Automated Synthesis of NPC AI with ADATE

Project Report

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Abstract

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An abstract is a brief summarizing statement, usually between 75 and 150 words long. It gives the reader a synopsis of the problem, method, results, and conclusions of your document. The abstract takes the form of a paragraph, usually with 5-10 sentences. Abstracts are often collected into volumes and must be able to stand alone. They are read by parties who are trying to decide whether or not to read the main document. Sometimes they are read by people who want to get the big picture before reading the main document. Abstracts can save readers an immense amount of time.

Acknowledgements

An acknowledgments section is sometimes included in the front matter of a longer report, thesis, or collection to note the assistance of people whose help was crucial but not extensive enough to warrant their being listed as co-authors. Thesis advisors, technicians, and colleagues who gave advice or time are all candidates for the acknowledgments section.

Prerequisites (OPTIONAL)

This is from the thesis of Linda Kjeldsen: Because the problems that this thesis deals with cover so many different aspects of computer science, it is not possible to go into every little detail of all the subjects that are mentioned. Consequently, it is assumed that the reader already has knowledge at the same level as a third year student of computer science. The reader should have basic knowledge of the construction of and search algorithms for data structures like binary trees, heaps and arrays. He or she should also be familiar with basic analysis concepts like big-O notation, and the difference between worst case and average case complexity. However, in case there still are unclarities, a glossary can be found in Appendix A, introducing most of the important terms used in this thesis.

Table of Contents

[1]

Chapter 1

Introduction

The introduction to your document should lead your readers into your paper and give them an idea of what to expect. It should not be simply a restatement of the abstract even though it will contain some of the same material.

Introductions often do the following:

- State the subject of your document as clearly as possible
- Define the problem you are addressing, your approach to the problem, and why this problem is important
- State the purpose of your document
- Define the scope of your document
- Provide necessary and relevant background information
- Give an outline of the rest of the document

Because the introduction leads your reader into your document, try to begin with a general statement about the topic before moving on to specific issues. This strategy will help make the topic accessible to your readers, especially those who are not specialists in the field. Illustrations, like Figure , often help to introduce the reader to the problem.

More stuff in Chapter 2.

1.1 Lists

Lists of items can be enumerated and itemized.

1. This is the first item in an enumerated list.
2. This is the second. There is no limit to the length of items in a list. A single item can be several sentences long. You can have lists nested within other lists. You can put equations, tables, and figures in lists as well.
3. This is the third item.

That list was enumerated. The following list is itemized.

- Item number one in an itemized list.
- Itemized lists work just like enumerated list...
- Item $\mathcal{C}$.

Chapter 2

Background

Provide enough information in a technical document to allow your reader to understand the specific problem being addressed and to provide a context for your own document. This background information may include (1) a historical summary of the problem being addressed; (2) a brief summary of previous work on the topic, including, if appropriate, relevant theory; and (3) the specific reasons the document is being written.

In short documents, include background information in the introduction. In longer documents, however, putting some or all of the background information in a separate section with a heading may be more effective. Long and fairly complex reports, especially experimental reports where the purpose of the document is to verify, evaluate, illustrate, or apply one or more theories, often include a separate theory section.

Chapter 3

Design (You may use a more specific title in your report)

Outline a scenario or two, derive some more detailed use cases, then present the resulting design. Use illustrations generously. The design is typically implemented, which is described in Chapter 4.

Typesetting of mathematical and scientific documents were one of the original reasons for developing LaTeX, and as you see, it's working quite well, ...however, the learning curve is a bit steep. Here are some samples to start with.

3.1 Examples of mathematical expressions

Never start a paragraph with an equation! Equation (3.1) says $\alpha = \beta\gamma\delta$.

$$\alpha = \beta\gamma\delta \tag{3.1}$$

Equations are automatically numbered by LaTeX. You can refer to an equation by its number if you label the equation. e.g., Equation (3.1). Labeling equations is optional.

The equation-formatting capabilities of LaTeX are highly touted! The following is an important equation in solid mechanics. It also shows how to do sub-scripts, super-scripts, and fractions.

$$I_{zz} = \int_{-b/2}^{b/2} \int_{-h/2}^{h/2} y^2 dy dx = \frac{bh^3}{12}. \tag{3.2}$$

Other mathematical symbols are available, such as $\approx$, $\pm$, $\times$, $\div$, $\propto$, $\leq$, $\geq$, $\ll$, $\gg$, $\neq$, ∇, $\Re$, $\Im$, $\flat$, $\sharp$, ∂, ∞, $\sin$, $\log$, $\arctan$, $\heartsuit$, and many, many more. Mathematical objects, like arrays, vectors, and matrices can be created as well. See any text on LaTeX for more details regarding mathematical formulas[1].

3.2 Proof of the Area of a Circle Formula $A = \pi r^2$

Theorem 1 *The area of circle with radius r is πr^2.*

Proof: The equation of a circle centered at the origin is

$$x^2 + y^2 = r^2,$$

where r is the radius. We write y in terms of the variable x and the constant r:

$$\frac{x^2}{r^2} + \frac{y^2}{r^2} = 1$$
$$\frac{y}{r} = \sqrt{1 - \frac{x^2}{r^2}}$$
$$y = r\sqrt{1 - \frac{x^2}{r^2}}$$

By symmetry, the area of a circle centered at the origin is four times the area of the circle between $(0, 0)$ and $(r, 0)$ above the x-axis. We can integrate to find the area (A):

$$A = 4r \int_0^r \sqrt{1 - \frac{x^2}{r^2}}\, dx$$

To evaluate the antiderivative of $\sqrt{1 - \frac{x^2}{r^2}}$, we make the substitutions:

$$x = r \sin\theta$$
$$\theta = \arcsin \frac{x}{r}$$

[1] Making Greek letters is a piece of π!

$$dx = r\cos\theta\, d\theta$$

Thus, our integral becomes:

$$A = 4r\int_0^r \sqrt{1 - \frac{x^2}{r^2}}\, dx = 4r\int_0^{\pi/2} r\sqrt{1 - \sin^2\theta}\cos\theta\, d\theta$$

We can use the trigonometric identity $1 - \sin^2\theta = \cos^2\theta$:

$$A = 4r\int_0^{\pi/2} r\sqrt{1 - \sin^2\theta}\cos\theta\, d\theta = 4r^2\int_0^{\pi/2} \cos^2\theta\, d\theta$$

We then apply $\cos^2\theta = \frac{1}{2}(1 + \cos 2\theta)$:

$$\begin{aligned} 4r^2\int_0^{\pi/2} \cos^2\theta\, d\theta &= 4r^2\int_0^{\pi/2} \frac{1}{2}(1 + \cos 2\theta)\, d\theta \\ &= 2r^2\theta\Big|_0^{\pi/2} + 2r^2\int_0^{\pi/2} \cos 2\theta\, d\theta \\ &= \pi r^2 + 2r^2(\sin 2\theta)\Big|_0^{\pi/2} \\ &= \pi r^2 \end{aligned}$$

Thus, the area of a circle with radius r is πr^2. ■

Chapter 4

Implementation (You may use a more specific title in your report)

Present the implementation, with emphasis on the more challenging parts. Remember that you do not need to implement the design to the full extent.

Source code listings often occur in the implementation part of a report:

```
1. Recursive procedure, starting at v = root. 2. Search(v,R)
    a. If v is a leaf, then report the point stored in v if it lies in R
    b. Otherwise, if Reg(v) is contained in R, report all points in the
    subtree of v
    c. Otherwise:
        i. If Reg(left(v)) intersects R, then Search(left(v),R)
        ii. If Reg(right(v)) intersects R, then Search(right(v),R)
```

Chapter 5

Testing (You may use a more specific title in your report)

Testing/Results. Present the results, i.e., most often the testing of the implementation, included, if any, feedback from users.

Table 5.1: Results from querying an area containing very few points surrounded by an area with very high point density. The ratio states what percentage the nodes visited in the staircase query is of the number of nodes visited in the bucket query.

Total # points	**# points in query area**	**Staircase query**		**Bucket query**		**Ratio of visited nodes in bucket and staircase**
		Visited	Reported	Visited	Reported	
1 million	1	558	1	29358	29324	1.9%
	10	546	10	29527	29494	1.85%
	100	1527	100	29798	29766	5.12%
2 million	1	561	1	59144	59107	0.95%
	10	651	10	58837	58804	1.11%
	100	1869	100	59538	59506	3.13%
5 million	1	708	1	147432	147397	0.48%
	10	758	10	147432	147394	0.51%
	100	2117	100	147222	147184	1.44%
10 million	1	771	1	294233	294194	0.26%
	10	850	10	294505	294463	0.29%
	100	2358	100	295236	295195	0.8%

Tables, like Table 5, can be tricky with LaTeX, but just keep calm, google around and copy & paste!

5.1 Summary

Longer chapters may be closed with a small summary section.

Chapter 6

Discussion, Future Work and Conclusions

Wrap up (in separate sections, or integrated in one final section):

Discussion Explain in the discussion section of your document information presented in the results section, commenting on significant data and experience produced by the study.

Conclusions Include a conclusion as the final part of the body of your document. Because some readers of documents, particularly managers, will sometimes not read the entire document but, instead, focus on the conclusion, this part of the document should summarize all essential information necessary for your audience's purpose. In your conclusion:

- Relate your findings to the general problem and any specific objectives posed in your introduction.
- Summarize clearly what the report does and does not demonstrate.
- Include specific recommendations for action or for further research. Sometimes these recommendations will constitute a separate section of a document.

Recommendations Include appropriate and specific recommendations as part of your conclusion or, in feasibility and recommendation reports, as a separate section preceding the conclusion.

Many types of scientific and technical documents conclude by pointing to further action. Research reports often recommend further studies to confirm tentative explanations or to answer

questions presented in the discussion section. Feasibility and recommendation reports always have one or more specific recommendations as the principal aim of the document.

Recommendations should always be specific and appropriate to the document's audience. Separate each specific recommendation. Often authors present recommendations in bulleted or numbered lists. Organize recommendations either in the order of importance or in the logical order of development.

References

[1] Bogie. Hupdupp.

List of Figures

List of Tables