

# **Graduation Thesis**

## **How to Write Your Graduation Thesis**

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Your Name

### Abstract

This guide describes how to write your graduation thesis according to the regulation of Computer Science Course, School of Informatics and Mathematical Science, Faculty of Engineering Kyoto University. This regulation specifies the rules about the structure and format of the thesis which you need to follow in writing. This guide also explains how to use a  $\text{\LaTeX}$  style file for graduation thesis, named `kuisthesis`, with which you can easily produce a well-formatted thesis. This guide itself is written using `kuisthesis`; the source code may be helpful if you would like to know how to use this style file.

## 特別研究報告書執筆の手引

姓 名

### 内容梗概

この手引は、京都大学工学部情報学科計算機科学コースにおける特別研究報告書の構成と形式について説明したものである。また、当コースで定めた形式に則った論文を日本語  $\text{\LaTeX}$  を用いて作成するためのスタイル・ファイル `kuisthesis` の使い方についても説明している。なお、この手引自体も `kuisthesis` を用い、定められた形式に従って作成されているので、必要に応じてソース・ファイルを参照されたい。

# How to Write Your Graduation Thesis

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# 1 Introduction

As you graduate the B.E. course, you have to submit your graduation thesis in which the results of your research work in the course are compiled. Thus, your thesis should be respected as an important milestone on finishing the course. Your thesis will be kept in the Faculty library long years so that teaching staffs and student refer it.

Your thesis must describes your research work clearly keeping a given page limit. You must pay close and great attention to the structure of your thesis and every sentences, phrases and words. This guide shows guide-lines of writing theses and instructions to make theses meet the standard of the Faculty. Following these guidelines and instructions, however, are not sufficient to write a good thesis, but they should be regarded as minimum requirements. The objective of writing a thesis is not to meet a standard but to make readers understand your research works correctly and clearly. Therefore, it is strongly recommended to read good research papers so that you develop your faculty for description and expression.

In the following sections, the standard structure of a thesis is shown, and then detailed instructions on writing a thesis are given. In appendix, a  $\text{\LaTeX}$  style file for theses, `kuisthesis`, and how to use it are explained.

## 2 Structure of Thesis

A thesis must consist of an abstract, a table of contents and the main text. Appendices may be added if necessary. Since each component has its own role, a component must be separated clearly from others and must have description appropriate to its role.

### 2.1 Abstract

The abstract of a thesis summarizes what the research work aimed at and what conclusion was formed. Thus, the abstract is not a condensed version of the thesis, but has to be essence of the thesis. Also note that an abstract is not an introduction.

## **2.2 Table of Contents**

The table of contents has a form like ordinary text books and is placed just before the main text. The table is useful to readers not only in looking up a section, but also in grasping the structure of your thesis.

## **2.3 Main Text**

The main text should be self-contained. Although your thesis may have appendices, your thesis must be understandable by reading the main text only.

It is strongly recommended that the main text has an introduction, the main issue, and a conclusion.

### **2.3.1 Introduction**

The introduction describes what position your research work occupies in a research area, what the research aims at, and how the research is characterized. Through those descriptions, readers will grasp the significance of your research work before reading the main issue.

Note that an introduction is different from an abstract in which the essence of a thesis is described. Rather, the introduction makes readers *warmed-up* and ready to proceed to the main issue. Thus, it may be necessary to show the past and/or current state of the activities in the research area as a background, and to mention the relationship and difference between your work and other related works.

### **2.3.2 Main Issue**

Since the main issue is obviously the body of your thesis, most of pages of the thesis should be given to the main issue. You must make much account of the completeness and consistency of the thesis, while emphasizing important issues. Also you must keep conscientious description in your mind, strictly and clearly separating what you did and what others did.

In order to keep the clearness of your thesis, which is the most important feature, take account of the following advice.

- Split the main issue into chapters and sections lining up them appropriately and giving them good titles. A section may be split further into

smaller pieces that should have appropriate titles too.

- Make each chapter and section complete, and keep natural relationship between them.
- Use simple and concise expressions. Emphasize important and/or original issues describing them in detail, while summarize other parts.
- Define meaning of symbols used in your thesis clearly and accurately. Arrange the order and detailedness of formulae in a derivation carefully. If a derivation has long and complicated formulae, leave some important ones in the main text, while moving others to an appendix.
- Show bases of approximated and/or experimental equations, if any, clearly.
- Use figures and tables, which are often very important components of a thesis, to give explanations and/or conclusions. If a figure or table is quoted, indicate its source.
- Draw figures and tables carefully and accurately, taking account of the appropriateness of symbols in them. Give a good heading, which is a title or a short explanation, to each figure and table.
- Cite selected important literatures that are tightly related to your work, instead of making a lengthy and redundant bibliography. The list of references should be placed at the end of the main text (just before appendices, if any).

### **2.3.3 Conclusions**

The concluding section summarizes the main results of your research work. Thus this part is naturally the essence of the main issue and concludes the thesis in a more lofty style than the abstract.

If you found derivative and/or unsolved subproblems that are left for future works, they should be mentioned in the concluding section.

The authors of papers traditionally express their thanks to the people who give them guidance, suggestions and supports on their research works. Thus, it is strongly recommended to follow the tradition and to record your acknowledgments to such people after the conclusions.



## 2.4 Appendices

In principle, a thesis must be completed by the components shown above. However, you may add appendices to supplement the main text.

The following are examples that should be moved to appendices, and advice on compiling appendices.

- Long and complicated formula derivations, which are hardly included in the main text because of their length and readability. Give cross references both in the main text and the appendix to show the correspondence between them.
- Proofs of theorems, similarly. If the objective of your research work is to prove these theorems, however, the proofs (or simplified versions, at least) should be in the main text.
- Huge results of observations and/or numerical computations. Although such a result that supports arguments in a thesis is preferably in the main text, huge one should be moved in an appendix leaving a summary in the main text.
- Long source program lists.
- If an extremely huge data or a program list is really necessary to be shown, it may be attached as a separate volume. In this case, the separate volume should have a form similar to the main volume for the convenience of keeping and referring.
- Each appendix, especially for that in a separated volume, should have an appropriate title and a brief explanation so that readers grasp what the appendix shows.

## 3 Instructions on Writing Theses

### 3.1 Symbols and Units

It is strongly recommended that a thesis with a lot of mathematics is typeset using (L<sup>A</sup>)T<sub>E</sub>X or other tool that is good at math handling. If you have to use an ordinary word-processor, choose fonts for math formulae carefully and pay close attention to the positions of subscripts and superscripts.

Symbols used in your thesis must be defined clearly, as mentioned before. If you use many symbols, you may define them in a “table of symbols” inserted in an appropriate place.

Abbreviated symbols for measuring units should be those standardized and/or used in transactions and journals widely. As for a unit whose standard symbol has not been fixed, show what it stands for (in a footnote, for example).

### **3.2 Figures and Tables**

Figures and tables must be inserted in the main text. Arrange the position of a figure or a table so that it is as close as possible to the text that refers it.

The number of a table, like “Table 1.3” and its heading must appear above the table. In case of a figure, its number, such as “Figure 2.1”, and its heading must be placed below the figure.

Use some computer-aided drawing tool, if available, for figures. Otherwise, hand-written figures must be drawn with very much care, as if they are used to make typographical plates. Note that pencil-drawn figures are not acceptable.

In general, a figure or a table must be self-understandable. On the other hand, some description of a figure/table must appear in the main text with the reference of its number.

If you want to show huge results of observations and/or numerical computations, move them to an appendix leaving some important ones in the main text.

### **3.3 Footnotes**

Footnotes are *not* recommended. It is occasionally acceptable, however, to use a footnote for a short annotation in order to make the main text less complicated.

A footnote must have a number to show its correspondence to a part of the main text, as shown in the example below.

A footnote may also be used to cite a literature describing, for example, a proof that is not a part of the main arguments of a thesis. However, remember

this citation style is quite exceptional and the recommended style is to use a bibliography list that is explained later.

**Example (Main Text)**

... this sequential approximation method is used in the proof of a theorem that state differential equations has solutions<sup>1)</sup>, and ... is known as a general feature<sup>2)</sup>.

### 3.4 Literatures

A list of cited literatures should be compiled and should be placed at the end of the main text (and just before the appendices, if any). Each item of the list has a bracketed serial number, like [1], [2], etc. The number also appears at the end of the phrase in which corresponding literature is referred to. A word, such as the name of a person, may also be followed by the number.

For each literature in the list, the name of its author(s), its title, the name of the journal in which it appears, volume number and pages, and published year are recorded, as shown in the bibliography list of this guide. The literatures [1] to [3] appear in journals and proceedings, while [4] is a book.

If a journal has a well-known abbreviation, its full name can be replaced with the abbreviation. In the list of this guide, the article [2] appears in "IEEE Trans. Computers" whose full name is "IEEE Transactions on Computers".

For an article in a journal, it is recommended to add the issue number and published month of the journal together with the volume number and published year. The following is an example of the issue number and published month.

The tenth issue in volume four of a journal, published on October 1995.



Vol. 4, No. 10 (Oct. 1995).

---

<sup>1)</sup> This concept is introduced by Picard, et al. (1890).

<sup>2)</sup> This proof is given in "Modern Analysis" by Whittaker and Watson, p. 123.

### 3.5 Other Suggestions

Before you start writing your thesis, take enough time to plan its structure and length. Discussion on the contents of your thesis in your laboratory is also required. Before finishing, proofread your thesis again and again by yourself to make the thesis free from logical leaps and inconsistency. The proofreading is also required to polish sentences and to remove typos. It is recommended to ask senior members in your laboratory to correct errors caused by your misunderstanding and/or carelessness.

## 4 Concluding Remarks

This guide described how to structure your thesis and how to form it. However, this guide is far from a fully-automatic procedure to write a good thesis, as mentioned at the very beginning.

The most important thing that you must have in your mind on writing your thesis is a strong will to let readers understand your research work. Having enthusiasm for improvement your thesis is also important. We hope you conclude your research work with strong will and enthusiasm.

Finally, if you have any questions on writing your thesis, ask your supervisor.

## Acknowledgments

The author of this guide would like express his thanks to all the teaching staffs in the Faculty of Information Science for their contribution.

## References

- [1] Caplener, H. D. and Janku, J. A.: Improved Modeling of Computer Hardware Systems, *Computer Design*, Vol. 12, pp. 59–64 (1973).
- [2] Beizer, B.: Towards a New Theory of Sequential Switching Networks, *IEEE Trans. Computers*, Vol. C–19, pp. 936–956 (1970).
- [3] Baraff, D.: Curved Surfaces and Coherence for Non-penetrating Rigid Body Simulation, *SIGGRAPH '90 Proceedings* (Beach, R. J.(ed.)), Dallas,

Texas, ACM, Addison-Wesley, pp. 19–28 (1990).

- [4] Barnett, S. and Storey, C.: *Matrix Methods in Stability Theory*, Nelson, London (1970).

## Appendix: How to Use Style File `kuisthesis`

In order to produce a well-formatted thesis following the guidelines and instructions given in this guide, a  $\text{\LaTeX}$  style file, named `kuisthesis` is provided. This appendix explains what you have to do before use the style file and how to use it.

Since this guide itself is produced with the style file, it will help you to refer its source file as an example.

Most of  $\text{\LaTeX}$  commands that will be used in your thesis source file are standard ones. Therefore, see the following book or other textbooks for basic usage of commands and  $\text{\LaTeX}$  features not explained here.

Lamport, L.: *A Document Preparation System  $\text{\LaTeX}$  User's Guide & Reference Manual*, Addison Wesley, Reading, Massachusetts (1986).

### A.1 Configuration of Source File

A source file must have the following format.

```
\documentclass[english]{kuisthesis}
    Specify other options/styles if necessary.
    Define your own macros, etc., if necessary.
\jtitle{<title in Japanese>}
\etitle{<title in English>}
\jauthor{<author's name in Japanese>}
\eauthor{<author's name in English>}
\supervisor{<supervisor's name>}
\date{<submission date>}
\begin{document}
\maketitle                                % output title page
\begin{eabstract}
    <abstract in English>
\end{eabstract}
\begin{jabstract}
    <abstract in Japanese>
```

```

\end{jabstract}
\tableofcontents           % output table of contents
\section{\langle 1st section heading \rangle}
    .....
    \langle main text \rangle
    .....
\acknowledgments
    \langle acknowledgments \rangle
\bibliographystyle{kuisunsrt}  or
\bibliographystyle{kuisort}
\bibliography{\langle BibTEX database file \rangle}
Put appendices here following \appendix or \Appendix, if any.
\end{document}

```

Each component is explained in the following sections.

### A.1.1 Page Format

Each page of a thesis is printed in a area whose width (`\textwidth`) is 14.2 cm and height (`\textheight`) is 22.2 cm. The hight is just enough to contain 32 lines, which is the regulation of a page shown in Section ??.

Fonts in `\normalsize` is the size of 12 pt, which also satisfies the regulation.

### A.1.2 Option Styles

The following style options are available to be specified in the optional argument of `\documentclass`.

- `english`

For a thesis written in English, which you must be on writing. If omitted, the result will have stuff in Japanese, which you do not want to have.

- `withinsec`

Produce numbers of figures, tables and math formulae in the form of “`\langle S \rangle . \langle N \rangle`” where *S* is the `\section` number in which a figure etc. appears, and *N* is its serial number in a `\section`. If omitted, numbering will runs through the whole of a thesis.

In the optional argument of `\documentclass` (or the mandatory argument of `\usepackage`), you may specify supplementary style files such as `epsf`.

Note that style files may be incompatible to the style of theses. For example, you cannot use a4 style because it modifies the height of a page unexpectedly.

### A.1.3 Specifying Title, etc.

The title of your thesis, your name, and your supervisor's name have to be defined by appropriate commands shown at the beginning of this section. After the definitions, do `\maketitle` to make a title page. In the title page, its page number is not printed. However, the page in dvi file has an imaginary page number 1000 for convenience of printing procedure. In the title page, the following items are centered and printed in order.

**type of thesis** Since you specified `english` option for `\documentclass`, the type of your thesis, "Graduation Thesis", is printed using `\Large\bf` font.

**title** The title specified by `\etitle` is printed using `\LARGE\bf` font. If the title is long, put `\\` in the title string to show a line break point, instead of depending on automatic line breaking.

The title is also put on the pages of abstract and table of contents. Since your thesis must have a Japanese abstract with a Japanese title, give the Japanese title using `\jtitle`. Desirable line break points of the title in abstract and table of contents may be different from those in the title page. To cope this, `\etitle` can have an optional argument to specify the title string for abstract and table of contents as;

`\etitle[⟨opt-title⟩]{⟨title⟩}`

where `⟨opt-title⟩` is the title for abstract and table of contents, while `⟨title⟩` is put in the title page.

**supervisor name** The name of your supervisor and his/her title (e.g. "Professor"), which are specified by `\supervisor`, are printed using `\large` font.

**affiliation** You certainly are a master course student and thus belong to "School of Informatics and Mathematical Science, Faculty of Engineering, Kyoto University". Therefore, this string is printed using `\large` font.

**author name** Your name given in the argument of `\eauthor` is printed using `\Large` font. Similar to the title of your thesis, your name also appear in



the abstract pages and you must show your name with Japanese characters using `\jauthor` command.

**submission date** The command `\date` is to specify the date on which you submit your thesis. The date is printed using `\large` font.

#### **A.1.4 Abstract**

An abstract in English should be given in `eabstract` environment, while its Japanese counterpart `jabstract` is for a Japanese abstract. At the top of the first page of each abstract, the title given by `\etitle/\jtitle` and your name specified by `\eauthor/\jauthor` are printed.

The order of printing two abstracts is that of your source file. Thus, it is natural to put `eabstract` environment before `jabstract`.

The page number of each abstract page is printed at the right-upper corner in lowercase Roman numeral. Although the page numbers are “i”, “ii” and so on, naturally, 1000 is added to those in `dvi` file to distinguish them from pages of the main text in printing.

#### **A.1.5 Table of Contents**

A command `\tableofcontents` produce a table of contents. At the top of its first page, the title specified by `\etitle` is printed.

In default, the table contains headings and page numbers of `\section`, `\subsection` and `\subsubsection`. If you want to eliminate `\subsubsection`, for example, do;

```
\setcounter{tocdepth}{2}
```

to set the counter `tocdepth` to 2 so that only level-1 (`\section`) and level-2 (`\subsection`) sections appear in the table.

Additionally, “Acknowledgments” and “References” are included in the table as numberless `\section`. If your thesis has an appendix, “Appendix” and its `\section` and `\subsection` are also included.

Page numbers are not printed for the table of contents, but `dvi` file pages have 1000-plus numbers following abstract pages.

#### **A.1.6 Sectioning**

As in usual  $\text{\LaTeX}$  documents, sectioning is done by `\section`, `\subsection`, `\subsubsection` and so on.

A heading given by `\section` is in two lines and is printed using `\Large\bf` font. A `\subsection` heading is printed using `\large\bf` font, leaving one blank line above it and no extra spaces below it. The command `\subsubsection` acts as `\subsection` but no blank lines are not inserted above and the font size is `\normalsize`.

In default, a heading given by one of these three commands will have a section number, while lower level commands `\paragraph` and `\subparagraph` will not show section numbers. Those lower level commands will not break lines after headings specified by them.

### A.1.7 Figures and Tables

Figures and tables are contained in `figure` and `table` environments, respectively, as usual. Figure (or table) numbers run through the whole of main text in default. If you use `withinsec` option of `\documentclass`, however, numbers runs only through a `\section` and are shown combined with a `\section` number.

Sometimes, you may want to line up two or more figures and/or tables horizontally to saving space. Two environments `subfigure` and `subtable` aims at this horizontal placement. For example, Figure A.1 and Table A.1 are produced by the following command sequence.

```
\begin{figure}
\begin{subfigure}{0.6\textwidth}
  \langle body of Figure A.1 \rangle
\caption{Example of Figure}
\end{subfigure}
\begin{subtable}{0.4\textwidth}
\caption{Example of Table}
  \langle body of Table A.1 \rangle
\end{subtable}
\end{figure}
```

In this example, `subfigure` and `subtable` are enclosed by `figure` environment. However, you may enclose them by `table`.

The environments `subfigure` and `subtable` have the following specifica-

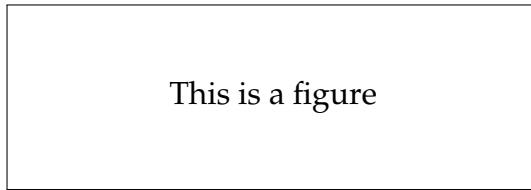


Figure A.1: Example of Figure

Table A.1: Example of Table

This	is	a table
placed	beside	a figure.

tions, similar to `minipage`.

```
\begin{subfigure}[\langle position \rangle]{\langle width \rangle} \langle body \rangle \end{subfigure}
\begin{subtable}[\langle position \rangle]{\langle width \rangle} \langle body \rangle \end{subtable}
```

The command `\caption` in an environment produce a heading appropriate to the environment.

It is recommended that the sum of widths of `subfigure`/`subtable` is equal to `\textwidth`<sup>1)</sup>.

### A.1.8 Itemizing

Standard  $\text{\LaTeX}$  itemizing environments, `enumerate`, `itemize`, `description` and so on, are available as usual. Note that no extra vertical spaces are inserted above/below an environment nor between two `\items`.

### A.1.9 Footnotes

A  $\text{\LaTeX}$  standard command `\footnote` will make a footnote. A footnote marks is this<sup>2)</sup> or this<sup>3)</sup> or those like them. Observing this page and pages having footnotes, you will find that footnote numbers runs only through a page. Remember that you need to run  $\text{\LaTeX}$  twice to have correct footnote numbers.

### A.1.10 Acknowledgments

Your acknowledgments must follow a command `\acknowledgments`. The heading “Acknowledgments” is automatically produced and is included in the table of contents.

---

<sup>1)</sup> You may put spaces between them by, for example, `\hspace{\fill}`

<sup>2)</sup> An example of footnote.

<sup>3)</sup> Another footnote example.

### A.1.11 Bibliography

Use BibT<sub>E</sub>X to make a list of references easily. First, make a database file that includes bibliographic informations of all the literatures cited in your thesis. Then process it with a bibliographic style `kuisunsrt` or `kuisort` to have a well-formatted list like that shown in Section 3.4 and the list of this guide. The order of items in a list is that of appearance if you use `kuisunsrt`, while `kuisort` sorts items alphabetically using author names as keys.

If you cannot use BibT<sub>E</sub>X, you may make the list by `thebibliography` environment, carefully following the style of the list in this guide.

Whether you use BibT<sub>E</sub>X or `thebibliography`, the heading “References” is automatically produced and is included in the table of contents.

### A.1.12 Appendices

If your thesis has an appendix, it must follows a command `\appendix` or `\Appendix`. These two commands act similarly, except for page numbering. The command `\appendix` inhibits page number printing on each page nor each line of the table of contents. On the other hand, `\Appendix` will produce appendix pages numbered A-1, A-2, and so on. In both cases, pages in dvi file have imaginary page numbers from 2001.

Both commands have an optional argument to specify the heading of an appendix itself. For example, this appendix starts with

```
\Appendix[Appendix: How to Use Style File {\tt kuisthesis}] .
```

If the optional argument is not given, the heading of an appendix is simply “Appendix”.

Each sectioning command in an appendix pretends as if it is ranked one level down. For example, a `\section` acts as a `\subsection`. Each section number has a prefix “A.”, and thus it will be “A.1” or “A.2.3” or like them. Similarly, the number of a figure, a table or a math formula also has the prefix “A.”<sup>1)</sup>.

---

<sup>1)</sup> This prefixing is independent from `withinsec` option of `\documentclass`.

## A.2 Other Suggestions

One of the important feature of  $\text{\LaTeX}$  is its capability of customizing functions and parameters for document processing. Thus, it is not forbidden but rather recommended that you add and devise your own functions in order to help yourself in writing a thesis. On the other hand, your own functions must not break the thesis format specified by the Faculty. Thus, it is necessary to balance innovation with conservation.

There are no simple and general guideline to judge whether a customization is allowed. One extreme guideline is that you do something only if you have confidence to do it after fully understanding the style file. If you feel proud that you are a  $\text{\LaTeX}$ nician, follow this guideline.

For other students, a not-so-extreme guideline might be that existing commands and parameters cannot be redefined. If you feel reading the style file to be troublesome, or you cannot understand the style file, follow this guideline.

The author of the style file made all possible efforts in order that the style file is bug-free. However, the author must confess that the style file may not be perfect, mainly because of lack of much application experience. If you have any trouble on using the style file, feel free to post your problem to the local news group `is.misc` of the Faculty. An announcement of new version release and other important notifications will be posted to the news group too. Remember that a teaching staff who is responsible for maintenance of the style file will *NOT* accept direct inquiries to him/her.