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Signal analysis and processing course task 1

Moving average algorithms

Weighted and exponential

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Vilnius
2024

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Abstract

In this report, we compare the Weighted Moving Average (WMA) algorithm, which selects weights based on a Gaussian function, with the Exponential Moving Average (EMA) algorithm. We demonstrate how these algorithms can be used to extract regular signal components such as trends, periodicity, and quasi-periodicity, as well as reduce existing or artificially added noises. We also investigate the effects of different algorithm parameters, such as K and L for WMA, and α for EMA, on the results obtained. For a selected signal, we provide a complete analysis consisting of all the mentioned studies. However, for other signals studied, the report may not include illustrations of all the studies. During the discussion, we can demonstrate the operation of the omitted studies on a computer screen if required. Keywords: Weighted Moving Average, Exponential Moving Average, signal analysis, trends, periodicity, noise reduction.

1 Algorithm implementation

For the implementation of moving average algorithms, python programming language was used. The following libraries were used: numpy, pandas and matplotlib. The code was written in Jupyter notebook, which is attached to this report.

1.1 Weighted Moving Average algorithm

Pateikiamas 1.1 poskyrio tekstas.

1.1.1 The first sub-subsection

Pateikiamas trečio lygio poskyrio tekstas.

$$x = \sum_{i=1}^N m_i \quad (1.1)$$

Table 1. Lentelė ...

test	test
test	test

Sprendimas pristatomas 1 algoritme, o įgyvendinimas – 1 išėities kode.

Algorithm 1. Algoritmas uždavinio sprendimui

Require:

Ensure:

a and b

Listing 1. Pagrindinio metodo žingsniai

```
1 public static void main(String args []) {  
2 }
```

Conclusions and Recommendations

Išvados bei rekomendacijos.

Ateities tyrimų planas

Pristatomi ateities darbai ir/ar jų planas, gairės tolimesniems darbams....

References