University of Lille

University of Sciences and Technology of Lille & Ecole Centrale de Lille
Laboratory of Automatic Control and Compuer Science
(LAIL-UPRESA 8021)
FDI - FTC GROUP (ASPIC)

LAIL (Laboratoire d'Automatique et d'Informatique Industrielle de Lille) is a shared laboratory between Ecole Centrale de Lille and University of Sciences and Technology of Lille. It is designated (UPRESA 8021) by the CNRS, the French National Organization for Scientific Research. LAIL houses about 90 people in 4 main scientific activities: Discrete Event Systems, Bond-Graph Modeling, Non-linear Control, Fault Detection and Isolation and Fault Tolerant Control, with applications in the fields of Process Control and Manufacturing Systems, Transportation Systems, Agriculture and Biotechnology. Research at LAIL is conducted by university professors, together with PhD students and post-doctoral fellows. LAIL produces an average of 100 publications and 20 theses per year, participates in EC networks, and has scientific cooperations with numerous foreign countries.

THE ASPIC GROUP IN LAIL- UPRESA 8021

The ASPIC group (Analysis and Supervision of Complex Industrial Processes) is concerned with fault detection and isolation and fault tolerant control of complex systems, ranging from the level of sensors and actuators to the higher levels of system supervision. The group develops learning based as well as model based approaches. Learning based approaches are mainly concerned with diagnostic based on qualitative data, with some recent evolution towards data fusion based on information theory, while model based approaches (for diagnosis or for fault tolerance) consider both numerical and qualitative knowledge about the system under investigation. The ASPIC group comprises 10 full time academic staff, 10 PhD students and 2 post-doc fellows.

The research topics include:

- Learning from qualitative data for Diagnosis
- Structural and Bond-Graph approaches to FDI-FTC analysis
- FDI-FTC for non-linear systems
- Intelligent sensors and actuators and distributed FDI-FTC.

Main application domains are:

- Process supervision and diagnosis
- Medical Monitoring
- Transportation systems

FDI-FTC research

The LAIL-ASPIC group has been active within the FDI area since 1982 and has published extensively during this period. It has had a major role in the structuration of the French FDI community as the leader of the Diagnostic group which ran from 1988 to 1996, supported by the national program in Control (PRC-GDR Automatique). Since 1996 it leads the S3 network (Sûreté, Surveillance, Supervision), supported by three national programs (GDR Automatique, GDR ISIS and GDR I3) to which the IMALAIA group belongs. It has focused on the application of qualitative and quantitative methods in the fault detection and diagnosis area following model-based and non-model based approaches; and has currently a major role in building the bridge between the two communities acting in this area (the FDI community in the control field and the DX community in the artificial intelligence field). It has recently extended its research area to the analysis of Fault Tolerance system properties and the design of Fault Tolerant Control systems.

UNIVERSITIES, RESEARCH INSTITUTES AND INDUSTRIAL LINKS

The LAIL-ASPIC group has strong links with industry and academic partners. Applied research has been carried out through cooperations with ELF Aquitaine, EDF, Thomson, IRSID, etc. Contacts with universities and research institutes in France include CRAN, IRISA, LAAS, LAG, LM2S while in Europe cooperations exist with Aalborg, Duisburg, Hamburg, Hull, etc.

LIST OF RECENT PROJECTS

- Thomson - COVADIS Conception et validation d'architectures distribuées
- EDF - Electricité de France Alarm filtering in nuclear power generation plants
- IRSID - Institut de Recherche de la Sidérurgie Fault Detection and Isolation in rolling mills
- COSY - Control of Complex Systems (ESF project) Theme 2: fault tolerant control
- DAMADICS - (RTN) Development and application of methods for actuator diagnosis in industrial control systems
- IDMAP - (RTN) Intelligent devices for manufacturing processes
- S3 - IMALAIA- (ASP) Intégration de modèles alliant Automatique et IA
- S3 (ASP) Méthodes géométriques et statistiques pour la conception d'algorithmes de décision optimaux

KEY STAFF MEMBERS

- M. Staroswiecki Prof., Head of the group
- M. Bayart Prof.
- A. Aïtouche Asst. Prof.
- V. Cocquempot Asst. Prof.
- N. Delfosse Asst. Prof.
- A.-L. Gehin Asst. Prof.
- R. Litwak Asst. Prof.
- B. Ould Bouamama Asst. Prof.
- M. Pollart Engineer
- D. Pomorski Asst. Prof.

M. Staroswiecki is a professor at the University of Sciences and Technology of Lille. He teaches Automatic Control at the Ecole Universitaire d'Ingénieurs de Lille, and is currently Director of the LAIL. He leads the LAIL - ASPIC group. His main research interests are in Fault Detection and Isolation and in Fault Tolerant Control, based on qualitative as well as on quantitative models. He is responsible for the French national program S3; within IFAC he belongs to the Safeprocess technical committee, and is the vice-chairman of the Intelligent Instruments and Components committee.