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ANOMALY DETECTION FOR OHT SYSTEM IN SEMICONDUCTOR FAB

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ABSTRACT

The material move between processing machine in semiconductor fabrication facilities (FABs) are mainly performed by an overhead hoist transfer (OHT) system, which consists of OHT vehicles and guided tracks. Because the OHT system operates as one-way traffic on most tracks, sudden failure of a OHT system causes the obstruction of other OHT vehicle passages and serious material-flow efficiency degradation. We propose an anomaly detection for OHT sysem with multiple time-series sensor signals collected from a OHT vehicle. We developed recurrent neural network-based autoencoder considering characteristics of a moving object. We demonstrate our experimental setup such as the testbed environment, collected multiple sensor signals, and model establishment. We also show the verification processes and how the IoT board and abnormality system can be applied to actual OHT systems operated in FAB environments.

1 EXTENDED ABSTRACT

The material move between processing machine in semiconductor fabrication facilities (FABs) are mainly performed by an overhead hoist transfer (OHT) system, which consists of OHT vehicles and guided tracks. The OHT system for large scale FABs is typically composed of more than hundreds of OHT vehicles and tens of kilometers of tracks. Because the OHT system operates as one-way traffic on most tracks, sudden failure of a OHT system causes the obstruction of other OHT vehicle passages and serious material-flow efficiency degradation. However, current anomaly detection of the OHT system relies largely on time-based preventive maintenance or corrective maintenance with limited trigger alarms.

In this regard, we propose an unsupervised anomaly detection with multiple time-series sensor signals collected from a OHT vehicle. We developed recurrent neural network-based autoencoder considering

characteristics of a moving object. To validate and verify the proposed method, the datasets were collected by Internet of Things (IoT) board embedded OHT vehicles at the testbed which is the identical environment as the actual FAB as shown in Figure 1. The performance of the proposed method was verified based on several possible anomalies. It was confirmed that detection anomalies that were not captured in the current error alarm or early detection were possible. Based on the research results, the proposed anomaly detection can be used as an industrial solution in actual semiconductor FABs. .

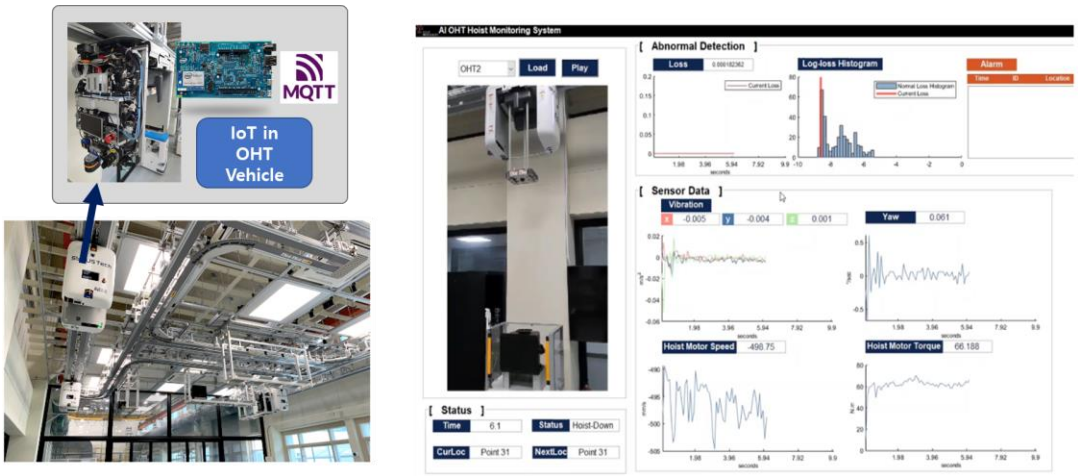

Figure 1: IoT board for the data collection in the OHT test environment (Left) and OHT anomaly detection and analysis test program.

In this talk we will presents an unsupervised learning abnormality detection approach particularly for the operation of an OHT system. In particular, we will describe how to employ a RNN-based autoencoder for detecting anomalies. We will also demonstrate our experimental setup such as the testbed environment, collected multiple sensor signals, and model establishment. Lastly, we will show the verification processes and how the IoT board and abnormality system can be applied to actual OHT systems operated in FAB environments.

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