

FARZAD BAGHERNEZHAD



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ACADEMIC HISTORY

Master of Science, Electrical Engineering
Concordia University, Montreal, Canada

Sep 2010 – Expected Aug 2012

Bachelore of Science, Electrical Engineering (Control)
K. N. Toosi University of Technology, Tehran, Iran

Sep 2006 – Jun 2010

Pre University Diploma in Mathematics & Physics
Shahid Danesh High School, Tehran, Iran

Sep 2005 – Jun 2006

High School Diploma in Mathematics & Physics
Shahid Danesh High School, Tehran, Iran

Sep 2002 – Jun 2005

RESEARCH INTERESTS

- System Identification
- Fault Detection, Isolation and Recovery for Complex Systems
- Neural Networks and Fuzzy Logic
- Nonlinear Systems and Control
- Real-Time Systems

BSc PROJECT

Model-Based Fault Detection of Penicillin Fermentation Process by Linear and Nonlinear Methods

Monitoring and control of batch processes are so important due to their important role in producing high-quality materials. This project consists of model-based fault detection on the penicillin fermentation process. The formation of the penicillin profoundly depends on the growth of the microorganisms in a batch culture followed by a fed-batch operation to promote the synthesis of the antibiotic. In this study, fed-batch fermentation simulator had been applied, to make proper data which is proportional to real data, tested in laboratories. This project consists of two major parts;

- **Modelled penicillin fermentation process**

Different kinds of methods have been applied in order to create MISO models of the system. It means, for each output, models depending on all measured variables created in order to estimate the behavior of the output in healthy situation and use its residuals to detect faults in faulty cases. First, linear dynamic methods such as Finite Impulse Response¹ and Auto-Regressive with eXogenous input² are tested to model the system. Then using external dynamics and nonlinear static methods such as Neural Networks³ (Radial Basis Functions⁴ and Multi-Layer perceptron⁵) and Locally Linear Neuro Fuzzy models⁶ trained by Locally Linear Model Tree⁷ algorithm, the process is modelled in a more professional way.

- **Diagnosed industrial faults of the process**

In Fault detection phase of the project, different system and controller faults are implemented permanently, intermittently and incipiently. Then, each model performance on detecting industrial implemented faults of the process was tested. Residual are defined as the difference between estimated output and measured output. Results indicate that by using proper models, detecting faults is with good performance. Finally, by an economical search on sensors of the process, a useful way for modeling and simulation of the process in order to detect faults by cheap sensors is proposed.

Supervised by

Dr. Mahdi Aliyari

Co-Supervised by

Ebrahim Amini

1 FIR

2 ARX

3 NN

4 RBF

5 MLP

6 LLNF

7 LoLiMoT