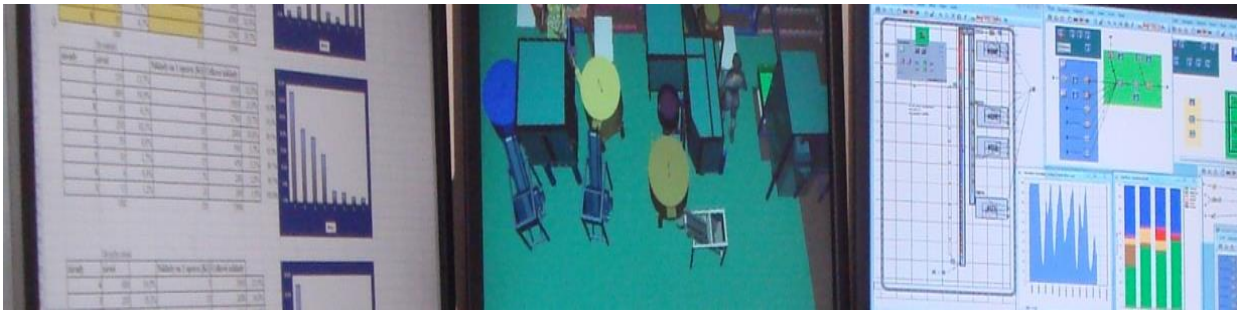
Research program

ARTIFICAL INTELLIGENCE / MACHINE LEARNING

Research and development on modeling basic elements of production systems – equipment, human and process. Research in the area of design regarding autonomous production systems, their control by means of artificial intelligence elements and optimization by heuristic algorithms. Development and applied research of modern elements concerning manufacturing systems – Digital Twin, IoT, Virtual/Augmented Reality, Simulation, Optimization and Decision Algorithms to Support Production Planning, Scheduling and Production Management. Research and application of results in a wide area of automation of production systems, especially in the development of enterprise information systems, in the development of digital factory tools and autonomous production and logistics systems.



Research activities

ANALYSIS, MODELING AND SIMULATION OF PRODUCTION PROCESSES / DIGITAL TWINS

- Research on relationships and interactions between man, machine, computer model and real system.
- Motion analysis - MOCAP, modeling and reproduction of movement of machinery, people and systems.
- Research in the field of virtual commissioning of machines and equipment, remote or assisted operation and service of equipment, using digital twin, virtual (VR) or augmented reality (AR / XR).
- Creation of computational model - digital twin of any CNC machine in order to find dynamic parameters of "unknown" machine and then recalculate real machining time for given NC program.
- Application of 3D models for assessment and optimization in the field of movement economics and work ergonomics.
- Creation of simulation models regarding production systems with real constraints.

DESIGN AND MANAGEMENT OF AUTOMATIC PRODUCTION SYSTEMS (IOT, VR, AR/XR, EA)

- Development of autonomous manufacturing and logistics systems within Industry 4.0 mainly by IoT and mobile devices. Creating system modules and IoT connecting modules to each other.
- Optimization of control algorithms regarding individual parts, minimization of the amount of transmitted data and communication between all members of the system.
- Development of optimization (EA) and control algorithms. Application to real problems in production systems.
- Development of systems for autonomous control of optimization parameters concerning advanced (EA) optimization algorithms (generally for combinatorial and process problems).
- Research in the area of control and design about production systems using the application of Robot Process Automation (RPA), Artificial Intelligence, Virtual (VR) or Augmented Reality (AR / XR).
- Creation of new tools not only for information transfer in process management, logistics, production and education of employees using mobile platforms, VR, video mapping etc.