **excellence in Industry 4.0**.

Target: set a **unique innovation system** approach for regional & transnational policy making with high practical relevance for the 30 participating CE/EU regions (robust strategies with a quick start & with transnational value).

BUSINESS CARD

Pomurje Technology Park, d. o. o.
Plese 9a
9000 Murska Sobota, Slovenia
info@p-tech.si
www.interreg-central.eu/Content.Node/CEUP-2030.html

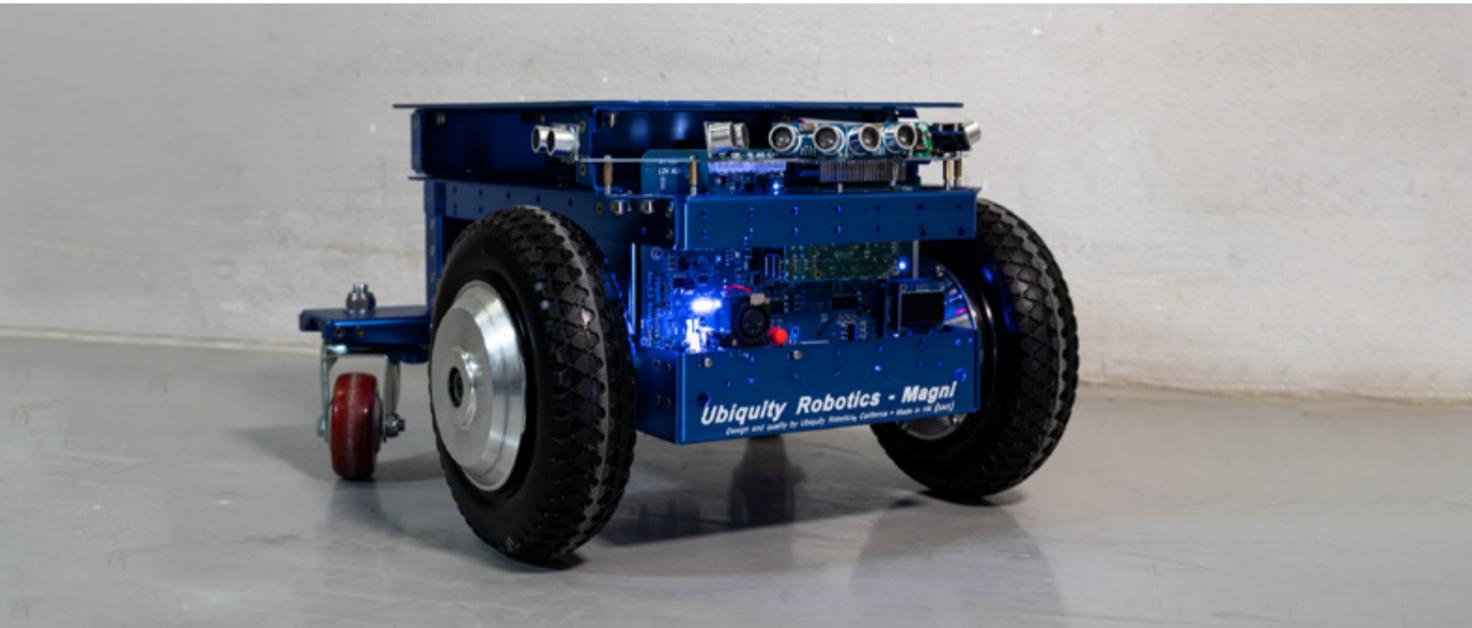


Business Creation

Company Pitches

Companies in Slovenia and in the region need to enhance their competitiveness and economic performance also by implementing new production and control systems. The Center for Technology Transfer and Innovation at the Jožef Stefan Institute organised pitch presentations of selected leading Slovenian companies that offer their services and products in the field of Industry 4.0 and Robotics. The aim was a condensed presentation of knowledge, expertise, products and services available in the field of Industry 4.0 and Robotics to the companies in the region.

The following companies presented themselves: YASKAWA, UBIQUITY ROBOTICS, ELVEZ, COMPETENCE CENTER ROBOFLEX, GOAP, AXIOM TECH, AVASTAR AUTOMATION, PODKRIŽNIK, VIRS, MIEL, KOLEKTOR SISTEH, INEL, ETRA, PLASMADIS, FANUC, INEA RBT and EPILOG.



UBIQUITY ROBOTICS

With customers on almost every continent, Ubiquity Robotics is a global leader in mobile robotic platforms that can be deployed for a variety of applications. The company recently won the Silicon Valley Robotics Award for excellence in robotics commercialization. Our motto is "Enable universal robotics service". One of the difficult problems in starting your robotics application is mobility - how does the robot know where it is and where to go next? We have solved this problem for you. We specialize in mobility, navigation and localization. We also offer custom hardware development, mechanical design, custom software solutions and production cost optimization.

BUSINESS CARD

Ubiquity Robotics, d. o. o.
Razgledna cesta 19
4260 Bled, Slovenia
contact@ubiquityrobotics.com
www.ubiquityrobotics.com

Ubiquity Robotics

ELVEZ

ELVEZ, d. o. o., (SME), is a family-owned company, manufacturer of specialized products for the automotive industry, electrical and mechanical engineering and white goods manufacturers. The excellence of their products and services, continuous improvement and development of know-how, as well as good relations with all stakeholders are the company's baselines. During their corporate history they have grown, developed and maintained competitiveness, implemented their strategic goals and were always dedicated to their mission and vision statement. Their employees are constantly engaged in the development and implementation of innovative and flexible solutions to meet an outstanding quality and the highest customer satisfaction, both of which are the foundation for long-term relationships.

ELVEZ`s core activity is manufacturing. A combination of three manufacturing programs allows them to provide a full service to their customers.

They are specialized for the production and manufacturing of cable harnesses, cable sets/accessories and wiring, various power cords, cable sets with a sensor-aided technique, injection moulding of technical plastic parts, aluminium metallisation of technical plastic parts with state-of-the-art physical vapor deposition (PVD) with a vertical coating machine and assembly (fitting) of various complexes and links for the industry.

BUSINESS CARD

ELVEZ, manufacture of cable harnesses and processing of plastic, d. o. o.
Ulica Antona Tomšiča 35
1294 Višnja Gora, Slovenia
info@elvez.si
www.elvez.si





COMPETENCE CENTER ROBOFLEX (CCR)

CCR is a regional competence center for the industrial use of collaborative robots, smart manufacturing applications, and systems. It is a non-profit private partner organization established by:

- **LENS Living Lab®** - international virtual living laboratory specialized in digitalization and management of virtual, spatial scattered industry research-innovation communities, operations, and test-beds,
- **ETRA Ltd.** - specialized in robotic systems integration, industry automatization, and development of industry customized innovative solutions, and
- **TCS** - Toolmakers Cluster of Slovenia (TCS) - the network of technology advanced manufacturing companies and their development partners; specialized in providing project office services.

CCR is one of the EU-wide networks of competence centers that act as the heart of the Digital Innovation Hubs (DIHs), established in 2017 under the partnership research and innovation project HORSE, funded

by the EU program HORIZON 2020. CCR is at the heart of the regional Digital Innovation Hub DIG-ITECH SI-EAST – the network of regional and international innovation partners specializing in digitalization and smart industry applications.

CCR focuses on manufacturing industry workplaces and innovative use of collaborative robots, augmenting reality and other technologies, as an integral part of digitalized smart manufacturing.

CCR provides one-stop-shop services of the regional INFO Center, demonstration center, innovation office, and project office services.

Target industry sectors are automotive, toolmaking, machine industry, maintenance, and logistics. Target markets are EU and other countries.

BUSINESS CARD

Competence Center ROBOFLEX
Zavod C-TCS Celje
Kidričeva 25
3000 Celje, Slovenia
info@toolscluster.net
www.toolscluster.net



GOAP

GOAP has many years of experience in automation projects and a proven track record in the successful implementation of automation systems on 50% of the biggest and most luxurious cruise ships in the world. In 30 years, GOAP has completed over 70 process automation projects in the steel industry and equipped more than 100 cruise ships with its innovative HVAC system. In 2014, GOAP launched the Qubino brand, which consists of a range of innovative smart home products that bring new experiences, fun, and luxury to every home worldwide. Today, Qubino home automation solutions are present in more than 65 countries.

One of GOAP's main pillars is innovation, which is why the company works closely with the largest universities and research laboratories in Slovenia. GOAP has also received several awards for its innovations. In the home automation market, the unique position of the Qubino brand is based on certified products manufactured in the EU. Among the 16 products,

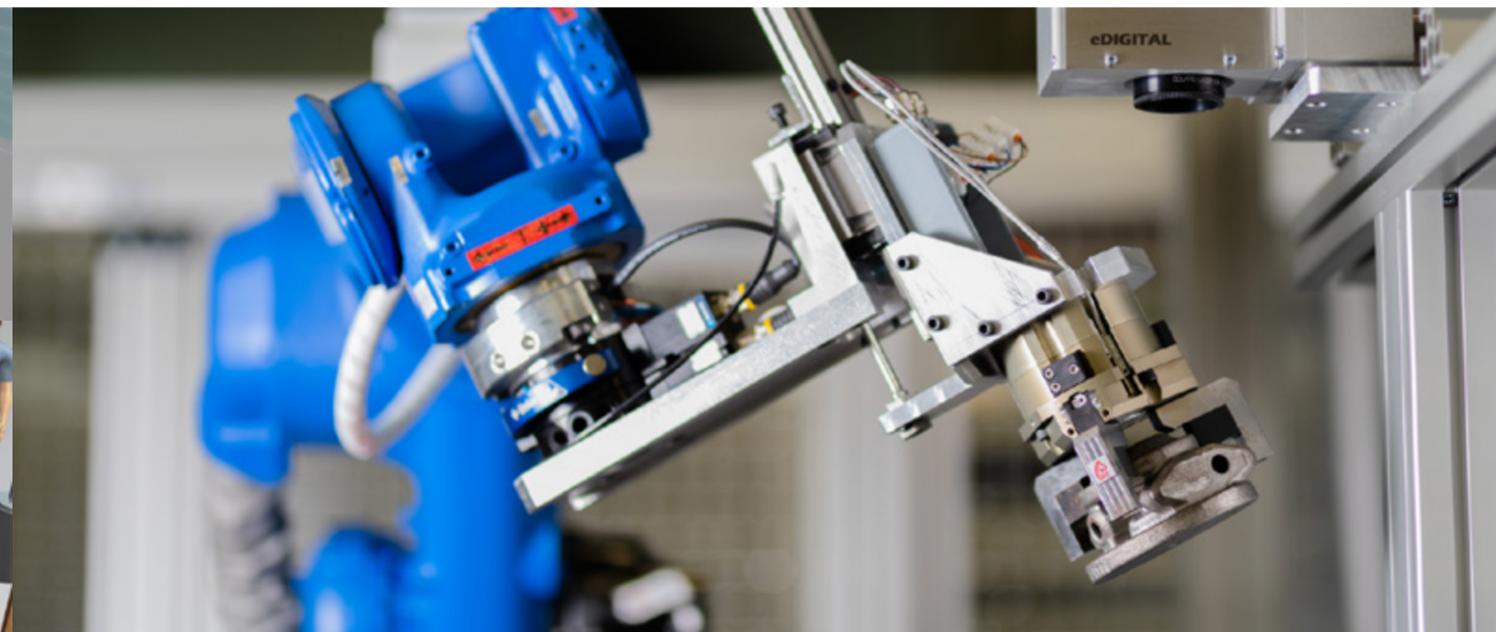
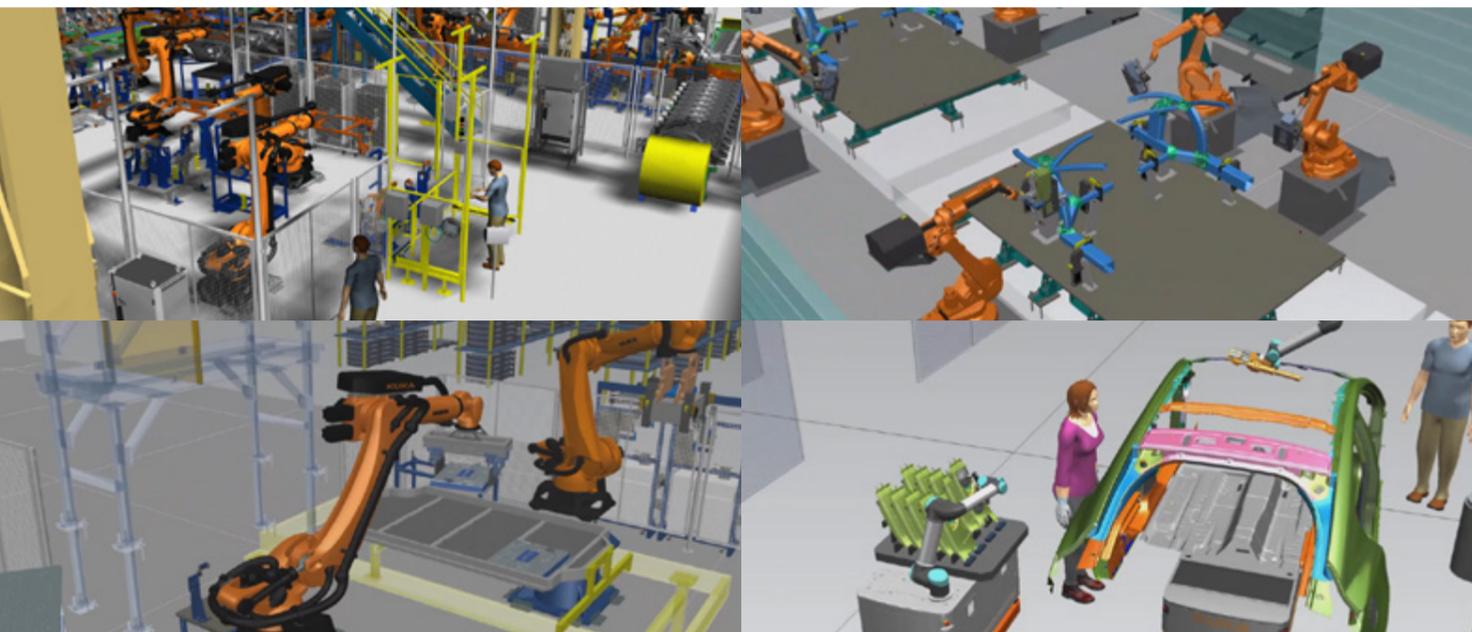
there are 3 that stand out for their innovative features. Qubino Mini Dimmer (enables automation of lights) is the smallest product on the market and the only one with an integrated fuse. Qubino Flush Shutter DC (enables automation of windows and indoor shades) is the only product that works with 12-24 VDC motors. And last but not least, Luxy Smart Switch opened a whole new product category as it is a unique combination of switch and ambient light (which illuminates the room in 16 million different colours).

Qubino's customers are homeowners who value energy efficiency, safety, and comfort. GOAP also focuses on the B2B segment in the selected niche of shutter manufacturers (with a focus on France, Germany, Sweden, and Italy), always with the vision of bringing new experiences to every home.

BUSINESS CARD

GOAP, d. o. o.
Ulica Klementa Juga 7
5250 Solkan, Slovenia
info@goap.si
info@qubino.com
www.goap.eu





AXIOM TECH

- Integrator of digital tools to help customers be better, faster and cheaper in research and development of a variety of products and production lines
- Offering the broadest portfolio for OLP programming via Tecnomatix Process Simulate - almost all robot brands are covered - KUKA, ABB, FANUC, YASKAWA, KAWASAKI, EPSON, STAUBLI, IGM, CLOOS, COMAU, NACHI, UNIVERSAL ROBOTS, REIS, DURR, ... including RCS (Realistic Controller Simulation) for major robot brands
- As Siemens Industry Software Partner we offer Siemens Industry Software products and solutions
- On the market since 1993, in Slovenia since 2015
- 80 employees, 5 branches in 3 countries (Czech Republic, Slovenia, Serbia)
- Stable economic growth
- 1000+ satisfied customers

BUSINESS CARD

AXIOM TECH, d. o. o.
Ulica Jožeta Jame 14
1210 Ljubljana - Šentvid, Slovenia
axiomtech@axiomtech.si
www.axiomtech.si



AVASTAR AUTOMATION

Avastar has over 25 years of experience in robotics and industrial automation solutions. We develop, design and produce automated and robotised machines for production processes where demanding standards and specifications of the automotive industry are applied (100% traceability, 100% repeatability, 100% product quality control, 100% process control). We are primarily an integrator of production processes in the automotive industry - hardware and software-wise, but we are also active in sectors such as household appliances, electrical, etc. Our products are interconnected with other machines in the surrounding environment. They communicate with them and collect process data for immediate use and decision-making. Our products are ready for the requirements of Industry 4.0 and can be integrated into Smart plants of the future.

Avastar is a team of about 30 experts who are knowledgeable in all main fields of Industry 4.0 production processes and requirements. Turnkey solutions are

our core business. Satisfied customers are our main goal. In addition to robotics and automation solutions, we also offer special fixing solutions for CNC machining of metal products. Avastar is a leader in the Slovenian market of hydraulic fixtures for CNC machining, especially for aluminium structural parts installed in electric and hybrid vehicles. The ISO9001 quality management system provides the framework and defines the ways of structured and formalised business model in our company.

BUSINESS CARD

AVASTAR Automation, d. o. o.
Ulica 15. maja 1a
6000 Koper, Slovenia
info@avastar.si
www.avastar.si





PODKRIZNIK GROUP

Podkrižnik group was established in 1987 and after more than three decades of successful business ventures it now consists of three companies: Podkrižnik, Edyn and ORA drive. The first two were established in Slovenia and ORA drive is based in Germany. The Podkrižnik group now totals more than three hundred employees and our vision is to become one of the leading companies in the fields of Electric Propulsion Systems and Intelligent Drive Technologies. In terms of products and services, we offer system solutions in the fields of drive technology, specialized gearboxes and hydraulic modules. We also offer components as a supplier, e.g. high-precision metal and plastic products. Our basic philosophy is simplicity, quality and collaboration with our customers through the whole lifecycle of a product.

With the announcement of Industry 4.0 as a new world trend, Podkrižnik was quick to recognize the opportunity and started with projects in e-mobili-

BUSINESS CREATION

Company Pitches

ty and robotics. The result of these efforts are three high-tech products:

- a fully sensorized drive for electric bikes, the strongest of its kind,
- a unique electric propulsion system for marine vessels, complete with IoT connectivity, navigation and onboard computer, and
- a smart gearbox for robotic applications, named Smart Gearbox Ultra (SGU). SGU is a high-precision and high-gear ratio gearbox that is integrated with an absolute positional encoder, a torque sensor and a piezoelectric sensor, which enables a new level of robot control.

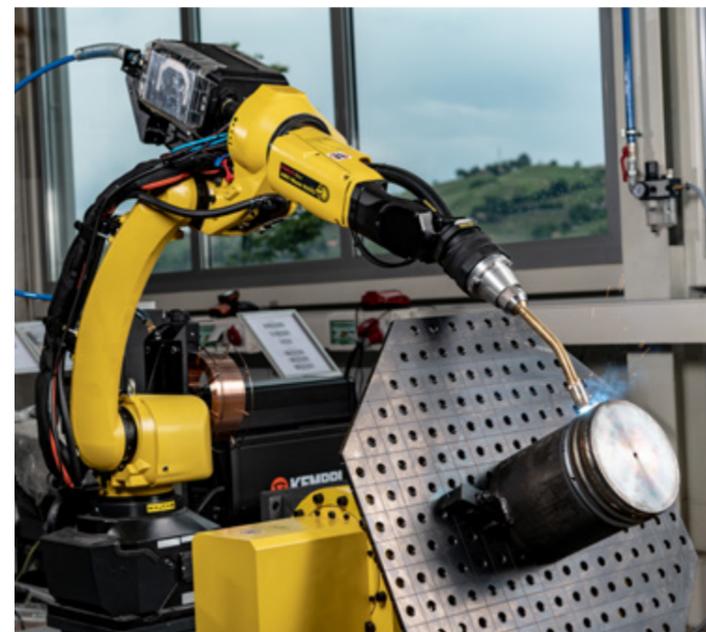
BUSINESS CARD

Podkrižnik, d. o. o.
Loke 33
3333 Ljubno ob Savinji, Slovenia
info@podkrižnik.si
www.podkrižnik.si



BUSINESS CREATION

Company Pitches



VIRS

We specialize in welding and cutting systems. We provide our customers with solutions that help them become leaders in their industry because their processes are faster, more reliable and make them more money.

We cover electric arc welding, plasma cutting, laser cutting and waterjet cutting.

We strive to be a system partner for our customers. This means that we not only sell equipment, but also help them select the optimal equipment for their needs, solve technological problems in production and take care of smooth and long operation of the delivered systems.

Why work with us:

- We are a reliable business partner, which is confirmed by hundreds of our satisfied customers.
- We are distinguished by more than 20 years of experience.

- We have numerous references from renowned manufacturers in various industries: automotive, mechanical engineering, sheet metal processing, etc.
- We offer effective solutions for the most demanding tasks, such as welding lines for welding car chassis, robot welding applications for welding car lifts and much more...
- Lots of expertise. Our team consists of more than 15 experienced engineers who are sure to help you find solutions for even the most challenging welding tasks.
- Equipment maintenance support and organized remote assistance around the clock.
- We are the company with the fastest response time. We always respond within 24 hours.
- The fastest delivery in Slovenia and abroad.
- Organized on-site support throughout Slovenia and abroad.

BUSINESS CARD

VIRS, d. o. o.
Industrijska ulica 4B
9220 Lendava, Slovenia
info@virs.si
www.virs.si



such as automation systems, motion & drives, robotics, safety, sensing, quality control and inspection, switching components, control components, etc.

We have references in various industries like automotive, pharmaceutical, food & beverage, wood processing, infrastructure & environment; water supply, energy management, PV and WT HW&SW support, etc. Due to our successful references in R&D, we are open for cooperation also on this level of industrial automation.

Our company slogan is "For Higher Productivity". We have obtained the ISO9001:2015 certification and the highest credit rating.



MIEL

MIEL was founded in 1990 and has been successfully active in the industrial automation market for more than thirty years. We are experts in consulting, developing, and implementing solutions for Industry 4.0 at various architectural levels.

Our main focus solutions for industry are:

- Vision inspection (AI-based solutions) and quality control
- Collaborative and industrial robots (complete solutions)
- Mobile robots (logistic automation)
- Traceability, inspection, and verification (QR)
- Advanced control systems (IoT)
- Multi-axis motion systems (servo and robot controller)
- Supervisory HMI and SCADA systems

We can also provide complete hardware and software solutions based on Omron industrial components,

BUSINESS CARD

MIEL, d. o. o.
Efenkova 61
3320 Velenje, Slovenia
info@miel.si
www.miel.si



KOLEKTOR SISTEH

Kolektor Sisteh Ltd. is a Slovenian development company with more than 30 years of global experience in the field of manufacturing process automation and digitization.

We are considered as a trustworthy consulting partner that paves the way towards Industry 4.0 to all manufacturing companies that are striving to leverage their potential in full. Based on our long years of experience we have developed a state-of-the-art MES/MOM solution called Sinapro.IIoT, which represents also our brand.

Sinapro.IIoT is an integral part of the concept of factories of the future and a fundamental element of Industry 4.0. It is always fully adapted to the specific working environment in order to effectively address its problems and room for improvement. The solution operates in real-time, which is one of the most impor-

tant attributes of modern manufacturing companies and also differs from other solutions (such as ERP).

Some of the features that reflect our solution in the early stages of digital transformation of manufacturing processes are as follows:

1. **Paperless production**, which includes digitization of work orders and other documents that are necessary for smooth work performance
2. **Micro-planning / scheduling**, which is based on available resources and is aligned with actual production times
3. **Complete traceability**, which is the ability to track where each item is in the production process
4. **Automated data collection**, which excludes the possibility of human input errors
5. **Comprehensive overview of production processes** with advanced analytics
6. **Digitized maintenance activities**

BUSINESS CARD

KOLEKTOR SISTEH, d. o. o.
Zasavska cesta 95
1231 Ljubljana - Črnuče, Slovenia
sisteh@kolektor.com
www.kolektorsisteh.si





INEL

INEL is a fast-growing company of experts with highly demanded knowledge from the fields of electronics, computer science and mechanical engineering. We are developing and producing:

- Systems for printing, labelling, inspection and verification in the pharmaceutical industry
- Specialized machines and robotic applications for automation in various industry fields
- Labelling systems

In 2012 we started to develop Print & Verify systems, which help the pharmaceutical industry introduce the required serialization and aggregation management technology into their production and logistic processes: when a pallet leaves the packaging line, the serialization data must contain the information about all the packages on the pallet.

At manufacturing we accommodate to the needs of each customer. We collaborate with the biggest Slo-

venian companies from the pharmaceutical industry, food and beverage industry, automotive industry, electrical engineering industry, building materials industry and others. We have established a strong presence in the European market and are expanding in Russia, Middle East, South East Asia and South America. When we deliver our machines to our customers, we also offer support and maintenance services and a supply of reproduction material.

We continuously expand our range of products and the work we do through following the innovations in the market, the continuous education and the development of new solutions. Our team is composed of both experienced professionals and recent graduates but they all share a passion for innovation.

Our main advantages:

- Full adaption to user requirements
- Research and development input
- Interdisciplinary
- Full maintenance
- Experience
- Progress
- Innovation and adaptability
- ISO 9001:2015 certified
- GS1 member

BUSINESS CARD

INEL, industrijska elektronika, d. o. o.
Bukovžlak 105
3000 Celje, Slovenia
info@inel.com
www.inel.com

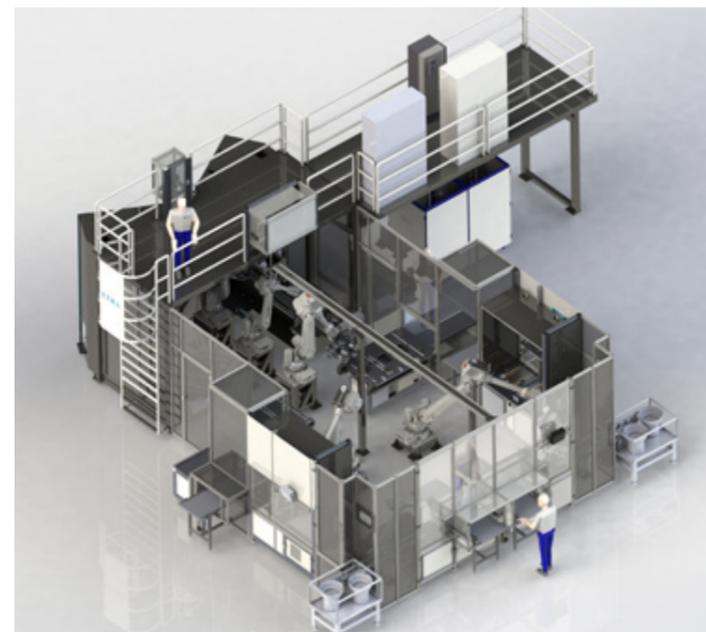
INEL

BUSINESS CREATION

Company Pitches

BUSINESS CREATION

Company Pitches



ETRA

Since its foundation in 1994, ETRA has become a recognized company in the field of intelligent production systems (IPS). ETRA is a certified Siemens Automation Solution Partner, official robotic integrator, CC Roboflex Partner, ISO certificate (9001, 14000) holder and has a registered R&D team.

The company's strategic goal is to be R&D partner in the field of Industry 4.0. It offers turnkey solutions from implementation to production of high-performance, environmentally friendly and cost-effective systems in the fields of automation, robotics, software, digitization, and logistics.

ETRA develops, produces and finalizes solutions. Among the best known are packaging and palletizing systems, automation and control systems, integrated systems, specific robotic cell solutions, fully automated warehouses, machine vision systems, software, and application solutions. Development and produc-

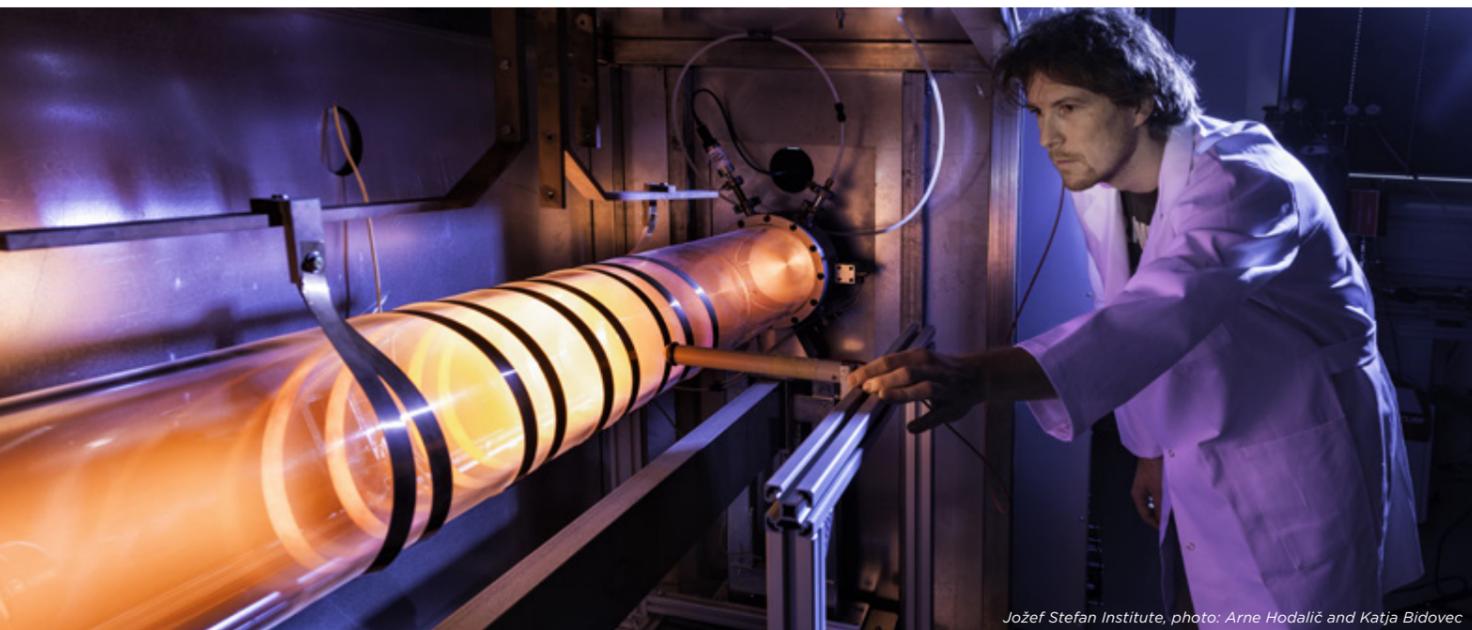
tion take place in their own premises. They perform various retrofits on existing systems or equipment and have 24/7 system and emergency maintenance. The company is characterized by a wide variety of solutions and application possibilities.

The company has a dynamic team of experts, for whom the most demanding projects are the most challenging. With experience and knowledge, they are prominent consulting partners, suited to help and contribute in the areas of digitalization toward digital company 4.0. Through constant investment in research and development, they are always at the cutting edge of innovations and new technologies.

BUSINESS CARD

ETRA, d. o. o.
Svetelka 5
3222 Dramlje, Slovenia
info@etra.si
www.etra.si

ETRA



Jožef Stefan Institute, photo: Arne Hodalič and Katja Bidovec

PLASMADIS

Plasmadis was founded in 2015 to market innovative technological solutions in the field of plasma technologies and unique sensors for the characterization of non-equilibrium gaseous plasma. The company employs 5 highly qualified colleagues with Ph.D. degrees in electronic vacuum technologies, material sciences, eco-technologies, and management. Plasmadis manufactures plasma characterization instruments and provides services for the integration of these devices into industrial and research systems. The company also provides consulting services in the niche of plasma technologies. The company offers custom designed industrial plasma systems according to specific customer requirements. Our reactors are more effective than commercially available reactors, especially in terms of energy efficiency and processing speed.

BUSINESS CARD

Plasmadis, d. o. o.
Teslova ulica 30
1000 Ljubljana, Slovenia
gregor.primc@plasmadis.com
www.plasmadis.com

PLASMADIS



FANUC

FANUC is a dedicated factory automation specialist with nearly 60 years of experience in the development of computer numerical control equipment, more than 27.5 million products installed worldwide and more than 8000 employees.

FANUC is one of the world's leading manufacturers of factory automation. Whether it's industrial robots, CNC systems, wire cut EDM, injection moulding machines or vertical machining centres, there is nothing we love more than automation. With more than 26 branches in Europe, we also operate in Slovenia, Celje, covering Croatia, Bosnia and Herzegovina, Montenegro and Kosovo. Part of our team is also responsible for FANUC Serbia.

FANUC is the most automated production facility in the industry. And as a result of this, we clearly understand your needs – supplying you with tried and tested products you can rely on.

BUSINESS CARD

FANUC Adria d.o.o.
Ipavčeva 21
3000 Celje, Slovenia
info@fanuc.si
www.fanuc.si





INEA RBT

INEA RBT is specialized in factory automation and digitalization of industrial environments. The company distributes Mitsubishi Electric products for factory automation (frequency inverters, PLCs, HMIs, servo drives, industrial and collaborative robots, LV switch-gears and SCADAs), HMS Networks communication devices, routers and protocol converters, and Kepware and OPC Router products for connectivity of factory floor and IT level with help of OPC protocol.

We follow contemporary market trends. Therefore, our factory automation devices are multi-protocol compatible with the most commonly used PLC protocols, we have some ready-to-use advanced solutions in the field of robotics (machine vision, force sensor, safety functions, conveyor tracking, collision avoidance/detection ...). We listen to the needs of our customers and are present during the design, assembly and commissioning of industrial machinery and equipment. We offer specialized technical sup-

port to OEM, SYS and END user customers with the help of our technical team.

We have references in the automotive, food and beverage, electronic, wood processing, medical, pharmaceutical, water treatment, process engineering, packaging and other general industry sectors. We are part of the INEA group and cover a territory of EX-Yugoslavian countries and Albania.

BUSINESS CARD

INEA RBT, d. o. o.
Stegne 11
1000 Ljubljana, Slovenia
info@inea-rbt.si
www.inea-rbt.si



EPILOG

Always serving the best. With well-thought-out, innovative and flexible IT solutions, we optimize and automate logistics processes for our customers. With the best team, made up of great individuals, we build stories of growth, trust and cooperation. All over the world. Since 1990.

We have taken our knowledge and experience in the field of information systems management of internal logistics, production processes, planning, transport, integration, and the coordination of human and mechanical resources in a single system, and condensed it into a family of products under the brand **Atlas**.

Our story began with the computerization of warehouses and continued with the computerization of production processes. Today, we focus on bringing IT to processes all the way from shipping to the final customer, i.e., last-mile, as well as to robotization, especially the development of self-driving vehicles for the needs of logistics.

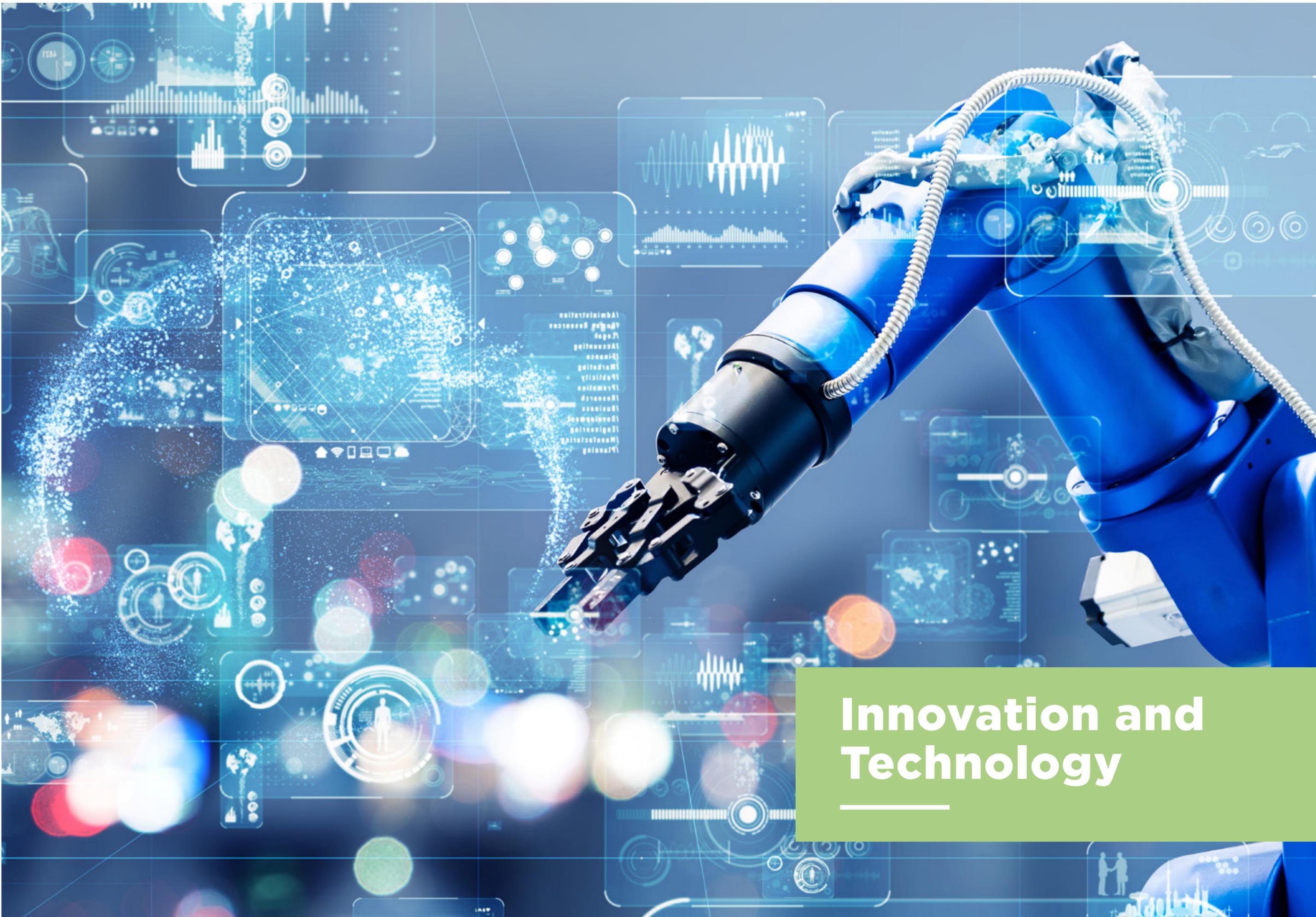
The map of our knowledge features IT (information systems design, programming, databases, mobile systems, high-availability systems, etc.), comprehensive knowledge of internal logistics processes, automation with robotics and communication.

By developing the AGV/AMR platform, we are supplementing the knowledge map of our company by adding navigation competences, object recognition skills, dynamic interaction with fellow human beings, managing a fleet of vehicles with motion optimisation, avoiding obstacles and adapting to current conditions – all in real time. With our focus on the efficiency of logistics, we combine different technologies into completed systems. To increase the added value, we develop specialized, customer-tailored solutions – from sensor systems development and control electronics, to innovative mechatronic assemblies. All of our solutions are designed in line with CE and UL standards, as well as taking account of the safety of our fellow human beings and our surroundings.

BUSINESS CARD

Epilog, d. o. o.
Tehnološki park 22A
1000 Ljubljana, Slovenia
info@epilog.net
www.epilog.net





Innovation and Technology



CONTROL TECHNOLOGIES – TECHNOLOGIES THAT MAKE THINGS WORK

The conference has focused on technological priority areas of the cluster coordinated by Competence Centre for Advanced Control Technologies. The technological priority areas of (i) artificial intelligence for control and optimization, (ii) digital twins in technical processes, (iii) energy domain in complex systems, (iv) prognostics and health management of machines and processes, (v) industrial IoT, (vi) integrated MES and (vii) some specific control applications, were overviewed and the challenges in supporting Factories of the Future (FoF) were highlighted. Within this scope, Slovenian companies and research organizations presented their results, which revealed the importance of the selected technological areas for the Slovenian environment.

The broader positioning and financing opportunities within the Slovenian and European landscape were

provided by the introductory key-note presentations, prepared by the Ministry of Education, Science and Sport, EFFRA, Hydrogen Europe and SRIP FoF. Moreover, the importance of facilities for testing, validation and promotion of new technologies was highlighted by two Slovenian demonstration centres on the topics of (i) digital twins and logistic processes and (ii) control technologies, artificial intelligence and hydrogen technologies. Smart energy-management ideas were additionally emphasized by the concept of the green hydrogen prosumer.

The event revealed that prioritized technological areas have a horizontal spread not only within the FoF focus area but also in other cross-section domains. So, these technologies are really horizontal enabling technologies that make things work.

The event would not be possible without the support of the Slovenian companies and research organizations that shared their results and best practices. These are SMM, Yaskawa, Domel, Podkrižnik, Kolektor Sisteh, Metronik, Cosylab, RENN Solutions, Faculty of Electrical Engineering (UL), Faculty of Mechanical Engineering (UL), FERI (UM), Jožef Stefan Institute, National Institute of Chemistry and TECOS.

BUSINESS CARD

KCSTV – Competence Centre for Advanced Control Technologies
Stegne 11
1000 Ljubljana, Slovenia
info@kcstv.si
www.kcstv.si



SMART FACTORY IN PRACTICE

The era of Industry 4.0, which has become very prominent in the last 5-10 years, has resulted in several smart factories being set up across Slovenia. This event will bring together several well-known companies, as well as some small companies that have implemented a smart factory in a real environment.

It will consist of two parts. In the first part, the Development Center Novo mesto will share its experience of setting up a Laboratory for Factories of the Future (LABTOP), where robots with various ad-ons, lasers, computer vision, R, VR and autonomous vehicles are integrated into a smart production line controlled by an ERP system and enabling customized production. The first part will be complemented with providers of the main technological components. In addition to technology, other aspects will also be presented, in particular, training and motivating young and key people in companies for the technologies of the fac-

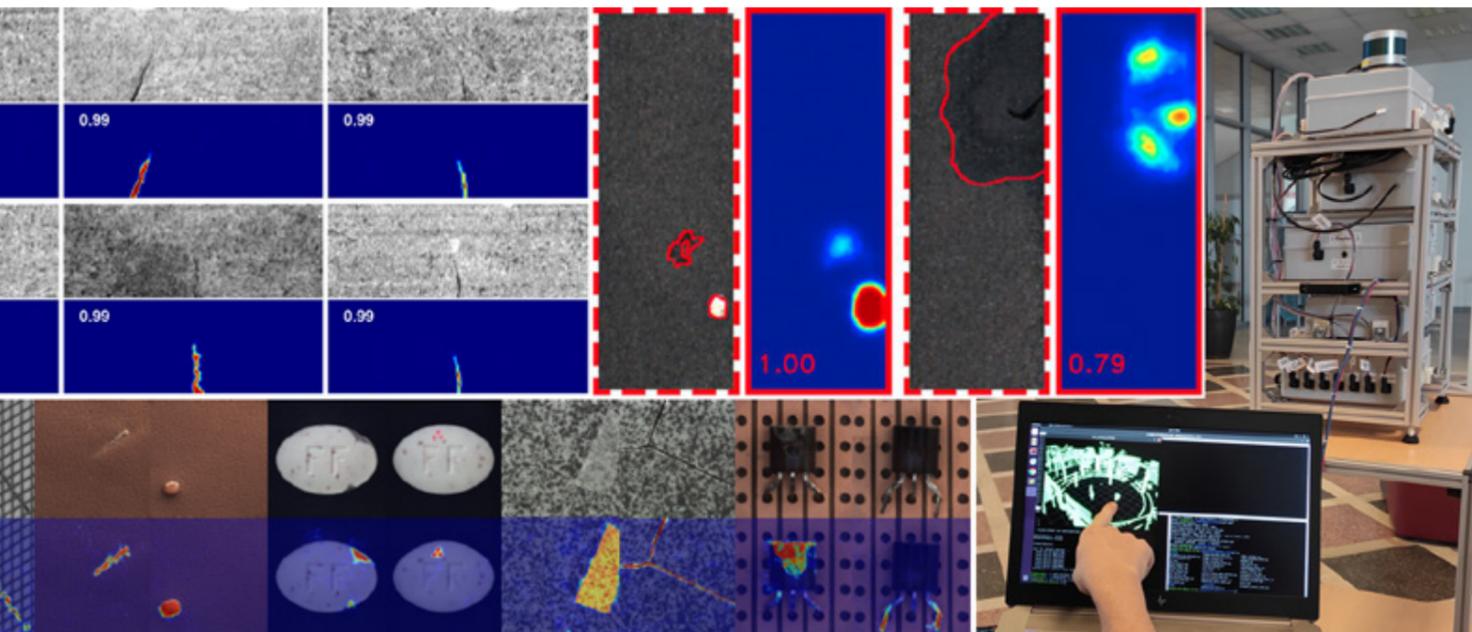
ories of the future, as well as research related to the factories of the future conducted at DC NM.

The second part of the event will involve approximately seven companies of different sizes and from different industries but which all have one thing in common: they have either implemented smart factory principles in their own production or supply the key components for smart factories. We will gain insights into the implementation of smart factories in pure batch production and in highly-customized production, as well as into the software and cloud back-end technologies underlying these implementations.

BUSINESS CARD

Development Centre Novo mesto
Podbreznik 15
8000 Novo mesto, Slovenia
info@rc-nm.si
www.rc-nm.si





MACHINE VISION IN INDUSTRY 4.0

Machine vision systems are commonly used for vision-based automatic inspection, process control, and robot guidance. As such, machine vision is a critical component of many high-end production lines, providing sensorial data for the efficient automation of production processes, as well as the efficient detection and elimination of defects to maintain the quality of processes and produced items at a required level.

Machine vision has been used for decades in constrained industrial environments to solve well-defined tasks. In Industry 4.0, quality requirements are even higher, the lot sizes are smaller, and the degree of product customization has increased, so more robust and flexible machine vision solutions are required. Computer vision has made tremendous progress in recent years, especially with the success of rejuvenated deep learning. Such data-driven learning-based solutions seem to be a perfect fit for In-

dustry 4.0, which relies heavily on intelligent methodologies to increase the efficiency and quality of production processes. Deep learning solutions have thus started entering also into the more conservative world of machine vision. However, deep learning approaches bring additional requirements and concerns that are not easily addressed in industrial settings.

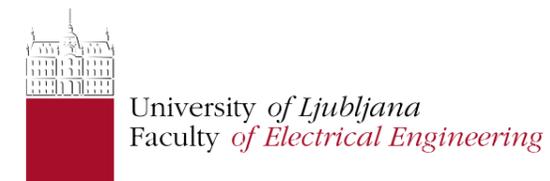
The event will highlight machine vision practices and challenges in the factories of the future and beyond. In the subsequent presentations and discussions, experts from academia and industry will share the latest trends in research and development, as well as practical examples and best practices. Several machine vision tasks will be covered, from visual inspection to robot control. In the last part of the event, the speakers will participate in the round table and will further discuss the advantages and caveats of machine vision as a key enabling technology for Industry 4.0.

BUSINESS CARD

University of Ljubljana
Faculty of Computer and information Science
Večna pot 113
1000 Ljubljana, Slovenia
daniyel.skocaj@fri.uni-lj.si
fri.uni-lj.si

University of Ljubljana
Faculty of Electrical Engineering
Tržaška 25
1000 Ljubljana, Slovenia
janez.pers@fe.uni-lj.si
fe.uni-lj.si

Kolektor Digital
Cesta v Gorice 34b
1000 Ljubljana, Slovenia
digital@kolektor.com
www.kolektordigital.com



KOLEKTOR



CREATIVE ROBOTICS AND ROBOTICS IN ART

DDTLab works in the fields of cybernetics, BCI systems and robotics. At the beginning of the 21st century, robotization has become one of the key branches of progress. A modern machine is no longer intended only for the mechanical execution of a single function but is becoming an increasingly independent unit designed to solve complex problems that the economy, society and humanity are facing today. As part of the humanization of technologies, DDTLab presents and develops creative robotics applications:

ROBOT EVA

In 2020 and 2021, we developed the character of a humanoid NAO robot. There are quite a few such robots in Slovenia and around the world, however, we wanted to make our robot something special, so the first step was to develop her character and name her Eva. The robot became a real sensation of the DDT-Lab. She appears at various shows and conferences, and regularly posts her experiences on her Facebook profile and YouTube channel.

NEUROYASKI PROJECT

The NeuroYaski rehabilitation prototype was created in collaboration with an industrial robotics company Yaskawa. NeuroYaski consists of individual components combined to provide a unique user experience. The project is an unparalleled transfer of technology from the industrial to the social field, aimed at infusing a repetitive robotic arm with the virtue of humanity. The user operates the Yaskawa robotic arm via a brain-computer interface, thus controlling it with his mind.

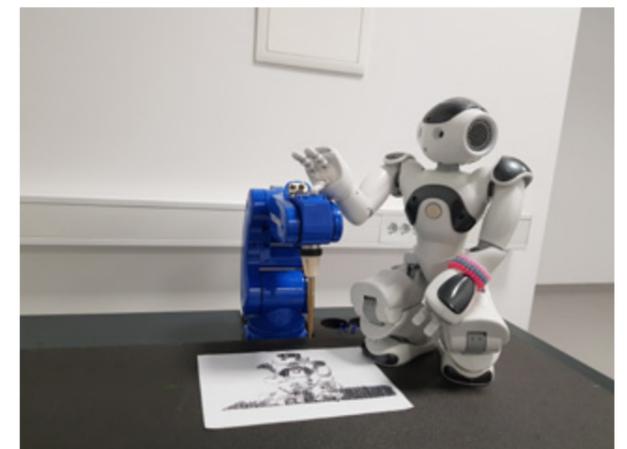
DRAWING AUTOMATA (IN COLLABORATION WITH VARVARA&MAR)

Drawing automata is a robotic art installation that creates sketches and drawings of people. While the type of robotic arm seen in the installation is normally used in industrial production, the project wants to liberate it, assigning it an artistic task. Installation uses Python Linedraw Library to transform webcam images into drawings, sketched by the robotic arm.

Although all the processes behind the creation are algorithmic, this gives us the impression that the sketches are hand-drawn.

I, HUMAN AND EVA (IN COLLABORATION WITH VARVARA&MAR)

The aim of the project is to produce comics that were created in collaboration between a human and a robot. The installation uses robots, AI and audience participation. While the human and the robot are talking and posing for a picture, the robotic arm draws a comic strip on paper in real time. The combination of communication, images and words creates a visual story, produced by the human and the robot alike. What happens when a robot becomes our partner in conversation? What sorts of stories and relationships can be born out of this scenario?



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DDTLab, Zavod za kulturo Delavski dom Trbovlje
Trg svobode 11a
1420 Trbovlje, Slovenia
dr. Maša Jazbec, Head of DDTLab
ddtlab@dd-trbovlje.si
www.dd-trbovlje.si/ddtlab





CIRCULAR ECONOMY AND INDUSTRY 4.0 - WINNING COMBINATION FOR CARBON NEUTRALITY UNTIL 2050

Carbon neutrality means that there is a balance between the emission of carbon and the absorption of carbon from the atmosphere in carbon sinks. The main natural carbon sinks are soil, oceans and forests. To limit global warming to 1.5 degrees Celsius, as proposed by the Intergovernmental Panel for Climate Change, carbon neutrality by the middle of the 21st century is essential. This goal is also laid down in the Paris Agreement signed by 195 countries, including the EU.

The European Green Deal and subsequently the Fit for 55 legislative package aim to make Europe carbon neutral by 2050. In this context, two emerging topics

INNOVATION AND TECHNOLOGY

are currently gaining interest due to their potential to implement systematic changes and contribute to achieving carbon neutrality - Circular Economy and Industry 4.0.

At the event, we will demonstrate how the CE-I4.0 nexus is pivotal in the endeavors to achieve carbon neutrality, as it combines innovative technologies with novel circular production and business models. Best practices will be presented by NGOs, research institutions and industry.

Event speakers are:

- Ana Šerdoner, Bellona
- Doc. Dr. Blaž Likožar, National Institute of Chemistry, Slovenia
- Dr. Mojca Lončnar, SIJ Acroni
- Dr. Tilen Sever, Steklarna Hrastnik
- Dr. Tomaž Vuk, Salonit Anhovo
- Andrej Gnezda, Umanotera

BUSINESS CARD

Chamber of Commerce and Industry of Štajerska
Ulica talcev 24
2000 Maribor, Slovenia
srip@stajerskagz.si
www.stajerskagz.si
www.srip-circular-economy.eu



INNOVATION AND TECHNOLOGY



GOOD PRACTICES IN INTRODUCING INDUSTRY 4.0 IN SMART CITIES

Today, more than half of the world's population lives in urban areas. Despite the fact that only 2% of the Earth's surface is covered by urban areas, they accumulate more than 50% of the population and consume up to 75% of natural resources.

There is still no common consensus on what "Smart City" means. The term "Smart City" could be understood as a new concept and a new model of urbanization, based on the 4th industrial revolution and the application of new technologies generated by the development of Industry 4.0 for the purpose of planning, construction, management, integrated industrialization, informatization, modernization and sustainable development of modern cities.

In the first phase of developing "Smart City", the focus was on providing citizens with public services.

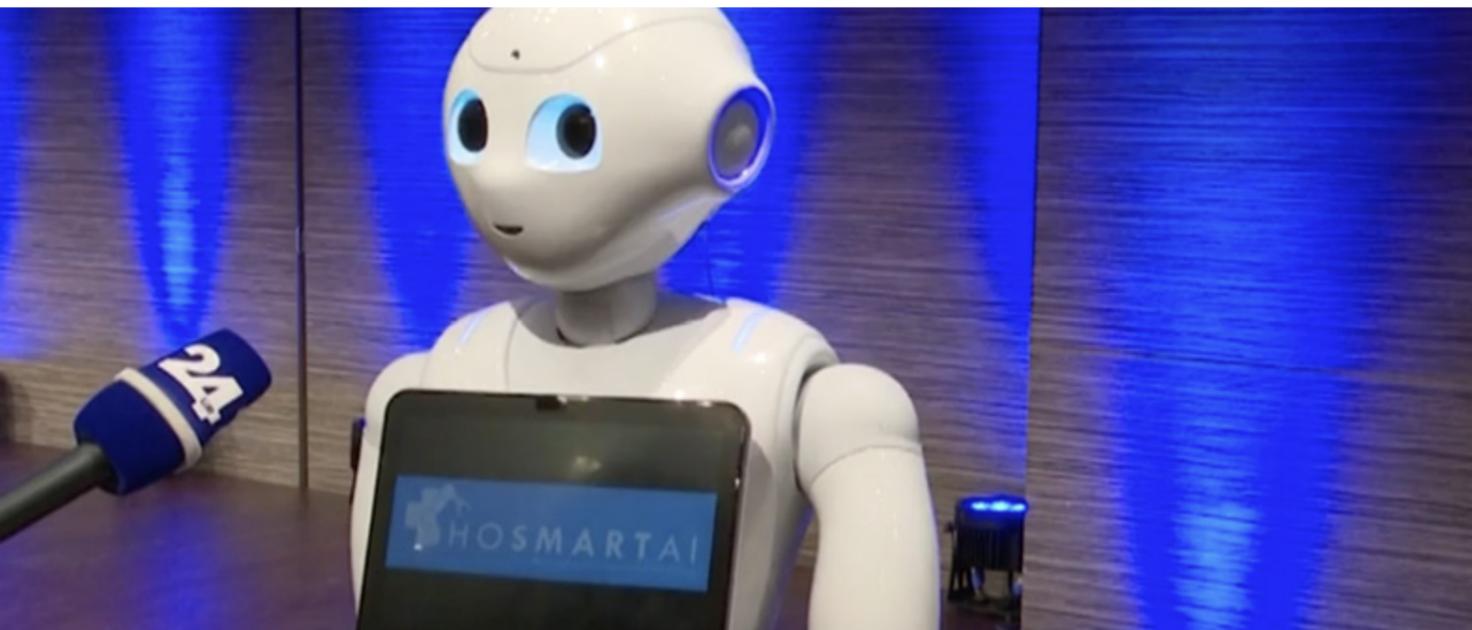
With the emerging new generation of ICT technology all elements of cities and their infrastructure are subject of change - to become "smarter".

The development of Industry 4.0 will influence the development of "Smart Cities" and their transformation towards carbon neutral cities. Concepts of Industry 4.0 will provide cities with the tools to overcome certain issues, such as effective use of resources, energy efficiency, urban production and demographic changes.

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Strategic Research Innovation Partnership, Smart cities & Communities
Jožef Stefan Institute
Jamova cesta 39
1000 Ljubljana, Slovenia
pmis@ijs.si
pmis.ijs.si





TRANSFORMING MEDICINE WITH ROBOTICS

Are we heading towards Hybrid Medicine?

Today, medicine is evolving fast on several frontiers: from new processes for development and production of medicines, the development of new treatment modalities, to introducing new products based on next generation key enabling technologies rooted in robotics, bioinformatics and 5G connectivity. This is creating challenges and opportunities for practitioners and specialists wanting to embrace and adopt new possibilities, as well as for the regulators, the distributors and patient care systems. These specialists can connect the new with the established, with the aim to increase the quality of life of patients and citizens.

The medical treatment is striving towards an efficient, precise and personalized approach; it is becoming ever more intertwined with other science disciplines, thus enabling a patient-centered approach. At this event we would like to draw attention to the enor-

mous potential of scientific research in life sciences, AI, and engineering, which can create innovative and revolutionary solutions by building a bridge towards meeting the needs of modern medical science. The news on Xenorobots just reached us a few days ago and one cannot help but wonder, what else will the future bring?

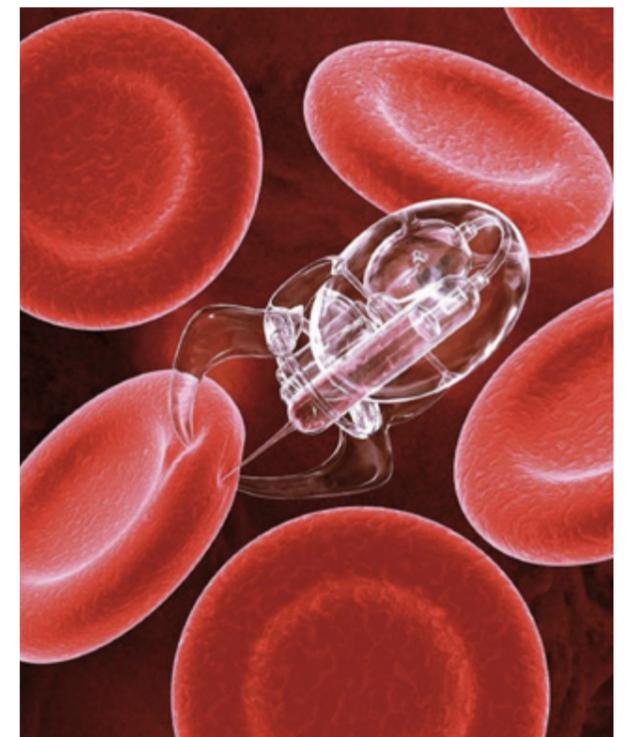
That is why at SRIP Health-Medicine we are connecting “the excellent and creative” actors in the focus areas of Cancer Treatment, Translational Medicine, Herbal medicine and Cosmetics, Active Healthy Ageing, and Biopharmaceuticals. Right now, we would like to emphasize the importance of exploring the potential and enrichment that robotics is bringing into the area of healthcare, long-term care and well-being.

Our roundtable speakers will share viewpoints on the medical and technological aspects of introducing and deploying new approaches, including how well

the engineering and connectivity side meet everyday practice and work with patients. A view on 5G connectivity, business development challenges and emerging opportunities for the health and tech sector will be discussed as well.

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SIH EEIG
Večna pot 113
1000 Ljubljana, Slovenia
Dr. Alenka Rožaj Brvar, MBA
Director Slovenian Innovation Hub
Coordinator SRIP Health-Medicine
info@sis-egiz.eu
www.sripzdravje-medicina.si
www.sis-egiz.eu



Slovenian Innovation Hub



Innovation and Technology

Research and
Educational Institutions



Jožef Stefan Institute, photo: Arne Hodalič and Katja Bidovec

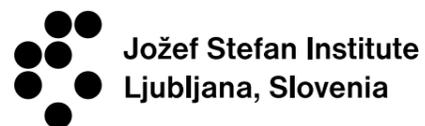
JOŽEF STEFAN INSTITUTE, DEPARTMENT OF AUTOMATICS, BIOCYBERNETICS AND ROBOTICS

Jožef Stefan Institute is the leading Slovenian scientific research institute, covering a broad spectrum of basic and applied research. The staff of about 1050 specializes in natural sciences, life sciences and engineering. The subjects concern production and control technologies, communication and computer technologies, knowledge technologies, biotechnologies, new materials, environmental technologies, nanotechnologies and nuclear engineering. The mission of Jožef Stefan Institute is the accumulation - and dissemination - of knowledge at the frontiers of natural science and technology to the benefit of society at large through the pursuit of education, learning, research and development of high technology at the highest international levels of excellence.

The research within the department of automatics, biocybernetics and robotics combines the fields of robotics (including intelligent control, robot learning, humanoids, exoskeletons, cognitive robotics and industrial robotics), factories of the future, biomechanics, kinesiology, ergonomics and environmental physiology. By combining engineering and life sciences, we were able to make significant contributions to the development of new methods for robot skill learning, human-robot physical interaction, including shared control in exoskeletons, a planetary habitat simulation facility, advanced humanoid and reconfigurable robotic systems and manikins enabling the evaluation of protective garments for industry and recreation. Our aim is to create robots that are capable of acquiring new knowledge through learning and can collaborate with people in a natural way, which is essential for bringing robots to new application domains.

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Jožef Stefan Institute
Department of Automatics, Biocybernetics and Robotics
Jamova cesta 39
1000 Ljubljana, Slovenia
e1-tajnistvo@ijs.si
abr.ijs.si



UNIVERSITY OF LJUBLJANA, FACULTY OF ELECTRICAL ENGINEERING, ROBO LAB

Robolab has long-standing excellence in the field of human-machine motion analysis, artificial and natural motor control, and psychophysiological measurements. The group has a good track in robotics research and applications in clinical and industrial settings.

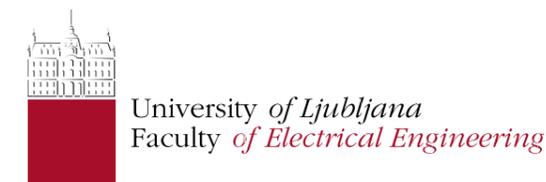
Robolab members work on innovations and the development of novel robotic devices and solutions for diagnostics and training in rehabilitation and sports. Sophisticated motion coordination between humans and robots is the common denominator of research on exoskeletons, bionic prostheses and advanced human assistance systems. Technologies for haptic human-machine interfaces, wearable motion and psychophysiological sensors also appear in combination with virtual reality.

Robolab provides Slovenian industry with a competitive advantage by advancing robotics technology for industrial users. Several complex assembly robot cells and solutions have been developed, including a large-scale robotic telescopic handler for the construction industry and the Advanced Robotic Cell for quality control. The Collaborative Robotic Centre, established within the Robolab, is a bubbling space between academics, students and industry.

One of the study programs at the Faculty of Electrical Engineering is also the Master in Robotics, the only one in Slovenia since its beginnings 35 years ago.

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University of Ljubljana
Faculty of Electrical Engineering
Tržaška 25
1000 Ljubljana, Slovenia
www.fe.uni-lj.si
www.robolab.si





UNIVERSITY OF LJUBLJANA, FACULTY OF COMPUTER AND INFORMATION SCIENCE

The Faculty of Computer and Information Science of the University of Ljubljana is Slovenia's leading educational and research institution for computer and information science.

The faculty's main function is educating undergraduate and graduate computer science experts of various profiles, as well as engaging in research work which generates new knowledge and uncovers solutions to contemporary problems. Faculty members cover the entire field of computer and information sciences, however the work on artificial intelligence is the most prominent one.

The faculty also offers a master's degree in Data Science, with a particular focus on various aspects of AI. Several laboratories are involved in research in differ-

INNOVATION AND TECHNOLOGY

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ent areas of AI, from machine learning to computer vision. One of them is the Visual Cognitive Systems Laboratory which is very active in developing novel vision-based intelligent solutions for the factories of the future, the main topic of the Machine vision in Industry 4.0 event. The laboratory is involved in basic and applied research of visually enabled intelligent systems. Their research interests include computer vision, deep learning, and cognitive robotics. Their extensive research and applied experience have been accumulated in collaboration with a wide range of partners in a number of EU, national and industry-funded projects on these research topics.

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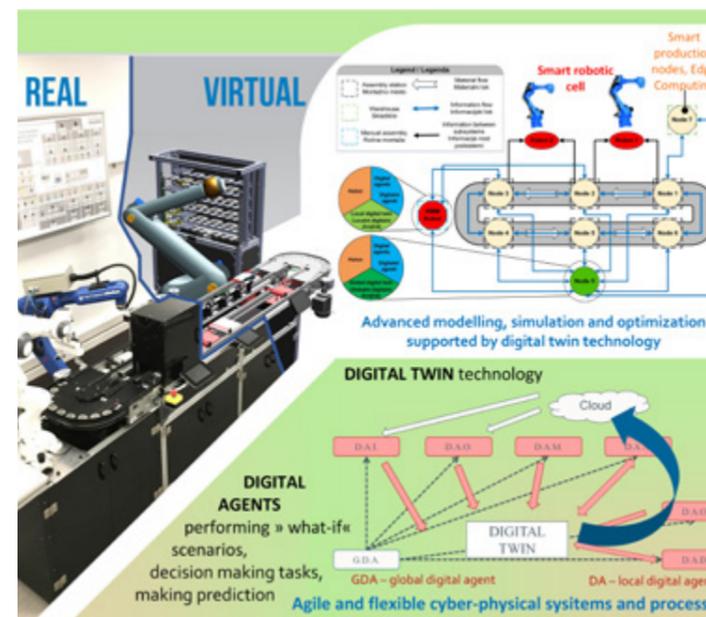
University of Ljubljana
Faculty of Computer and Information Science
Visual Cognitive Systems Laboratory
Večna pot 113
1000 Ljubljana, Slovenia
daniel.skocaj@fri.uni-lj.si
fri.uni-lj.si



University of Ljubljana
Faculty of Computer and
Information Science

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UNIVERSITY OF LJUBLJANA, FACULTY OF MECHANICAL ENGINEERING, LABORATORY LASIM

Industry 4.0 and the key enabling technologies associated with it are here and the implementation of these technologies in industrial applications has already begun. Digitization and digital twin technology are two important areas related to Industry 4.0 that enable new business opportunities and a new vision for agile, flexible and sustainable manufacturing. To realize such a Smart Factory concept, the focus should be on the integration of distributed control structures instead of conventional centralized or even decentralized structures, the development of cyber-physical systems, the use of cloud computing in combination with edge computing, the integration of IoT and 5G, standardized communication protocols such as OPC UA, digital twins and digital agents with integrated AI-based control and decision-making algorithms. The above new approaches can be integrated into the different

manufacturing areas such as handling, assembly, robotics or logistics and allow us to optimize the processes and analyze the system behavior in real-time, make predictions and prepare corrections in advance using digital twins and so-called "what-if" scenarios.

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University of Ljubljana
Faculty of Mechanical Engineering
Laboratory for Handling, Assembly and Pneumatics
Aškerčeva 6
1000 Ljubljana, Slovenia
doc. dr. Marko Šimic, marko.simic@fs.uni-lj.si
prof. dr. Niko Herakovič, niko.herakovic@fs.uni-lj.si
web.fs.uni-lj.si/lasim



University of Ljubljana
Faculty of Mechanical Engineering



UNIVERSITY OF MARIBOR, FACULTY OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

The Faculty of Electrical Engineering and Computer Science at the University of Maribor (UM FERİ) is one of the leading teaching and research institutions in the field of electrical engineering and computer science in Slovenia. It provides students with knowledge based on internationally recognized scientific research, enabling them to successfully integrate into future working environments in Slovenia and/or abroad.

UM FERİ is the largest faculty at the University of Maribor with about 2200 full-time students, more than 600 first-year students, more than 300 foreign students, and 340 staff members including about 150 teachers and about 90 researchers. We offer 10 undergraduate, 7 master and 3 doctoral degree study programs in electrical engineering, comput-

er science, informatics, media communications, telecommunications and mechatronics. Through the plethora of them we provide students with most of the knowledge and skills required for Industry 4.0 and Robotics.

The Faculty recognizes the importance of integrating education, research and industry. Research work is conducted within 26 laboratories organized in 8 institutes. The activities related to robotics are mainly conducted within the Institute of robotics, which was established in 1981. Since then it performs R&D work in the fields of robotization, automation and mechatronic systems. In the last five years, the faculty researchers have successfully carried out more than 200 European and national projects in the areas defined by the Smart Specialization Strategy as leading or cooperating partners in international projects such as Horizon 2020, ESA, NATO SPS, COST, INTERREG, ERASMUS +. This allows our students to acquire knowledge based on internationally recognized scientific research.

BUSINESS CARD

University of Maribor
Faculty of Electrical Engineering and Computer Science
Koroška cesta 46
2000 Maribor, Slovenia
feri@um.si
feri.um.si



Faculty of Electrical Engineering
and Computer Science



DEVELOPMENT CENTRE NOVO MESTO, LABORATORY FOR THE FACTORIES OF THE FUTURE (LABTOP)

The Laboratory for the Factories of the Future is an industrial learning laboratory for motivation, teaching, applied research, and testing. The laboratory presents the latest technologies, concepts, and solutions for smart factories, integrated with a business system as a link in the entire production process. The laboratory's vision is to become an agile and symbiotic platform where pupils, students, researchers and industry stakeholders meet to develop and transfer knowledge and upgrade competencies in the field of smart manufacturing, while also considering the highest social, environmental, and quality standards.

Our main goals are:

- Improve the efficiency and competitiveness of local businesses with flexible, autonomous, and agile production technologies
- Increase productivity and resource efficiency in production
- Improve the transfer of knowledge and practical experience to make traditional teaching methods more effective

- Improve the competences of the industrial workforce and consequently reduce the shortage of skilled workers

Research: The laboratory conducts applied research in industry technologies 4.0: robotics, automation, artificial intelligence, digitalization of industrial processes and creative production or personalization. Furthermore, in cooperation with relevant industry stakeholders, industry requirements are directly transferred to applied research projects. In addition, research knowledge is transferred to the future workforce through student projects and student work.

Motivating and training young people: LABTOP is used to motivate and train pupils and students by performing practical exercises, study projects, and final assignments in the laboratory with the latest equipment in the smart industry and automation. We also involve young people in industrial projects, thus providing them with valuable experience for their future career paths.

Work for industry: LABTOP is a space for (i) introducing and testing new technologies, methods, and concepts of the smart industry: through the many seminars, courses, and training programs offered by the laboratory, companies can better prepare their employees for the challenges of Industry 4.0; (ii) preparing and implementing different phases of Industry 4.0 technology in a specific industrial environment and (iii) prototyping and testing before integration into the real industrial environment.

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Development Centre Novo mesto
Podbreznik 15
8000 Novo mesto, Slovenia
labtop@rc-nm.si
www.rc-nm.si





Education



ROBOTICS AND FUN PROGRAMMING

For the fifth year, the Development Centre Novo mesto is performing robotics and programming workshop for children. Additionally, we also offer weekly summer camps and technical days in schools.

Robotization and automation have become the reality of modern times. Children grow up with technology and are very receptive to learning, especially if it is fun at the same time. We offer workshops on robotics and programming aimed at children who are interested in technology, computer science and robotics. Given the shortage of technical staff and the fact that there is not enough teaching of robotics and computer science in primary schools, we decided to offer this kind of content ourselves. We also give a special place on programming knowledge, as we believe that programming skills are the alphabet of the 21st century.

As part of the Robotics Month event, we prepared a 3-hour workshop for children divided into 2 groups -

younger and older. At the workshop for the younger group (1st to 5th grade), children created the Lego Wedo robot and then programmed them using simple object commands. We created a robot named Smarty, who tracked us using a sensor. Children learned the basics of robotics and programming and how robots can help us in real life.

At the workshop for the older group (5th to 9th grade), we used Lego SPIKE Prime. We created and programmed the Rhino as part of the "Going the distance" project and a robotic arm that simulated the use of the robot for industrial purposes.

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Development Centre Novo mesto
Podbreznik 15
8000 Novo mesto, Slovenia
crri@rc-nm.si
www.rc-nm.si



WORKSHOP FOR CHILDREN, YOUTH TECHNOLOGY AND RESEARCH CENTRE 404: ROBOKOCKA AND ELEKTRO BUNKA

404 is the first youth technological and development center in Slovenia, established with the aim of providing young people with technical skills and getting them excited about research, science and entrepreneurship. So far, more than 4,000 children and young people, more than 20,000 in total, are involved in the 404's activities and places involved in various programs and projects. Partnership in projects and educational activities takes place with various primary and secondary schools and faculties as well as other educational institutions. Our partners are also tech companies, the City of Ljubljana and many related institutions in the field of "maker" communities, as well as student and youth organizations.

Stepping out of the safe-zone of merely using technology into a new, unknown world of creativity is the first step each individual must take on the long road ahead. With initial encouragement and support in a suitable environment, we can turn young people into self-initiated individuals who independently create and develop their ideas.

We have prepared a workshop for the first steps into the world of robotics and programming with the handsome robot Kubeto. Through storytelling and playing with the robot, children learn how technology works. While controlling the robot, they are trained in algorithmic thinking, as they control the robot's movements by assembling colorful blocks on a physical programming platform.

With older children we will create a very special ornament for Christmas decoration. It will glow in rainbow colors! How to do it? By inserting a printed circuit board with a light - RGB LED - and a chip that will control the color change. We will learn how to solder and what components to use. Then we will solder the components to the printed circuit board ourselves. Following the magical inspiration of December, we will design the exterior of the ornament.

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Zavod 404
Mencingerjeva ulica 7
1000 Ljubljana, Slovenia
pisarna@404.si
www.404.si





KUBO ROBOTICS – COMPUTER FREE DIGITAL EMPOWERMENT FOR CHILDREN

KUBO Robotics is a funny and impressive way to learn the basics of programming simple robots for children ages from 7 to 11. It enhances creativity, collaboration, critical thinking and communication skills.

KUBO makes coding easy and fun for children of all abilities, even the most technology-shy. Learning to code is also about abstraction and algorithmic thinking; breaking down a problem to accomplish a task or solve a problem.

It is essential that children make their first contact with programming through dynamic and playful coding experiences. The KUBO robot is a great choice for this because it impresses young programmers with its cuteness. With the help of

KUBO, kids can learn through play. And what is most important, without using a computer!

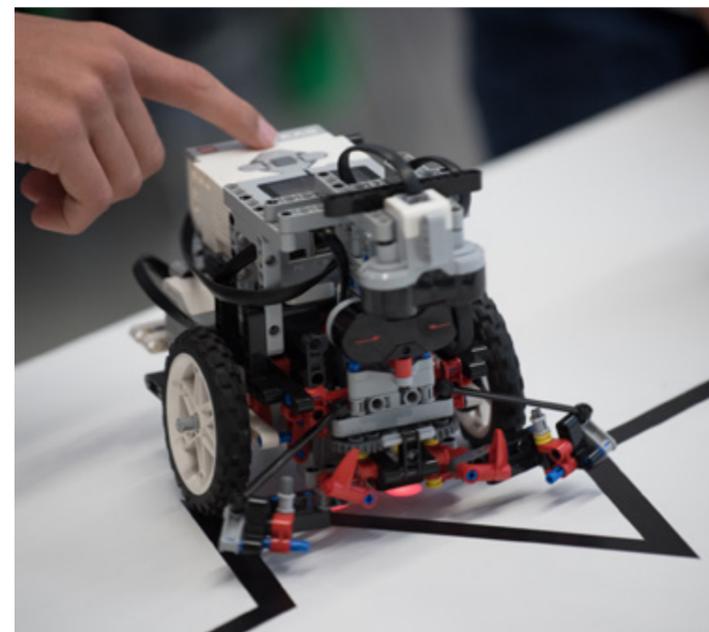
Through guided KUBO robotics workshops, children learn how to program a robot in a simple way. Without knowing it, they are introduced to basic coding and robotics. The most advanced young programmers will have a chance to also try some more complex programming functions.

In addition, they also practice their communication skills, storytelling ability and problem-solving. With the help of various tasks, young participants develop creativity on several levels. They also have a chance to create their own stories through storytelling and drawing. They make KUBO maps and clothes for the KUBO robot. Through all these activities, we encourage them to implement current school learning content into their KUBO story.

Through these assignments, children gain basic coding solutions such as routes, functions, loops and subroutines. The whole experience gives them an inside view of coding and the possibility to develop computational thinking, which are essential skills for the future.

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Business Incubator Kočevje
Novomeška cesta 16
1330 Kočevje, Slovenia
info@inkubator-kocevje.si
www.inkubator-kocevje.si



ROBOTICS FOR YOUTH - ROBOCUPJUNIOR (RCJ) EXHIBITION COMPETITION

RoboCupJunior (RCJ) is a world-wide robotics competition, based on international rules and organized with the aim of popularizing and promoting STEM content and skill learning through robotics and AI research, innovation, and science among young people through project-based education. RCJ offers several challenges, including the development of autonomous search and rescue robots, soccer robots, etc., each emphasizing cooperative, problem-solving and task-achievement aspects. The competition enables a friendly introduction of highly attractive robotics technology to youth of all ages from childhood to students and beyond.

University of Maribor, Faculty for Electrical Engineering and Computer Science, (UM FERI), has been organizing the regional RCJ competition on a national level with international guest teams since 2010 (robobum.um.si). The competition has been organized in

three different leagues: Rescue, Soccer and OnStage (former Dance). In the Rescue league, consisting of three sub-leagues, named Rescue Line, Rescue Maze and Rescue Simulation, robots identify victims within re-created disaster scenarios, varying in complexity from line-following on a flat surface to negotiating paths through obstacles on uneven terrain. In the Soccer league teams of autonomous mobile robots play soccer in a highly-dynamic environment that mimics a real soccer field. In the OnStage league one or more robots come together with humans, dressed in costume and moving in creative, interactive and collaborative ways. The best teams from the national level competition advance to the global level competition, organized every year in a different place all over the world.

RCJ Exhibition Competition will participate in the Rescue and Soccer leagues. While a major part of registered teams will compete in the Rescue Line sub-league, which will offer great competition, some registered teams will take part in the Rescue Simulation sub-league competition.

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University of Maribor
Faculty of Electrical Engineering and Computer Science
Koroška cesta 46
2000 Maribor, Slovenia
feri@um.si
feri.um.si



Faculty of Electrical Engineering and Computer Science

YASKAWA

Yaskawa robots
manufactured in Slovenia for EU



Month of industry 4.0 and robotics
**from 29th of Nov.
to 28th of Dec.**

SLOVENIAN DIGITAL CENTER

Technology for the People



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