**Latvia university of life sciences and technologies**

**Faculty of Information technologies**

**Department of Computer Systems**

**Name surname**

**Title of the thesis**

**Bachelor thesis
for obtaining an engineering bachelor's degree
in Computer control and computer science**

|  |  |  |  |
| --- | --- | --- | --- |
| **Supervisor:** |  | Dr.sc.ing., prof. | N.Surname |
|  | *signature, date* |  |  |
|  |  |  |  |
| **Consultant:** |  | Mg.sc.ing., lect. | N.Surname |
|  | *signature, date* |  |  |
|  |  |  |  |
| **Author:** |  | Matr. No. IT04521 | J. Bērziņš |
|  | *signature, date* |  |  |

**Jelgava 2023**

ABSTRACT

The abstract is a short and precise reflection of the work, which does not exceed one page. The abstract shall be created according to the sample that is added in library catalogues – it should include two types of information:

1) formal description of the work – author of the work, title of the work, brief description of the scope of the work: city, year, number of pages (up to the appendices), tables, figures, information sources and appendices;

2) a brief description of the content of the work, emphasising the author's research. This description should not duplicate the task of the bachelor’s thesis. After reading the abstract, the what, why and how described in the bachelor’s thesis should be clear.

References to specific sections of the work and used literature sources are not used in the abstract.

The abstract shall be written in two languages (each on a separate page): Latvian and English.

A sample of the abstract:

**Bērziņš J.** Development of a new image segmentation method: bachelor's thesis. Jelgava: LBTU, 2017. 78 pages, 10 figures, 3 tables, 15 sources of information, 3 appendices.

The master's thesis examines several existing algorithms of image segmentation methods and the shortcomings of these methods. In addition, various image enhancement techniques are described, which can be used to increase the quality of the image segmentation result.

For the purposes of developing a new segmentation method, several algorithms are offered, including segmentation algorithms independently developed by the author and image enhancement techniques. A programme has been created for the study of algorithms, which allows comparing the proposed methods, and an analysis of these algorithms has been carried out.

A new image segmentation method has been developed during the work, which uses both image enhancement techniques and developed algorithms. A programme has been developed for studying and evaluating the operation of the new method, which significantly facilitates this process.

Anotācija

Annotation translation into Latvian.

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#  Introduction

The task of the introduction is to provide an idea of the bachelor’s thesis. The introduction is a separate section without sub-sections, but contains certain types of information.

* The aim and tasks of the bachelor's thesis

In this section, the scope and relevance of the topic of the bachelor's thesis should be described, the objective and the tasks set for its achievement should be precisely formulated. The description should not be long, no more than 2 pages.

* Overview of the bachelor's thesis

This section provides an overview of the work's content (excluding the first pages). Indicates how many sections the thesis description consists of and briefly explains the content of each section (characterises what kind of information is given in the respective section, but the explanation should not duplicate the title of the section).

Definitions and designations

If the bachelor thesis uses abbreviations and concepts that are not clearly understood, they shall be explained. The most important concepts used in the bachelor’s thesis and their definitions are usually presented in the form of a table (the table does not need to be numbered), with the entries arranged in alphabetical order.

The symbolic designations or acronyms used in the work and their explanations are arranged in a separate table in alphabetical order. If there are no such designations in the work, or if only generally accepted designations are used in their traditional meaning (for example, IT – information technology), then this section may be omitted.

For example:

|  |  |  |
| --- | --- | --- |
| Abbreviation/Concept | Full word | Definition |
| API | Application programming interface | set of functions that allow access to other services |
| IT | information technology |  |
| Normalization |  | a process of eliminating the units of measurement for data. |

# The structure of bachelor’s thesis

The bachelor’s thesis shall include the following sections:

1. first pages (title page, abstract, table of contents);
2. introduction (objective and tasks of the work, overview of the work, definitions and abbreviations);
3. main part of the work (theoretical part, description of the solution, practical application);
4. summary
5. conclusions and proposals;
6. literature (list of used literature and other sources of information);
7. appendices;
8. informative pages (author's guarantee, evaluation page).

# The main part of thesis

The main part of the bachelor's thesis shall be logically structured, written in literary language, using business language style and professional terminology, and be appropriately designed. A student shall make references to the used sources of information, design tables, figures and other elements in accordance with the requirements of the Methodological Regulations.

The discussion of the topic is usually divided into three blocks.

In the first block, it is desirable to describe the current state of the problem and the known experience in solving it. Here, the author demonstrates his/her ability to select and review literature and other materials, as well as draw conclusions. It should be taken into account that the existing state of the problem, techniques and methodology should not be considered in general, but in a specific context that corresponds to the objectives and tasks of the thesis.

The theoretical part of the bachelor's thesis of the academic study programme shall be of a distinctly analytical nature. It shall form a justification for the problem given in the task and the chosen directions for achieving the set objective (problem solution paths). The theoretical part of the theses of the academic study programme shall preferably be larger than the theoretical part of the theses of the professional bachelor's programme.

The theoretical part of the professional bachelor's thesis shall be related to the chosen stage of the life cycle of real software and the work provided for in it. The specific model of the life cycle of the developed programme should be considered and the work to be performed in it should be justified.

The second block shall describe the solutions proposed by the author and their justification.

The third block shall describe how these solutions were implemented and what results were obtained.

The volume of the main part of the bachelor's thesis is **recommended to be between 40 and 70 pages**, and the first block shall not exceed the total volume of the second and third blocks. The pages starting with the introduction and ending with the list of sources and literature are counted in the volume of the main part.

NOTE! **The volume** of the main part of the bachelor's thesis **shall reach at least the minimum specified limit**. Too little volume of the main part of the bachelor's thesis may be the reason for not allowing the thesis to be defended.

If the work is dedicated to the development of specific software, the amount of programmable units should be indicated, the relationship of the specific development to a certain stage of the life cycle should be reflected on, and all stages of the life cycle of the specific software development should be described. If the specific software is developed or used in the works of the academic study programme, then not only the course of its development, but also what solutions and for what purpose can be obtained with the help of this software should be reflected on.

If the majority of the work consists of programming, then its recommended volume should be at least 800 executable commands (this requirement is only indicative, since the number of lines only partially determines the workload of the software).

## Subsection

All illustrations (sketches, drawings, schemes, diagrams, photos, etc.) used in the work have a common name – figures. Illustrative material placed as figures should complement the text, facilitate its understanding and facilitate the perception of the material presented in the work. At the same time, figures should not duplicate the information contained in the tables. All figures included in the thesis shall be referenced in the text.

The serial number of the figure and its name are placed below the figure, in the centre. The figures are numbered in Arabic numerals by sections or continuously throughout the work. **The name of the figure is written in English** using the same font and size as in the main text, but in bold. Between the text and the figure, as well as after the figure name and explanations, there should be single line spacing. Figure names should be concise and reflect the essence of the information contained in the figure.



Fig. 1. Title of figure (a) first model (b) second model [10]

m – mass; c - spring stiffness; y - mass coordinate;

L - inductance; C - capacity.

The formula text should be placed in a separate line in the centre. Use *MS Equation* or another formula preparation programme. The formulas are numbered in Arabic numerals within the sections or continuously throughout the work. Formula numbers are written in parentheses opposite the formula on the right side of the page. To place the formulas in the centre and the number on the right side, it is convenient to use tabulation marks. The units of measurement are written after the numerical values of the size and in formula explanations. Formula explanations shall be written below the formula, each in its own line. A comma is placed between the explanation and the unit of measurement, a semicolon is placed after the unit of measurement, and a period is placed after the unit of measurement of the last explanation.

An example of a formula:

 , (1)

where *Ek* – kinetic energy, J;

 *m* – mass, kg;

 *v* – speed, m s-1.

In the text, when referring to one of the formulas, its number is written in round brackets, for example, ... **is calculated according to the formula** **(1)**.

Subsubsection

A numbered list or bulleted list shall be used to create structured text. The recommended designation of list items are as follows: a number in parentheses, a letter in parentheses, a bullet*.* It is recommended not to use paragraphs marked with the symbol on several levels to structure the text (it should be noted that it is not possible to refer to such text). It is not allowed to use the same symbol on several levels.

**Bold**, *italics*, underlining, etc. should be used to highlight certain elements of the text, only such highlights should be used consistently throughout the text, i.e. the same type of highlighting should be used for the same type of information, for example, to highlight words in Latin, italics are used.

The main text shall be spell-checked before submission of the finished work. Due to low language skills, the work may not be accepted for defence.

1. Numbered list
2. Numbered list
3. List with letters
4. List with letters
* Bulleted list
* Bulleted list

If the text includes the programme code of a programming language, then the Courier New font should be used for it.

When writing software documentation and other technical documents, a student shall mostly use simple extended sentences and avoid long monolithic text. The function “Text structuring” shall be used where appropriate.

An example of a code formatting:

model.compile(loss='categorical\_crossentropy',

optimizer=Adam(lr=0.0001, decay=1e-6))

epochs = 150

model\_info = model.fit\_generator(

 train\_data,

 steps\_per\_epoch=learning rate,

 epochs=epochs,

 validation\_data=validation)

# Summary

 The results of the work (what exactly has been researched, developed, implemented, etc.) should be described within the framework of one page. In this section, information can also be provided if, in connection with the topic of the thesis, its author has participated in a project (indicating name of the project, place, position held), Latvian or international scientific conference (indicating name, place, time), or has prepared a scientific article and whether this scientific article is accepted for publication (indicating the author(s) of the article, title, edition, number of pages).

# Conclusions and proposals

Conclusions and proposals should be written in the form of theses, guided by the objective and tasks of the formulated work and based on the results obtained in the work.

The conclusions are based only on the materials presented in the sections. They should be specific, provide answers to the tasks set, and show their creative contribution. As far as possible, the fact of whether the defined tasks have been fulfilled and whether it will be possible to achieve the set objective should be reflected on. Conclusions should reflect the knowledge gained by the author of the work, and not generally known things read in literary sources.

In the proposals, the author should show the ways of solving a certain problem, resulting from the summary of the research.

# References

1. Source
2. Source

The list of sources and literature is drawn up according to the Methodological Regulations. The total number of sources is not less than 10 and it is recommended that the number of internet resources does not exceed 1/3 of the total number.

***An example of book source formating***

[1] J. W. Beard and T. O. Peterson, *A Taxonomy for the Study of Human Factors in Management Information Systems*. Norwood: Ablex Publishing, 1988.

[2] E. T. Hall, *The Silent Language*. New York, USA: Doubleday, 1959.

***An example of an article in a journal formating***

[3] G. Gevorgyan and L. Porter, “One Size Does Not Fit All: Culture and Perceived Importance of Web Design Features,” J. Website Promot., vol. 3, no. 1, pp. 25–38, 2008.

[4] J. Lazar, A. Dudley-Sponaugle, and K. D. Greenidge, “Improving Web Accessibility: a Study of Webmaster Perceptions,” Comput. Human Behav., vol. 20, no. 2, pp. 269–288, 2004.

[5] E. T. Loiacono, N. C. Romano, and S. McCoy, “The State of Corporate Website Accessibility,” Commun. ACM, vol. 52, no. 9, p. 128, Sep. 2009.

***An example of an scientific article formating***

[6] X. Sun and Q. Shi, “Language Issues in Cross Cultural Usability Testing: A Pilot Study in China,” in UI-HCII’07 Proceedings of the 2nd International Conference on Usability and Internationalization, 2007, pp. 274–284.

[7] A. Zacepins, N. Bumanis, and I. Arhipova, “Administration of government subsidies using contactless bank cards,” in ICEIS 2014 - Proceedings of the 16th International Conference on Enterprise Information Systems, 2014, vol. 3, pp. 128–132.

***An example of electronic resource formating***

[8] Umer, “Java Card Development Tools,” 2012. [Online]. Available: http://umer555.wordpress.com/category/java-card/. [Accessed: 05-Feb-2014].

[9] G. Purdy, “Rhomobile: Automating App Development across Multiple Mobile Platforms,” 2011. [Online]. Available: http://www.mobiletrax.com/Newsletters/tabid/115/ EntryId/99/Rhomobile-Automating-App-Development-across-Multiple-Mobile-Platforms.aspx. [Accessed: 09-Oct-2014].

CAUTION! The electronic resource must be specified as accurately as possible. You cannot link to an entire site, such as [www.microsoft.com](http://www.microsoft.com)

Appendices

Appendix 1. Title

Appendix 2. Title

**AUTHOR'S GUARANTEE**

With this I, Name Surname, matriculation No. IT12345, guarantee, that master thesis is written by me individually. Version which is uploaded in LLU IS matches printed and submitted version.

Information that is gathered from other resources is properly referenced. Thesis is not published before and for the first time submitted for defense in State Examination Committee of Latvia.

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| --- | --- | --- | --- | --- |
| \_\_.05.2023. |  | *(signature)* |  | N.Surname |