MTA SZTAKI

Systems and Control Laboratory (SCL)

Head of department:
Dr. József Bokor

Phone:
+36 1 279 61 17

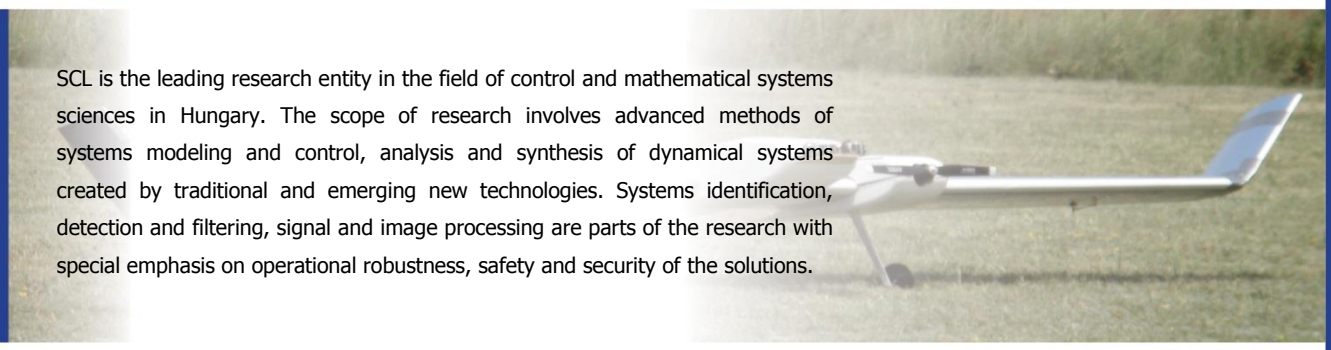
E-mail:
info@scl.sztaki.mta.hu

Address:
H-1111 Budapest, Kende u. 13-17.

Web:
scl.sztaki.mta.hu/en

INTRODUCTION

SCL is the leading research entity in the field of control and mathematical systems sciences in Hungary. The scope of research involves advanced methods of systems modeling and control, analysis and synthesis of dynamical systems created by traditional and emerging new technologies. Systems identification, detection and filtering, signal and image processing are parts of the research with special emphasis on operational robustness, safety and security of the solutions.



MAIN R&D TOPICS

- Deterministic and stochastic theory of linear and nonlinear systems in continuous and discrete time, by means of algebraic and geometric approaches
- Controllability, observability, stability and structural resilience of dynamical systems
- Robust control and filtering in uncertain dynamical systems
- Modelling, analysis and synthesis of Linear Parameter Varying (LPV) systems
- Robust design of control systems based on μ-synthesis, LMI and IQC techniques
- Modell-based detection of system malfunctions and other malicious actions in cyber-physical systems, engineering diagnostics
- Synthesis of dependable systems
- Fault tolerant control in linear hybrid systems
- Optimal control and filtering in large-scale, heterogeneous distributed systems
- Control over networks, coordinated and cooperative control methods
- Modell reduction in big dimension state-space systems
- Advanced signal and image processing, systems identification

With regard to the above fields and theories the laboratory conducts basic and applied research. Applied research focuses on two main application areas: namely, the vehicle industry (including road and commercial air vehicles) and industrial energetics. SCL takes part both in community financed and industrial projects for testing and validation of prototype implementations of the theoretic results in an attempt to bring theory and practice closer to each other.

International relations

SCL maintains an extensive network of scientific relations with foreign partners that plays a crucial role in the embedment of the activity in the global network of international research. This includes multilateral enforcement of project works (both European and Transatlantic), as well as informal communication channels to persons and institutions with academic and industrial engagements. The continued strategic partnership with universities, research institutes and international industrial partners around the world enables the laboratory to keep high standards of science in the research while firmly staying on the platform of real applications.

INDUSTRIAL SOLUTIONS

The main consumers of the results developed by the laboratory are from the energy, vehicle and transportation industry. Both national and international projects of the laboratory aim at providing results in connection to one of these application fields. There have been prototypes, industrialized and partially industrialized solutions developed to various fields of applications in the past time, such as the high performance robust control of one of the most critical safety systems (i.e., pressure control of the primary circuit) of the nuclear power plant of Paks, Hungary, the advanced fault-tolerant control capable to support high safety standards in civil aviation, the control of coordinated vehicle platoon systems for commercial vehicles, moreover the various fault tolerant methods and algorithms developed for intelligent (driverless, autonomous) vehicle systems.

MAIN INTERNATIONAL REFERENCES

- Airbus Industries
- UTC Aerospace
- USA Office of Naval Research (ONR)
- University of Minnesota, MN

MAIN DOMESTIC REFERENCES

- Bosch Magyarország Kft.
- Knorr-Bremse Fékrendszerek Kft.
- MVM Paksi Atomerőmű Zrt.

Development and industrialization of advanced fault detection and fault tolerant control methods for commercial aircraft applications. Smart actuators and resilience in aircraft structures. A machine vision based sense-and-avoid (SAA) collision avoidance detection technology was developed to help mitigating the risks of mid-air collisions in civil aviation. The development of a new data acquisition and control method for the treatment of resonance issues (i.e., fluttering) occurring in the flexible aircraft structures, especially in the wings, during high speed courses helps in the production of safer and more economical aircraft structures in the future.

There have been industrialized solutions developed in the cooperation with OEM, Tier-1 and Tier-2 suppliers operating in the field of vehicle industry in Hungary. The development of various component systems solutions for electric and hybrid-electric vehicles, the efficient platoon control, passenger safety and advanced driver assistance systems with enhanced reliability, energy efficiency and environment awareness promote proliferation of eMobility. The contribution to the primary circuit pressure control refurbishment project have demonstrated the applicability of theoretic results in real industrial practice, efficiently.

MAJOR PROJECTS

- FLEXOP (EU H2020 636307) – Flutter Free FLight Envelope eXpansion for ecOnomical Performance improvement
- VISION (EU H2020 690811) – Validation of Integrated Safety-enhanced Intelligent flight cONtrol systems
- RECONFIGURE (EU FP7 314544) – REconfiguration of CONtrol in Flight for Integral Global Upset Recovery ACTUATION 2015 (EU FP7 284915) – Modular Electro Mechanical Actuators for ACARE 2020 Aircraft and Helicopters
- VKSZ – Platform for Partially Automated Commercial Vehicles with Safety and Economic Considerations
- Bosch Magyarország cooperation – Development of system solutions supporting passenger safety, driver assistance, reliability, energy efficiency and environment awareness of vehicles
- EPIC – Centre of Excellence in Production Informatics and Control