American University of Central Asia

Applied Mathematics and Informatics Program

Mathematical Model in Acute Cardiac Ischemia Evaluation

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ABSTRACT

This abstract will be written once the paper is more finished.

Keywords: acute cardiac ischemia, ECG, mathematical modeling

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I also thank …

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1 INTRODUCTION

1.1 Important Points

1.1.1 background and purpose

- ischemia and similar diseases are some of the most deadly and common diseases
- when it comes to ischemic heart disease (IHD), rapid decision making is important
- ECG is one of the most widely used diagnostic tools
- reading an ECG is very difficult, which leads to different results among different physicians
- to develop software that analyzes 12–lead ECG to detect IHD
- this could reduce the time it takes to diagnose IHD, which is crucial
- detect changes during myocardial ischemia, some of those remain invisible to physicians

1.1.2 goals

- create a 12–lead ECG analysis tool to diagnose IHD
- we will mathematically model the changes of the ECG compared to at–rest, nominal ECGs

1.1.3 questions, problematic, rationale

- the ECG is the most widely used method to assess heart conditions
- the QRST–wave complex changes when ischemia is present, enabling its detection
- a mathematical model could make the analysis of ECGs easier for doctors and speed up their diagnosis
- the model needs to work well for this to be possible
- such a tool would remove some of the problems that normally exist (mentioned above)

1.1.4 background, literature review

- heart disease is a significant medical issue
- one of the most deadly ones
- middle income countries like KG are hit harder
- health expenditure in KG is also one of the lowest
- IHD is the main killing disease
- for most treatment methods, the longer the treatment is delayed, the lower the chances of survival become
- if the necessary infrastructure is nonexistent, treatment times cannot be reduced to acceptable levels
- basically, in Kyrgyzstan most modern and good methods do not work because of the missing infrastructure and economic limits
- computers can help to analyze an ECG, which makes diagnosis easier

1.1.5 methods

- get 100 digitized ECGs from healthy volunteers
- from this a good model of healthy and stressed ECGs should be created
- maybe use FFT for the analysis
- use a Maplesoft Signal Processing Tool for wave analysis

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1.3 Advice from Imanaliev

1. Search for the recent advancements in published papers
2. Search for the advancements in software of the related problems
3. Study the Fourier Transform and Fast Fourier Transforms, and their representation on chosen software
4. Comparison of the different transforms for the related problem
5. Scan of the paper based verified cardiograms and digitalising
6. Comparison of the scanned graphs with the verified graphs
7. Adjustment of the software parameters
8. Error estimate
9. Analysis of the results with doctors
10. Real time method probation
11. Adjustment of the parameters
12. Thesis preparation and submission
13. Scientific Paper preparation and submission
14. Distribution of the results in media and analysis of references
15. Adjustment of the parameters

1.4 Content requirements

1.4.1 Introduction

- short, verbal problem statement
- rational relevance of the selected topic
- formulates goals and objectives of the project
- refer to some information
- maybe a brief description of the main results

1.4.2 Literature Review

- overview of the current state of the problem
- based on analysis of literary sources
- don't summarize sources, just give the important information they contain
- don't just call it "Literature Review", call it something like "Mathematical models and methods of magnetotelluric monitoring"

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