

EDI in Riga, Latvia was established within framework of Latvian Academy of Science in 1960. EDI is a public research institution- – a derived public person under the supervision of the Minister of Education and Science of Latvia.

The activities of EDI are regulated by the Latvian Law of Scientific activity and statute of EDI. The decision-making body of EDI is the Scientific Council. The daily administrative operations of EDI are ensured by a director, elected by the Council.

At EDI we believe (vision) that our future world will be even more connected, digital and automated than ever, forming various ambitious challenges, e.g. personalized predictive and preventive healthcare (incl. digital avatar); flexible, efficient, connected and autonomous (zero defect) factories; safe (zero fatalities), affordable, sustainable, connected, cooperative, automated and clean (zero emissions) mobility; secure, safe and trustable connectivity and system interoperability; to name a few, impacting the everyday life of people as well as all business sectors.

As EDI is among the highest rated scientific institutions in Latvia specializing in Smart Embedded Cooperative Systems (SECS), we have a unique perspective, expertise and capacity to contribute in solving the above-mentioned challenges on Latvian and global scale. Therefore, we see our mission to perceive the world and design a better future by creating new knowledge, developing innovative technologies and demonstrating their practical significance in real life applications.

Our goal is to become internationally recognized RTO and apply our SECS expertise in mobility, industry 4.0, health, digital life and space domains while working in following research directions:

- Extremely precise event timing incl. space domain (1min [video](#))
- Remote sensing and space data processing (1min [video](#))
- Robotics and machine perception (1min [video](#))
- Signal processing and embedded intelligence (1min [video](#))
- Smart sensors and IoT (1min [video](#))



Our objectives to achieve the goal are in line with challenges and ambitions of Latvian and EU development policies (e.g. creation of innovative solutions for digitalization of industry to increase its competitiveness; enhancement of data-based digital life knowledge to ensure well-being of society; development and transfer of innovative ICT technologies to provide growth of knowledge- intensive economy, etc.).

Our expertise is complemented by close collaboration with 300+ international partners. EDI have coordinated and participated in numerous EU projects (FP5, FP6, FP7, H2020, ECSEL, ERA-NET, ESA, COST, etc.).

EDI has a workforce of 90+ scientific personnel (a total employees: 110+), of which ~50 are in elected academic positions – leading researchers, researchers and assistants.

More information @ www.edi.lv/en/

Extremely precise event timing incl. space domain. Equipped with the best instrumentation and decades of experience, our team of scientists develop general purpose event timers and application-specific timing, synchronization, signal processing and signal conditioning systems. Our timers are used in more than half of all satellite laser ranging stations. With extreme precision of 3 pico-seconds our timers are used worldwide by different entities such as NASA. Each new system is thoroughly tested to ensure stable and predictable performance even in harsh and fast-changing conditions. In collaboration with European Space agency we have developed a space-grade timer, which is planned to be used for Luna-27 space mission with ROSCOSMOS and for Portuguese satellite in lidar systems.

Remote sensing Space data processing. EDI has decades of expertise in developing unique sub-8GHz short-range high-resolution Ultrawideband radar technology and their testing in different applications, including ground and wall probing, through wall imaging, remote human breathing and heart rate detection, non-contact ice thickness measurement and time domain reflectometry. With support of European Space Agency, we also develop complex methods and software for Earth observation. Our unsupervised land cover classification technology is focused on automatic classification of multispectral satellite images or other data and our latest results show the superiority of our non-parametric clustering algorithm over other available methods such as K-means and ISODATA.

Robotics and machine perception. We enable robots to operate in changing environments and perform tasks that require autonomous decision-making and adaptability. Our systems combine sensor technologies with original data fusion, processing and computer vision algorithms, including AI. We develop new and fast data labelling methods to facilitate the use of our perception algorithms on various real-world tasks. We perform cutting edge R&D on connected and automated driving, where we develop fail-safe, fail-aware and fail-operational V2X communication technology as well as perception system. We use our drive-by-wire test platform in our ITS TestBed to test different functionalities of the developed technologies. Other mobile platforms, including drones, are targets for machine learning algorithms trained at EDI HPC. Our research on trustworthy and explainable AI envisions safe and collaborative operation between robots and humans.

Signal processing and embedded intelligence. Our extensive expertise in signal processing and embedded intelligence has facilitated development of unobtrusive wearable sensing fabrics capable of real-time 3D reconstruction, train integrity monitoring system, patented multi-modal FPGA-based biometric system, industrial low latency and high-data rate wireless sensors, hardware accelerators for image processing and depth sensing, V2X communication systems, one of the first Artificial Neural Network accelerators for realizing state-of-art vehicle control and many others. Currently, EDI experts work with hardware platforms ranging from the smallest micro-controllers to the most advanced state-of-the-art Systems-on-Chips and their expertise covers high-speed PCB design, low-level software development, algorithm design, digital and analog circuit engineering, prototyping, and smart embedded cooperative-system development.

Smart sensors and IoT. EDI has more than 10 years of R&D expertise in smart sensors and internet of things systems, including PCB and firmware design, network architectures, and data collection and processing. We have developed our own WSN programming language, operating system and unique large scale 100 node IoT testbed with the possibility to move 50 nodes to any testing location for extensive testing, debugging and data gathering, including battery discharge simulation and energy consumption measurements. We develop cutting-edge wearable systems based on inertial and bio-electrical sensors on flexible PCBs and conductive textiles for applications in healthcare, active life style and sports. We focus on energy and computationally efficient data transmission and processing to enable unobtrusive usability of wearable devices that provide real-time feedback. We have developed proprietary communication solution that supports connection of hundreds of sensors with only four wires, and is used for deformation monitoring systems for buildings, bridges and tunnels.



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