

LABORATORY COMMUNICATION

Brief introduction to the State Key Laboratory for Industrial Control Technology

The State Key Laboratory for Industrial Control Technology (SKLICT) is located at the Yuquan Campus, Zhejiang University, Hangzhou. It began to operate and to receive domestic and international visiting researchers in 1991. Prof. Chu Jian, Director of Institute of Advanced Process Control Engineering, Zhejiang University, is the director of SKLICT and is in charge of the administration in the Laboratory. Its academic activities are managed by the SKLICT Academic Committee, which consists of 16 experts in the front rank of industrial control research area in China and is chaired by Professor Sun Youxian, an academican of the Chinese Academy of Engineering.

The Laboratory occupies a working space of 3000 square meters. Besides a large number of visiting scholars and research fellows from many research institutes and enterprises throughout China and the world, there are 28 full time members in SKLICT, among them 24 researchers are senior scientists and 2 administrators.

1 Main research fields

The primary goal of research programs in SKLICT is to fill the gaps between modern control theory and its applications in large scale industrial processes. The Laboratory encourages its participants to conduct research work on advanced production automation in conventional industries such as steel-making, paper-making, oil-refining, petrochemical and biochemical processes. Its major research activities are focused on: (i) industrial process modeling and advanced control systems synthesis, including modeling and model simplification techniques for large scale complicated industrial processes, robust control, adaptive control, predictive control, fault tolerant control and structural variation control; (ii) intelligent control and decision making, including the design of intelligent control systems and man-machine systems for industrial processes with parameter uncertainty and information incompleteness, the design of intelligent decision making systems for industrial production planning, scheduling and management; (iii) the design of integrated production management and control systems, including computer aided production scheduling and management techniques, distributed computer systems for production management and control integration; (iv) the computer simulation and computer aided design (CAD) of industrial control systems, including industrial control computer simulation techniques based on integrated expert system, intelligent industrial control CAD system; (v) advanced measurement technology and actuator design, including multi-phase flow measurement, low-pressure-difference valve, soft sensing techniques.

2 Main research achievements

Since its establishment, the Laboratory has undertaken 38 national key projects sponsored by the State Planning Committee and 21 research projects supported by the National Natural Science

Foundation of China. 64 projects have been authenticated by the state authorities, among which 31 won the Science and Technology Awards or the Invention Awards issued by Chinese government or the provincial governments, including "SUPCON JX-100 Industrial distributed control computer system", "Large-scale paper-making process computerized optimal control", "1.4-Million-tons FCCU computerized optimal control", "Ammonia-oxidation process computerized optimal control", "Low pressure drop ratio control valve series", and "Streptomycin fermentation process computerized optimal control". More than 9 million US dollars of the economical benefits were gained through the implementation of research achievements.

In the last three years the Laboratory published more than 400 papers, among which more than 70 papers were published in international journals or presented at international conferences. In addition, 7 monographs have been published.

3 Education and promotion

The education and promotion of young professionals are a key task of the Laboratory. During 1995—1999, 42 young researchers in the Laboratory were promoted as full professors, 15 as associate professors or research associates. In the same period 98 graduate students were conferred the Master of Engineering, 52 the Ph. D. degree, and 8 post-doctoral research fellows finished their research projects. At present there are 74 master graduate students, 77 doctoral students and 7 postdoctoral research fellows working in the Laboratory, and they make great contribution to their research projects.

Presently, 13 young researchers in the laboratory are in charge of the projects supported by the National Key Science and Technology Promotion Plan, the National Hi-Tech R & D Plan, the National Natural Science Foundation, the National Outstanding Young Investigator Fund and other scientific and technical research plans supported by the ministries of the State Council or the provincial governments in China.

4 Opening and Cooperating

Since its opening to domestic and international researchers in 1991, the Laboratory has supported 38 open research projects in which 27 were conducted by the researchers from other institutes of China.

The Laboratory has established close relationship with more than 50 large-scale industrial enterprises in China and several famous research institutes in France, UK, USA and Japan. In the last three years there were 41 foreign researchers visiting the Laboratory, 44 researchers in the Laboratory were sent to other countries for further studying, academic visiting and attending international conferences. The Laboratory has sponsored 3 international academic conferences or symposiums and 5 domestic conferences.

5 Laboratory facilities

The laboratory is equipped with the following advanced research facilities and experimental devices. (i) A set of integrated control simulation system (ICSS) for the researches on system

modeling, advanced control strategy developing, control system simulation and design, which consists of a mainframe computer with 34 terminals, 19 workstations and 24 desktop computers. A number of control system computer aided design software package (e.g. MATLAB©, Mathematica©, Cadence©, Nexpert©, etc.) are installed. All of the computers are connected to Internet and CERNet. (ii) Peripheral equipment supporting scientific computation which consists of an engineering plotter, a graphic color copier, 3 laser and inkjet printers, a high speed printer and a color scanner. (iii) Ten sets of pilot systems for various kinds of complicated industrial process modeling and control strategy validation, including an industrial robot, a biochemical fermentation reactor, a distillation column, an electric heating furnace. (iv) An integrated automation platform composed of an industrial-scale flexible continuous production line and an open distributed control computer system specifically designed to facilitate the research work in the fields of continuous process CIMS and flexible continuous process control.

The State Key Laboratory for Industrial Control Technology

Mailing Address: Zhejiang University, Yuquan Campus, Hangzhou 310027, China

Telephone: 86.571.7951069

Fax: 86.571.7951069

E-mail: nlict@ipc.zju.edu.cn

Correspondence: Prof. Chu Jian, Ms. Xiong Rong