

TTT4295 - Acoustic Signal Processing

Assignment 1

Music Box

performed by

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Person 2

Person 3

Report by

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Summary

This is a set of guidelines for writing the report. This document may also be used as a template for the reports.

The Summary is the report's "commercial". After reading the summary, the reader should understand quite well what has been done. The most important results and conclusions should be reported, hence it should be very similar to the Conclusions chapter.

Contents

1	Introduction	1
2	Theory	3
2.1	FFT	3
2.2	Windowing	3
2.3	Room Impulse Response	3
3	Method and Equipment	4
3.1	Recording setup	4
3.2	Post-processing	4
3.3	Measurement procedure	4
3.4	Equipment	4
4	Results	5
5	Discussions	6
6	Conclusions	7
7	References	8
A	Appendix	10
B	Appendix	11

Contents

Chapter 1

Introduction

The reports should be organized with chapters as in the Table of Contents on the previous page, and in the list below. The reasons are:

- The reading of the report is made much easier when a standardized structure is used.
- This is a very common structure of a report which can be used for most reports on experiments.
- It might seem unnecessarily formal that you should present the work like this, when you have in fact been given the task by the reader of the report (the teachers). The idea is that you should practice presenting your measurements in a way which is easily recognizable by the reader - whatever the origin of the measurement task was.

Please note that the report does not have to be long, and the text in each chapter can be very concise. In the following pages, instructions are given on what each chapter should contain.

Report chapters:

1. **Summary**
2. **Introduction**
3. **Theory**
4. **Measurement method and equipment**
5. **Results**
6. **Discussions**
7. **Conclusions**
8. **References**
9. **Appendix**

In general:

- The introduction should describe what is going to be done. In more general research reports, the introduction will also give a motivation for why the work has been done: what are the unclear questions that have not been solved and published elsewhere? What approach is going to be taken in this report? For a lab assignment report, it is not relevant to argue that you have worked on unanswered research questions - but you should explain what is going to be done.

- Write as a passive 3. person. Focus on what was done, not who did what.
- The report should be objective and all statements should be well documented.
- Only full sentences should be used.
- Be critical about what you include in the report. The reader's patience should not be tested.
- Never assume that the reader knows about what is written in the report. The report should be able to stand on its own without the reader having to read the assignment text.
- You may write in Norwegian. Make sure to change the template to Norwegian headlines and include Norwegian letters if you chose to do so.
- If in trouble with Latex - google it! There is a massive amount of information out there.
- In general research reports, the summary and conclusions are often the first parts that are read of a report, and often the only parts of a report that are read. It is therefore important that these parts are clear and consistent. All unnecessary words and vague formulations give a bad impression.

Chapter 2

Theory

2.1 FFT

Explain the theory behind FFT and how it is used to analyze signals in the frequency domain. Include relevant equations and concepts.

2.2 Windowing

Explain the concept of windowing in signal processing. Discuss different types of windows (e.g., Hamming, Hanning, Blackman) and their effects on spectral leakage and resolution.

2.3 Room Impulse Response

Explain the concept of room impulse response (RIR) and its significance in acoustics. Discuss how RIR can be measured and analyzed.

Chapter 3

Method and Equipment

3.1 Recording setup

To achieve the recording used for this assignment, a smartphone was used to record the sound of a music box in a quiet room. The phone was placed on a table next to the music box, approximately 10 cm away from it. The recording was done using a application that allows for lossless audio recordings in the WAV format.

When playing the music box, we made sure that each note from the music box was played separately, allowing for a clear split between the notes in the recording later. Some notes were played at the same time as an accord, which we couldnt avoid due to the setup of the music box.

3.2 Post-processing

This chapter should describe how the measurements were performed and which equipment was used. The description should be so complete that the measurements could be reconstructed by someone else. The equipment list should contain equipment type, model (often, instrument registration numbers are expected but we don't expect that for these reports).

A sketch of the setup is often a good way to complement your description of the measurement procedure. A sketch can be seen in Fig. and should be referred to like this: ... as illustrated in Fig.. A figure should *not* be referred to like this: "... as shown in the figure below....."¹

3.3 Measurement procedure

Explain the measurement procedure. Again, the procedure should be explained in enough detail that someone else could carry out an equivalent experiment.

3.4 Equipment

List the relevant equipment: manufacturer and model number. Often, instrument registration numbers are expected but we don't expect that for these assignment reports.

¹One reason for not refering to "the figure below" is that Latex software typically moves figures around and then referring to "the figure below" will not work.

Chapter 4

Results

The Results chapter should describe all the results obtained in the experiments, and give comments/discussions to the results (but see also what is written in the Discussions chapter).

- All kinds of figures/diagrams (figure captions should be centered below the diagram), tables (table captions should be centered above the table), and appendices should be numbered.
- *Diagrams should be marked with quantities, units and values for both axes.* Measurement series that are compared, or comparisons with calculated values, should be presented in the same diagram. All variables, constants and abbreviations that are not obvious must be explained.
- Some types of results are more suitable to present in tables rather than diagrams, as curves. Large tables should be placed in the appendices.
- Measurement results should be commented, with an analysis and an evaluation of the results and measurement data with the aim of drawing a conclusion. If possible, the sources of error should be brought up and their possible effect on the results considered. If relevant, deviations should be quantified and given in percent. As mentioned above, see also what is written in the Discussions chapter.
- *Do not present the same data twice.* If you think a curve is the best way to represent the data, leave out the table containing the same data and vice versa.

If you want to present tables, <http://www.tablesgenerator.com/> might be of interest. Tables should be referred to as follows and look something like Table 4.1

Table 4.1: The caption should be above tables.

	Value	Unit
Length	1	m
Volume	2.5	m ³

Chapter 5

Discussions

This chapter could either be its own chapter or be merged with the 4 chapter. If there is a separate Discussions chapter, then the Results chapter should not have any discussion of the results.

Whether in the Results chapter or in a separate Discussions chapter, than measurement results should be commented, with an analysis and an evaluation of the results and measurement data with the aim of drawing a conclusion. If possible, the sources of error should be brought up and their possible effect on the results considered. If relevant, deviations should be quantified and given in percent.

Chapter 6

Conclusions

The Conclusions should be based on (the discussion of) the results. The most important results should be repeated/highlighted. No new information should be listed here. It is important not to forget the purpose of the assignment.

Chapter 7

References

The References chapter should name **all** literature that has been used in the assignment. If you have used an equation from a book or a standard *or the assignment text*, make sure to cite it. To cite a reference, use square brackets, as in [1]. There are many good ways to list your sources, pick one bibliography style and stick with it for all the sources in your report.

Literature references usually look like this (see next page): [Ref.nr.] author, title, publisher, place, year, pages: [1] Nilsson, James W., Electric circuits, Fourth edition, Addison Wesley, New York, 1993, 923 p.

Bibliography

- [1] Nilsson, James W., Electric circuits, Fourth edition, Addison Wesley, New York, 1993, 923 p.

Appendix A

Appendix

The appendix should contain observations, calculations and results that are too long to be included in the previous parts. Data sheets, source code, and things like that can also be included here.

The appendix often includes extra material which works as a compliment to the report for those who want deeper insights into derivations, assumptions made and for those who want to look closer at the results. Raw data might in some cases be possible to include, and might be valuable for the reader.

Appendix B

Appendix

If you have data from different measurements, you might want to use multiple appendices.