A DATA FORECAST FOR DETECTING AND CORRECTING SENSOR DATA FAULT IN REAL-TIME

Lan Anh Nguyen[(1)], Eiji Kamioka[(2)], Duc Toan Nguyen[(1)]
[(1)] Ha Noi University of Science and Technology, Ha Noi, Viet Nam
[(2)] Shibaura Institute of Technology, Tokyo, Japan

Introduction

Internet of Things (IoT) systems are generating massive sensor data, supporting the success of various IoT applications, IoT service providers as well as the convenience for end users. In an IoT system, the sensed data are generally collected via IoT devices at the Edge layer in the IoT architecture. The collected data are then being processed and analyzed at the Cloud layer. The analysis process is to understand the surround environments and the need of the monitoring things. Hence, the correctness of the collected data is important. Since the data are processed and analyzed after they are stored on the Cloud, it is almost unable to detect and correct the faulty data in real-time. As a result, the IoT systems waste of time and energy to deliver fault data. This paper addresses this issue by proposing a novelty method based on Data Forecasting to detect and correct faulty sensor data in real-time at the Edge layer. The proposed method has been implemented on a real test-bed using Raspberry Pi. In addition, the detecting and correcting features are developed by using R language. The primary results show that the proposed method can detect and correct faulty sensor data in real- time with the average accuracy of over eighty percent.

Methodology

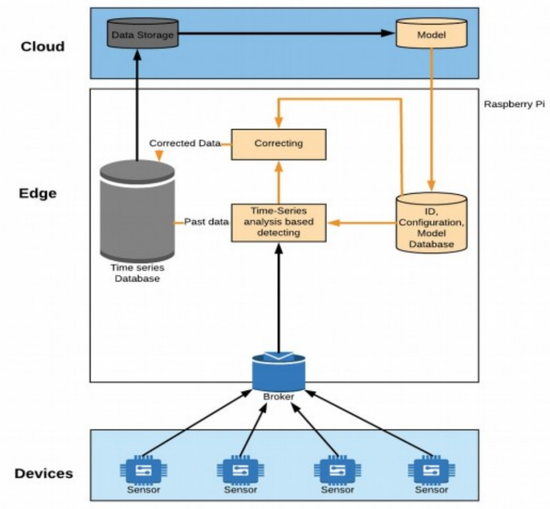


Figure 1: Proposed system

Experiment

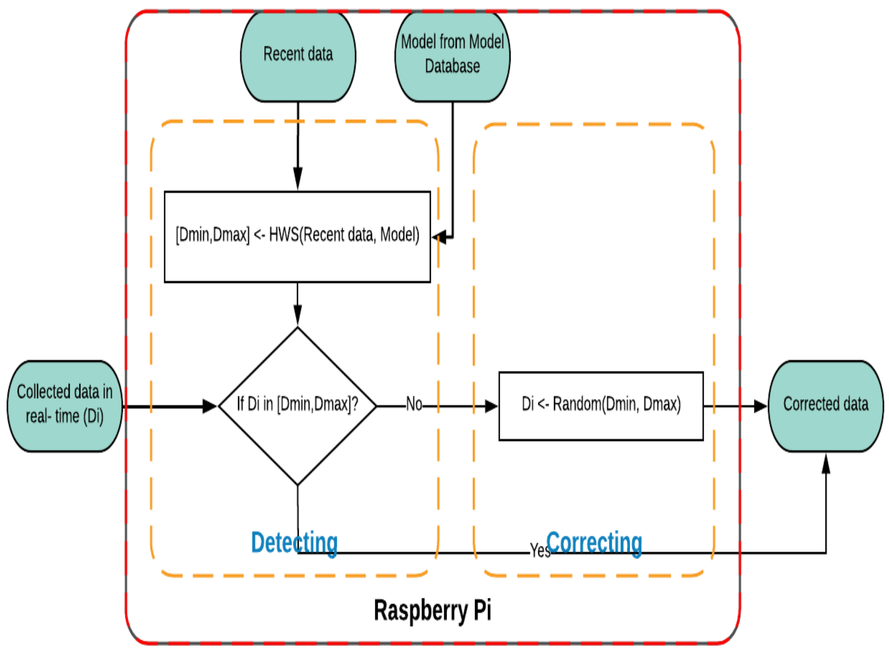


Figure 2: Experiment setup

Two datasets Santander and Sensorscope [1] are used in the experiment. The datasets contain four types of sensor data faults including Bias, Drift, Malfunction, and Random. The data values are continuously pushed to the Detecting and Correcting components developed in Raspberry Pi environment.

Reference

[1] Bas de Bruijn, Tuan Anh Nguyen, Doina Bucur, and Kenji Tei. Benchmark datasets for fault detection and classification in sensor data. In SENSORNETS, pages 185–195, 2016

Results summary

The accuracy of detecting process is calculated as below equation: $A = (N_r/N)(\%)$

N_r: The number of correct detection

N: The total of faults

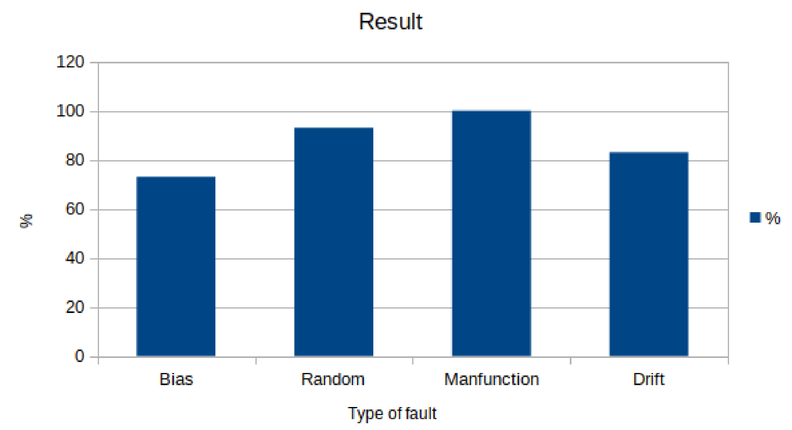
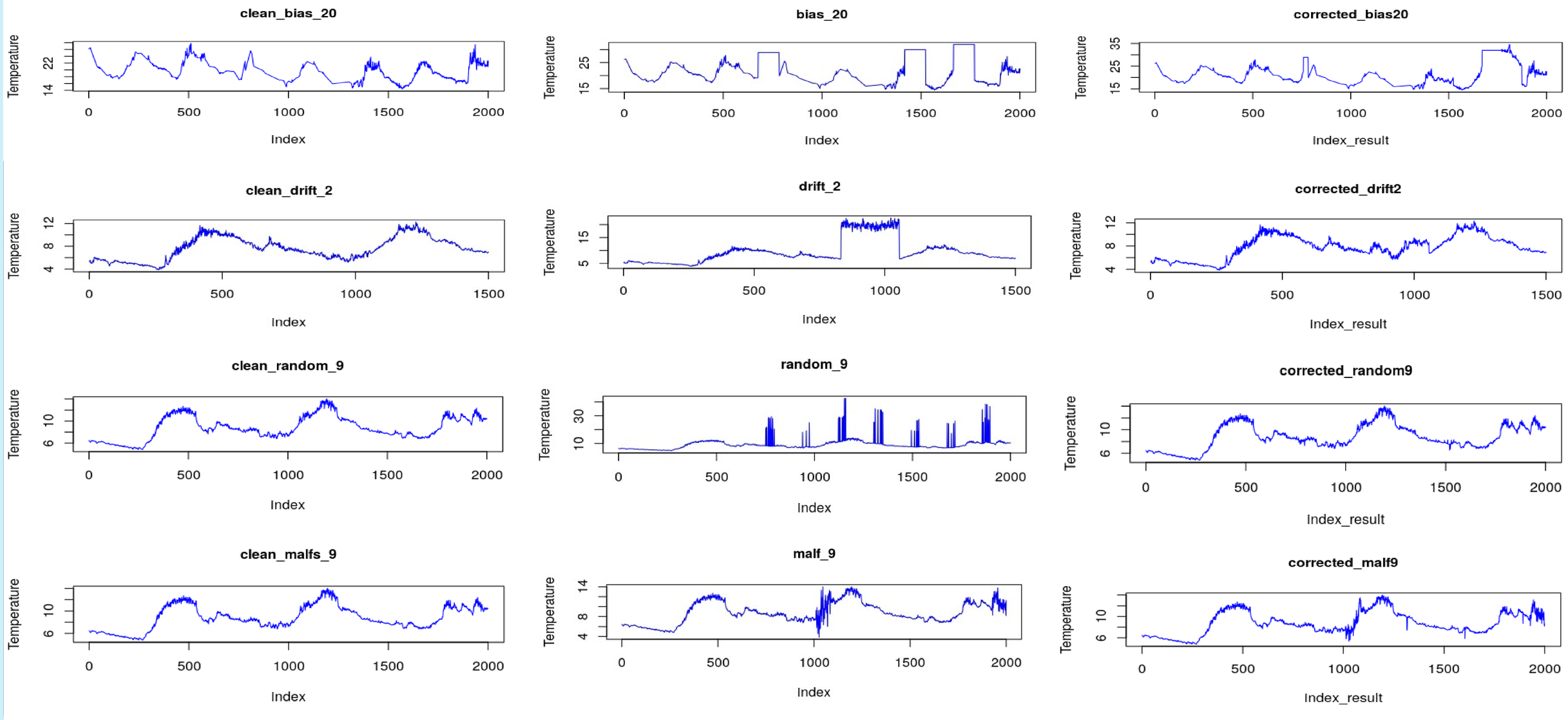


Figure 3: Accuracy in detecting various faults

Results visualization



Clean Data **Faulty data** **Corrected data**

Conclusion

In this research, we proposed a new method to detect and correct faulty sensor data in real-time. The primary obtained results show the correctness of the detection process is over eighty percent.

Contact Information

Lan Anh Nguyen
Ha Noi University of Science and Technology
E-mail: *anh.nl140131@sis.hust.edu.vn*