

## Detecting Events in Signals from Sensors: the Hinkley Detector is the Answer

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For the detection of an event, i.e., a significant change in the output signal of a sensor, Hinkley detectors are recommended. There are different versions: the higher-order Hinkley detector (HOHD) and sublevel Hinkley detector (SHD). They yield the following advantages: better estimation of the duration of an event, applicability of routines for adjusting the temporal resolution to the actual signal-to-noise ratio and to the allowed number of missed events, the equation for the correction of the effects of missed events, and automatic identification of events with different magnitudes. The application is illustrated by two examples: detection of multiconductance levels in the patch-clamp current from a *Chara* droplet in a  $K^+/Tl^+$  solution and detection of the mobility of waterfleas used as biosensors of water pollution.

### 1. Introduction

Sensors convert certain physical or chemical quantities into signals which can easily be processed. These are mainly electric signals. However, in addition to the sensor, something must be employed which indicates whether the signal from the sensor contains new information or whether it may be ignored. Very often, this observer is a human being, but computers with adequate algorithms are necessary for automatic devices.

In many cases, the problem involves determining whether a certain parameter has changed its value or not. Often the detection of a significant jump in a time series of data can become a difficult problem for the human being, as well as for a computer, if the data are very noisy.