

Development of Early Warning System For Intelligent Digital Power Plant

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1. Introduction

In recent years, unplanned breakdowns due to the degradation of power plants are on the rise, and power generation is expected to change frequently as renewable energy increases. The KEPRI(Korea Electric Power Research Institute) has developed an abnormality detection system to avoid unplanned breakdown of power plant. It is necessary for the power plant facilities to detect abnormal condition early before the occurrence of the fault to minimize maintenance cost. Abnormality detection is a technique used to identify unusual patterns that do not conform to expected behavior, called outliers in dataset. There have been many studies such as statistical, classification, clustering and soft computing in the diagnosis of abnormal conditions [1]. In this study, the proposed algorithm improves predictive diagnostic reliability by adding training data compression and kernel optimization techniques. Proto type software including this algorithm was developed and compared with commercial software.

2. Algorithm Theory

AAKR(Auto-Associated Kernel Regression) predicts the state of the system by comparing past data indicating normal state with measured data. The training data, X , is shown in eq. (1).

$$X = \begin{bmatrix} X_{1,1} & X_{1,2} & \dots & X_{1,p} \\ X_{2,1} & X_{2,2} & \dots & X_{2,p} \\ \vdots & \vdots & \ddots & \vdots \\ X_{n,1} & X_{n,2} & \dots & X_{n,p} \end{bmatrix} \quad (1)$$

AAKR calculate the distance between the training data and a test data. Based on the magnitude of the distance matrix, AAKR is applied a Gaussian kernel function to determine the weight of the system as followed.

$$w = K_h(d) = \frac{1}{\sqrt{2\pi}h^2} e^{-d^2/h^2} \quad (2)$$

We improve AAKR by adding training data compression and optimization techniques by validating test data.

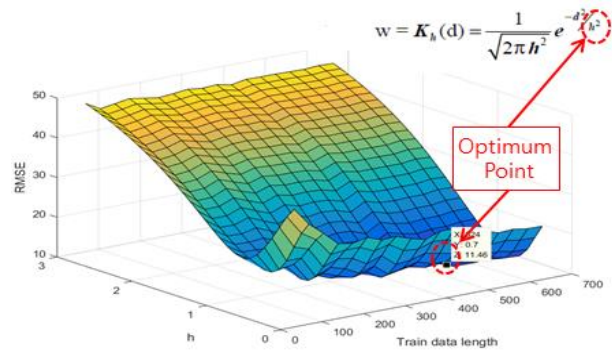


Fig.1 Optimization for AAKR

3. Result

Development App. verified prediction accuracy using power plant data acquired IoT(Internet of Things) sensor data and operation data.

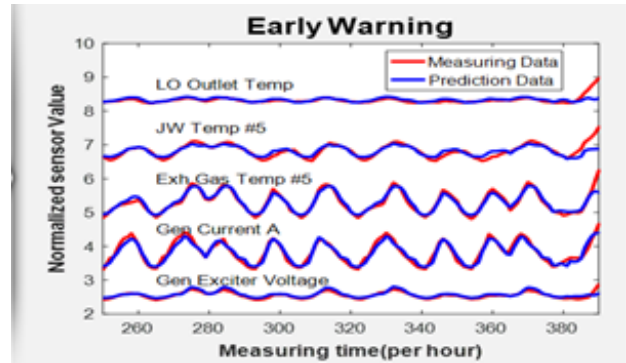


Fig.2 Prediction of Power Plant Facility

4. Future Plan

We plan to build a real-time monitoring system to expand the power plant facilities to be applied. Through additional App. development, we'll build Intelligent and digital power plant system to optimize O&M(Operation and Maintenance).

References

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