



VILNIUS UNIVERSITY
FACULTY OF MATHEMATICS AND INFORMATICS
INSTITUTE OF COMPUTER SCIENCE
DEPARTMENT OF COMPUTATIONAL AND DATA MODELING

Bachelors Thesis

Implementation of application for visualization of regularities and randomness in data

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Keywords

Pateikiamas terminų sąrašas (jei reikia)

Abstract

Santraukos tekstas rašto darbo kalba...

Santrauka

Darbo pavadinimas kita kalba

This is a summary in English...

Introduction

Signals can be observed all around us. For example, measuring the time taken between a weight-driven pendulum clock's ticks produces a signal. It does not require a great deal of effort to image how such a signal behaves. We would expect the clock's pendulum to swing back and forth, each time travelling a minutely shorter distance until the pendulum stops completely. Analysis of even a part of such a signal can help us determine the pendulum's position far into future.

Now consider a more complex signal: the rates of a stock market. People have been analyzing this data for decades, grasping to predict its future state. For the scope of this paper, we defined the term signal processing as *the science of analyzing time-varying processes* [1].

In this thesis we analyzed the non-triviality of digital signals. Certain signals can be classified as simple (relatively trivial), like the aforementioned clock's pendulum. A more complex (non-trivial) signal would be the rates of a stock exchange.

1 Signal processing and Recurrence plot

1.1 Signal processing

A signal is a function that conveys information about the behaviour of a system or attributes of some phenomenon [2]. For example, measuring the time taken between a weight-driven pendulum clock's ticks produces signal. In turn, for the scope of this paper, we defined the term signal processing as *the science of analyzing time-varying processes* [1]. By processing a signal we analyzed the non-triviality of a given signal. Analyzing a signal reveals that some signals have properties that can be categorized.

1.2 Signal property categories

We have considered the following categories:

1. Stationary and non stationary signals
- 2.

Signals have varying properties. Some consist of simple repetitions while others have no apparent patterns. For example, measuring the time taken between a weight-driven pendulum clock's ticks produces a relatively simple (trivial) signal.

2 Web application development

3 Pirmasis skyrius

3.1 Pirmojo skyriaus poskyris

Pateikiamas 3.1 poskyrio tekstas. Vienas iš šaltinių [?]. Visas [?] turinys priklauso 3 skyriui.

3.1.1 Pirmojo skyriaus pirmo poskyrio poskyris

Pateikiamas trečio lygio poskyrio tekstas.

$$x = \sum_{i=1}^N m_i \quad (3.1)$$

Table 1. Lentelė ...

test	test
test	test

Sprendimas pristatomas 1 algoritme, o įgyvendinimas -- 1 išeities 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

- [1] R.G. Lyons. *Understanding Digital Signal Processing*. Prentice Hall professional technical reference. Prentice Hall/PTR, 2004.
- [2] R. Priemer. *Introductory Signal Processing*. Advanced Series In Electrical And Computer Engineering. World Scientific Publishing Company, 1990.

Appendices

Dokumentą sudaro du priedai: A priede

A Pirmojo priedo pavadinimas

Pirmojo priedo tekstas ...

B Antrojo priedo pavadinimas

Antrojo priedo tekstas ...