name of the unit:

ARTIFICIAL INTELLIGENCE METHODS IN NON-INVASIVE DIAGNOSIS

Institute of Applied Computer Science, Lodz University of Technology

symbol:

I-24

http://www.iis.p.lodz.pl

head of the unit:	potential promoters:	contact person:
Radosław Wajman, DSc. Ph.D. Eng., Prof. TUL		

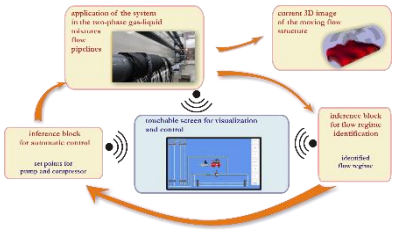
scope of activities:

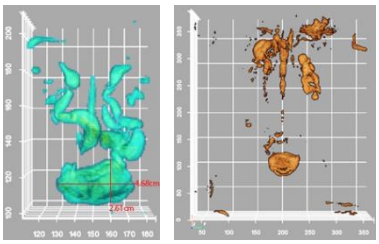
Among the area of my research the most important and the main research are the computer methods for non-invasive three-dimensional tomographic diagnostic and fuzzy control dedicated to the two-phase flow processes (TFP). TPFs arouse growing interest because of their great practical significance. They are closely related to the rapidly developing field of research in bioprocess engineering, biotechnology, environmental engineering, energy, and many other related branches. The growing needs of industry for simple, versatile, relatively inexpensive, non-invasive and rapid method of process diagnosis and control for TPFs in horizontal and vertical pipelines justify the importance of this topic. The knowledge of the characteristics and of the gas-liquid flow type is very important for the design and implementation of industrial-scale research facilities as well as for the process of numerical modelling. The continuous monitoring and diagnosis of any abnormalities can provide valuable information about their dynamic state and allow for continuous and automatic control. The scope of my research covered the development, implementation and verification of:

- raw tomographic measurement data processing algorithms in the context of TPF diagnosis;
- computer methods for spatial ECT sensor modelling and designing;
- fuzzy inference algorithms for the TPFs type identification and regulation;
- software deploying the developed algorithms and methods for the purpose of real flow processes monitoring and regulation.

Despite of the industrial purposes I develop methods of machine learning in medical applications. The main goal is to extract static and dynamic parameters in non-invasive diagnosis of lower urinary tracks.

graphic material





present activities:

Computer Science in Medicine (algorithms of diagnostic data analysis and static/dynamic parameters identification)

Computer Science for Industrial Applications (methods for non-invasive diagnosis and regulation of industrial processes)

Future activities:

Carry on the present activities listed above, with the emphasis on integrating AI methods for non-invasive diagnosis, monitoring and control.

publications/patents/awards/grants:

Fiderek, P., Kucharski, J., Wajman, R. (2021). Fuzzy Regulator for Two-Phase Gas–Liquid Pipe Flows Control. Applied Sciences-Basel, 1, 1-17. doi: 10.3390/app12010399

The portfolio of research groups was created as part of the Programme "STER" – Internationalisation of doctoral schools" as part of the realization of the project "Curriculum for advanced doctoral education & taining – CADET Academy of Lodz University of Technology".

Aghajanian, S., Rao, G., Ruuskanen, V., Wajman, R., Jackowska-Strumiłło, L., Koiranen, T. (2021). Real-Time Fault Detection and Diagnosis of CaCO3 Reactive Crystallization Process by Electrical Resistance Tomography Measurements. SENSORS, 21, 1-20.

Wajman, R. (2021). The concept of 3D ECT system with increased border area sensitivity for crystallization processes diagnosis. Sensor Review, 1, 35-45. doi: 10.1108/SR-10-2019-0254

Wajman, R. (2019). Computer methods for non-invasive measurement and control of two-phase flows: a review study. Information Technology and Control, 3, 464-486. doi: 10.5755/j01.itc.48.3.22189

List of internship proposal in this research team:

List of attachments: