

# TA01

## Fault Diagnosis

09:00-11:00

Room : 1st Floor-Mozart

Chair1 : Byungwhan Kim ( Sejong Univ., Korea )

Chair2 : Youngjin Park ( KAIST, Korea )

09:00 – 09:20

TA01-1

### Development of Fault Monitoring Technique for Agitator Driving System

Gee-yong Park, Byung-suk Park, Ji-sup Yoon, Dong-hee Hong, Jae-hyun Jin(KAERI, KOREA)

The fault monitoring technique is presented for identifying the status of the agitator driving system in thermal reduction reactor. For identifying a fault such as bearing defect or clearance blocking, Wavelet transform (WT) is applied to vibration signals and features are extracted. For classification, the fuzzy ARTMAP is employed. With the features from WT, a single training epoch and a single learning iteration are sufficient for the fuzzy ARTMAP to classify the faults. The test results show the perfect classification though some features extracted from the test data are distorted against those in the training data.

09:20 – 09:40

TA01-2

### Efficient FFT-Based Fault Detection Using Mean Absolute Difference

Chun-Ho Jeong, Myung-Hyun Song, Eui-Sung Kang(Sunchon Nat'l Univ., KOREA), Kyung-min Kim(Yosu Nat'l Univ., KOREA)

In this paper, an efficient FFT-based fault detection algorithm is proposed. In our proposed method, fault detection is accomplished by process similar to the conventional FFT-based fault detection. However, the proposed technique adopts fast algorithms for preprocessing, where the conventional operation such as averaging is replaced with recursive average operation that outperforms the former in computational cost. And, the proposed approach utilizes the feature vector with the small dimension, which is extracted from spectral components of the lower and upper sidebands around the fundamental frequency. The mean absolute difference (MAD) criterion is used to finally determine whether motor ...

09:40 – 10:00

TA01-3

### Fault Detection and Isolation Performance Analysis of Modified SPRT with respect to Inertial Sensor Errors

Jeong-Yong Kim, Cheol-Kwan Yang, Duk-Sun Shim(Chungang Univ., KOREA)

We analyze the effect of main inertial sensor errors such as, misalignment, scale factor error and bias on the performance of modified sequential probability ratio test (SPRT) for sequential fault detection and isolation (FDI). The inertial sensor errors cause the modified SPRT method to give false alarm. We use a two-stage KF to obtain a modified parity vector with which the inertial sensor errors can be removed and thus modified SPRT method can be used regardless of inertial sensor errors.

10:00 – 10:20

TA01-4

### Simultaneous Faults Detection and Isolation Using Null Space Components of Faults for INS Sensor Redundancy

Cheol-Kwan Yang, Duk-Sun Shim(Chungang Univ., KOREA)

We consider inertial navigation system (INS) sensor redundancy and propose a method which uses singular value decomposition to detect and isolate faults when even two sensors have faults simultaneously. When redundant sensor configuration is given, such as symmetric configuration in INS, the range space and null space of configuration matrix are determined. We use null space of configuration matrix and define 21 reference fault vectors which include 6 one-fault vectors and 15 two-fault vectors. Measurements are projected into null space of measurement matrix and compared with 21 normalized reference fault vectors, which determines fault detection and isolation.

10:20 – 10:40

TA01-5

### Modular Backpropagation Network to Diagnosing Plasma Processing Equipment

Byungwhan Kim(Sejong Univ., KOREA)

Processing plasmas are playing a crucial role in either depositing thin films or etching fine patterns. Any variability in process factors (such as radio frequency power or pressure) can cause a significant shift in plasma state. When this shift becomes large enough to change operating condition beyond an acceptable level, overall product quality can greatly be jeopardized. Thus, timely and accurate diagnosis of plasma malfunction is crucial to maintaining device yield and throughput. Many diagnostic systems have been developed, including HIPOCRATES [1] and PIES [2]. Plasma equipment was also diagnosed by combining neural network and expert system called Dempster-Schafer Theory [3]. A fact c...

10:40 – 11:00

TA01-6

### Feedback scope for fault detection and localization

Hunsang Jung, Youngjin Park(KAIST, KOREA)

The damage localization of the structural system using the natural frequency measurement only is proposed. The existing methods use the changes of mode shape, strain mode shape or curvature mode shape before and after the damage occurrence as these shapes carry the geometric information of the structure. Basically, the change of natural frequencies of the structure can be used as the indicator of the damage occurrence but not as the indicator of the damage location as the natural frequency changes does not carry the geometric information of the structure. In this research, the feedback scope method that measures the natural frequency changes of the structure with and without the feedback loo...