Silesian
University
of Technology

SILESIAN UNIVERSITY OF TECHNOLOGY

FACULTY OF AUTOMATIC CONTROL, ELECTRONICS AND COMPUTER SCIENCE

PROGRAMME: CONTROL, ELECTRONIC, AND INFORMATION ENGINNERING

Final Project

Title of engineer thesis

author: Name Surname

supervisor: Name Surname, DSc PhD

consultant: Name Surname, PhD

Gliwice, February 2022

Contents

Abstract

The text of the abstract should be copied into a respective field in the APD system. The Abstract with keywords should not exceed one page.

Keywords: 2-5 keywords, separated by commas

Chapter 1

Introduction

- introduction into the problem domain

- settling of the problem in the domain

- objective of the thesis

- scope of the thesis

- short description of chapters

- clear description of contribution of the thesis's author – in case of more authors table with enumeration of contribution of authors

Chapter 2

[Problem analysis]

- problem analysis

- state of the art, problem statement

- literature research (all sources in the thesis have to be referenced [2, 1, 3, 4])

- description of existing solutions (also scientific ones, if the problem is scientifically researched), algorithms, location of the thesis in the scientific domain

Chapter 3

Requirements and tools

- functional and nonfunctional requirements

- use cases (UML diagrams)

- description of tools

- methodology of design and implementation

Chapter 4

External specification

- hardware and software requirements

- installation procedure

- activation procedure

- types of users

- user manual

- system administration

- security issues

- example of usage

- working scenarios (with screenshots or output files)

Figure 4.1: Figure caption (below the figure).

Chapter 5

Internal specification

- concept of the system

- system architecture

- description of data structures (and data bases)

- components, modules, libraries, resume of important classes (if used)

- resume of important algorithms (if used)

- details of implementation of selected parts

- applied design patterns

- UML diagrams

Use special environments for inline code, eg **int** a; (package `listings`) or **int** a; (package `minted`). Longer parts of code put in the figure environment, eg. code in Fig. 5.1 i rys. 5.2. Very long listings–move to an appendix.

```
1  class test : public basic
2  {
3      public:
4          test(int a);
5          friend std::ostream operator<<(std::ostream & s,
6                                          const test & t);
7      protected:
8          int _a;
9
10 };
```

Figure 5.1: Pseudocode in `listings`.

```
1  class test : public basic
2  {
3      public:
4          test (int a);
5          friend std::ostream operator<<(std::ostream & s,
6                                          const test & t);
7      protected:
8          int _a;
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10 };
```

Figure 5.2: Pseudocode in `minted`.

Chapter 6

Verification and validation

- testing paradigm (eg V model)

- test cases, testing scope (full / partial)

- detected and fixed bugs

- results of experiments (optional)

Chapter 7

Conclusions

- achieved results with regard to objectives of the thesis and requirements

- path of further development (eg functional extension ...)

- encountered difficulties and problems

Table 7.1: A caption of a table is **above** it.

ζ	alg. 1	alg. 2	alg. 3 $\alpha = 1.5$	$\alpha = 2$	$\alpha = 3$	alg. 4, $\gamma = 2$ $\beta = 0.1$	$\beta = -0.1$
0	8.3250	1.45305	7.5791	14.8517	20.0028	1.16396	1.1365
5	0.6111	2.27126	6.9952	13.8560	18.6064	1.18659	1.1630
10	11.6126	2.69218	6.2520	12.5202	16.8278	1.23180	1.2045
15	0.5665	2.95046	5.7753	11.4588	15.4837	1.25131	1.2614
20	15.8728	3.07225	5.3071	10.3935	13.8738	1.25307	1.2217
25	0.9791	3.19034	5.4575	9.9533	13.0721	1.27104	1.2640
30	2.0228	3.27474	5.7461	9.7164	12.2637	1.33404	1.3209
35	13.4210	3.36086	6.6735	10.0442	12.0270	1.35385	1.3059
40	13.2226	3.36420	7.7248	10.4495	12.0379	1.34919	1.2768
45	12.8445	3.47436	8.5539	10.8552	12.2773	1.42303	1.4362
50	12.9245	3.58228	9.2702	11.2183	12.3990	1.40922	1.3724

Bibliography

[1]   Name Surname and Name Surname. *Title of a book.* Hong Kong: Publisher, 2017. ISBN: 83-204-3229-9-434.

[2]   Name Surname and Name Surname. 'Title of an article in a journal'. In: *Journal Title* 157.8 (2016), pp. 1092–1113.

[3]   Name Surname, Name Surname and N. Surname. 'Title of a conference article'. In: *Conference title.* 2006, pp. 5346–5349.

[4]   Name Surname, Name Surname and N. Surname. *Title of a web page.* 2021. URL: `http://somewhere/on/the/internet.html` (visited on 30/09/2021).

Appendices

Index of abbreviations and symbols

DNA deoxyribonucleic acid

MVC model–view–controller

N cardinality of data set

μ membership function of a fuzzy set

$\mathbb{E}$ set of edges of a graph

$\mathcal{L}$ Laplace transformation

Listings

(Put long listings in the appendix.)

```
1  if ( _nClusters < 1)
2      throw std::string ("unknown number of clusters");
3  if ( _nIterations < 1 and _epsilon < 0)
4      throw std::string ("You should set a maximal number of
           iteration or minimal difference -- epsilon.");
5  if ( _nIterations > 0 and _epsilon > 0)
6      throw std::string ("Both number of iterations and minimal
           epsilon set -- you should set either number of
           iterations or minimal epsilon.");
```

```
1  if (_nClusters < 1)
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```

List of additional files in electronic submission (if applicable)

Additional files uploaded to the system include:

- source code of the application,

- test data,

- a video file showing how software or hardware developed for thesis is used,

- etc.

List of Figures

List of Tables