List of sensor fault detection methods

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Zusammenfassung

This document is meant to list up different methods for sensor fault detection. Furthermore, all methods should be classified whether they can handle specific fault types or not. As we assume the sensor signal as the only input of the fault detection methods, another classification is done concerning the dynamic of the input signal. This classification is done by deciding whether a method is able to detect a specific fault type in a high/middle/low dynamic signal.

1 Preparation

1.1 Fault model

We want to classify sensor fault detection methods concerning specific fault types, the first step is to introduce the underlaying fault model. The model used for this analysis was investigated by Sebastian Zug et. al.

1.2 Process model

2 Methods for sensor fault detection

2.1 Recognizing patterns of sensor faults

Multi-Layer-Perceptron

Time-Delay neural network
Wavelet-Analysis
Hidden-Markov-Models
Support-Vector-Machines
Fuzzy-Classifier
Nearest-Neighbor-Classification

2.2 Using time-redundancy for residual/symptom generation

Gradient-Checking

Tabelle 1: Classification of „Limitchecking of the signals gradient “

	High dynamic	Normal dynamic	Low dynamic
1. Outlier	not appropriate	OK	Well

Average-Checking
Variance-Checking
Auto-correlation-analysis
Fourier-Analysis
Spectrum-Analysis
PCA (AANN)

2.3 Using process models for residual/symptom generation

MLP's
Recurrent neural network (Elman-Network, NARX)
State-Observer
HMM??
Method of (extended) least squares
Transfer-Functions(DGL)