

# Data processing for multimodal application

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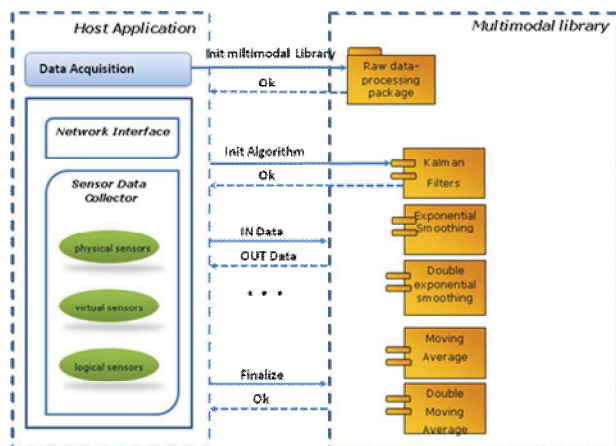
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**Abstract** – Multimodal human-computer interaction is employed in a variety of contemporary information systems in order to enhance the naturalness, flexibility and convenience of user interface. Modality is a mode of communication according to human senses (sight, touch, hearing, smell, and taste) or type of computer input devices (input devices equivalent to human senses: cameras (sight), haptic sensors (touch), microphones (hearing), olfactory (smell) and input devices that do not map directly to human senses: keyboard, mouse, writing tablet, motion input and others). A multimodal interface provides several distinct tools for input and output of data. Data fusion input data is much researched in the field of sensor networks where the primary motivation is to reduce communication costs by the integration of similar data sources. **Keywords** – Multimodal, smoothing raw data, Kalman filter, moving average, exponential smoothing.

## RAW DATA-PROCESSING PACKAGE

The raw data-processing package to evaluate the reliability of data information for sensors environment (pic.1). That it consist of algorithms that smoothed data because the data information influences by environment status may be imperfect[1].



Pic. 1. – raw data-processing data

An often-used technique in industry is "smoothing". This technique, when properly applied, reveals more clearly the underlying trend, seasonal and cyclic components.

There are three distinct groups of smoothing methods

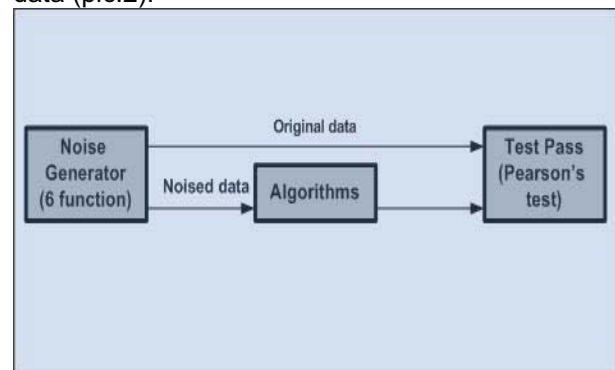
- Averaging Methods
- Exponential Smoothing Methods
- Kalman filter

Kalman filters shall be used to smoothing numerical time series and to estimate the state of a system from possibly erroneous observations. This technique makes it possible to make corrections to noisy Multimodal raw data collected from sensors. Moving average method shall be used to describe stochastic processes that have a finite, short-term linear memory.

Exponential smoothing shall be used to produce smoothed data from a sequence of observations (raw sensor data). The algorithms assign exponentially decreasing weights over time to take into account the fact that the most recent data are the most actual and informative.

## TESTING ENVIRONMENT

The goal of testing is to estimate algorithm's quality, trace functionality issue, and estimate resources consumption and estimate of difference between the data after the algorithm with original data (pic.2).



Pic. 2. – testing environment

The result of testing is choose algorithm in which general restrictions typical for mobile environments shall be kept in mind:

- low memory consumption
- error tolerance for the input data
- speed

## REFERENCE

[1] Ren C. Luo and Michael G. Kay. Multisensor integration and fusion in intelligent systems. IEEE Transactions on Systems, Man and Cybernetics.