

Department of Electrical & Computer Engineering Technology (ECET)

Division of Engineering, Computer Programming, and Technology (ECPT)

EET 4950

Senior Design Project

A Fast Spectrum Sensing for CP-OFDM Cognitive Radio

**Submitted by**

**Student Name and Student Name**

**Supervised by**

**Dr. Barkat**

**April 24, 2015**

**Abstract**

The 1.5 spaced text of the abstract should identify clearly and succinctly the purpose of the research, the methods used, the results obtained and the significance of the results or findings.

Notice that the beginning of the first paragraph is not indented while the beginning of other paragraphs, if any, will be indented.

The abstract, no matter how extended, should not exceed one page.

**Acknowledgements**

In this first paragraph, the authors of the report should gratefully acknowledge the guidance, support and assistance received from their advisor or advisors during the project.

Then, reference should be made to any financial assistance received for carrying out and completing the project. Any important assistance received from other students that helped in carrying out the project should also be properly acknowledged.

Reference should be made to the members of the jury.

In the last paragraph, the authors of the report may also acknowledge any support or assistance they may have received in one way or another and felt, at their discretion, that it deserves mention. The acknowledgement, no matter how extended, should not exceed one page.

Table of Contents

Abstract

Acknowledgements

List of Figures

List of Tables

Chapter 1 Title1

1.1 Type chapter title (level 2)2

1.1.1Type chapter title (level 3)3

1.2 Type chapter title (level 2)4

1.2.1Type chapter title (level 3)5

Chapter 2 Title6

2.1 Type chapter title (level 2)7

2.1.1 Type chapter title (level 3)8

Chapter 3 Title9

3.1 Type chapter title (level 2)10

3.1.1Type chapter title (level 3)11

References12

Appendix A: Title13

Appendix B: Title14

List of Figures

Figure 1.1 Figure caption text as it appears in the report 2

Figure 1.2 Figure caption text 3

Figure 2.1 Figure caption text 4

Figure 3.1 Figure caption text 5

Note: Figure number should be in the format of *chapter number.figure number*. Same goes for table numbers.

List of Tables

Table 1.1 Table caption text as it appears in the report 2

Table 1.2 Table caption text 3

Table 2.1 Table caption text 4

Table 3.1 Table caption text 5

**Chapter 1**

**Introduction**

**Summary**

In this chapter, we present the basic principles of …. Observe that only the major headings are shown on this page. The other subheadingsare given in the table of contents.

The definition of the problem must also be given in this chapter even though the proposed solution with results may be given in Chapter 3. The objectives of the projects must be clearly stated in the introduction, but necessarily in bullets.

The literature serving as a motivation to the considered problem is also given in this chapter.

## Introduction

* 1. **Principles of …**
  2. **Organization of the Report**

## Introduction

It is suggested to use Times Roman 12 points. No indent for the first paragraph, but indent the beginning of the other paragraphs. The left margin will have a spiral so it takes more space than the left margin. Thus, it is suggested that the left margin be 1.25 inches while the right margin is 1 inch.

This is a new paragraph. Observe that it is indented

## Another Heading 2

No indent for the first paragraph, but indent the beginning of the other paragraphs.

### Heading 3

No indent for the first paragraph, but indent the beginning of the other paragraphs. For senior design it is strongly recommended not to go beyond the third heading as shown above; that is there is no fourth heading with number 1.2.1.1. The fourth heading is as shown below in *italic*.

#### Heading 4

No indent for the first paragraph, but indent the beginning of the other paragraphs.

# 

**Chapter 2**

**Background Research**

**Summary**

In this chapter, we present an analysis of … The chapter should contain the necessary background information for the project, but in your case you write the chapter that corresponds to the content of your project. The content is taken form books, papers, internet, class notes, etc… with proper reference.

Any person reading this chapter should be able to follow the contribution to be given in the next chapter.

Observe that only the major headings are shown on this page because this is not a table of contents, but just a guide of the chapter with a summary.

## Introduction

## Principles of …

## 2.3 Title

## 2.1 Introduction

It is suggested to use Times Roman 12 points. No indent for the first paragraph, but indent the beginning of the other paragraphs. The left margin will have a spiral so it takes more space than the left margin. Thus, it is suggested that the left margin be 1.25 inches while the right margin is 1 inch.

This is a new paragraph. Observe that it is indented

## Another Heading 2

No indent for the first paragraph, but indent the beginning of the other paragraphs.

### Heading 3

No indent for the first paragraph, but indent the beginning of the other paragraphs.

#### Heading 4

No indent for the first paragraph, but indent the beginning of the other paragraphs.

### Heading 3

No indent for the first paragraph, but indent the beginning of the other paragraphs.

## Another Heading 3

No indent for the first paragraph, but indent the beginning of the other paragraphs.

**Chapter 3**

**Contribution**

**Summary**

In this chapter, we present an analysis of …

This chapter should contain the contribution because it is your work of the project.

The analysis, results and discussion should be given in this chapter.

A small and more focused literature review may be needed here to situate the problem at hand properly. Note that the extended literature review was given in Chapter 1.

Observe also that even though you are presenting your contribution in Chapter 3, the problem considered was presented in Chapter 1 to avoid a situation where one has to reach the third chapter before knowing the problem you are trying to solve.

**3.1 Introduction**

**3.2 Major Title**

**3.3 Analysis of …**

**3.4 Results and Discussion**

**Chapter 4**

**Non Technical issues**

**Summary**

In this chapter, we will discuss the budget and the economic side of the project… …environmental hazards… safety of the project… the ethicality of the project…some social aspect and sustainability

**4.1 Budget**

**4.2 Environmental Aspects**

**4.3 Health and safety**

**4.4 Ethical Aspects**

**4.5 Social Aspects**

**4.6 Sustainability**

**4.1 Budget**

Mention software used, components, documentation that you may used

**4.2 Environmental Aspects**

The system (for example, the detector, etc..) is friendly to the environment and does not cause any harm since…

**4.3 Health and safety**

The system developed is electrically safe and not harmful when used properly….

**4.4 Ethical Aspects**

All references used for the completion of this project are properly cited etc. You may mention the contribution in the project from the ethical aspect.

**4.5 Social Aspects**

Impact on the society; for example, such a detector is of great use to the society because ….

**4.6 Sustainability**

The processor or system developed will remain in use for … as long as….

**Chapter 5**

**Conclusion**

**Summary**

This is probably theshortest chapterof the report. It contains two sections as shown below. The first section is an extended summary of the work done with observations and conclusions drawn from the findings. This should be about a page or a page and a half.

The second section is just a paragraph showing that this work can be extended and you propose some extensions. This way, it shows that you gained some insight in doing the project and you are able to propose future work.

**5.1 Summary and Conclusion**

**5.2 Suggestions for Future Work**

**Some Comments Regarding the Figure Caption Text, the Table Caption Text, and the Equations**

**Figures**

If a figure is in chapter 2 the number should start with two, and then the number of the order of the figure in the chapter. For example, the basic block diagram of any communication system consists of a transmitter, a channel, and a receiver as shown in Fig. 2.1.Note that if the figure is taken out of the text, it still can be “understood” properly.



Fig. 2.1 Basic Communication System

Observe that the figure is presented **after** citation in the text; that is no figure should appear in the text before being called. Figure 2.2 shows that....

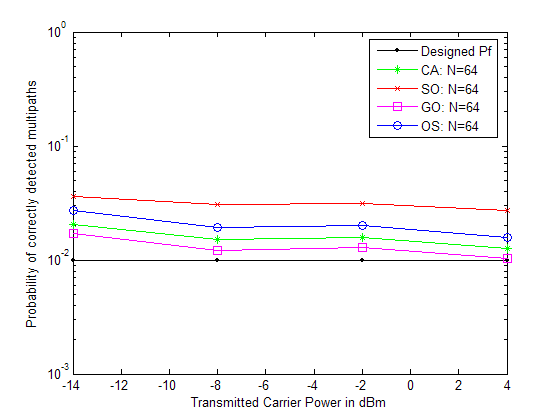


Fig. 2.1 Probability of falsely detected paths using various CFAR detectors versus transmitted carrier power with N=64

Tables

Similarly, if a table is in Chapter 3, then it should start with the number 3 and then the number of order of the table in the chapter. For example, we observe from Table 3.1 that the value of threshold multiplier tends to decrease as the window size increases. We also observe that for any value of N.Again, no table is presented before it is called in the text.Also, note that if the table is taken out of the text, it still can be “understood” properly.

Table 3.1

Comparison of the multipliers for each type of CFAR detector;

|  |  |  |  |
| --- | --- | --- | --- |
| Window Size |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Equations**

The equations must be written by the equation editor and given a number. As in figures and tables, the first number denotes the chapter, while the second number denotes the order of the equation in the chapter. For example, the first equation of Chapter 1 is

where denotes the slope of the equation, and is the independent variable. Observe thatthe equation is centered butthe number of the equation is flushed right and aligned on the same line of the equation.

The first equation of Chapter 2 will have the number (2.1), and so on…

**Samples of a Timeline and a Budget as part of the oral presentation**

****

**References**

It is important to give proper credit to references used by properly citing the work used as a reference and not using it as if it is your own, which is a serious problem. **I always say:**

“**Recognizing the work and contributions of others does not diminish your work in anything, but on the contrary it makes you look beautiful**”

There are many ways of numbering the references in the report, by order of appearance, or chronological, etc. You can check with your advisor for the option to adopt.**However, I recommend the easiest one, which is by order of appearance in the report. That is the first reference you cite in the report will have number [1], the second one will have number [2], etc.**

**How the references should be written in the report.**

**Books:**

[1] M. Barkat, *Signal Detection and Estimation*, 2nd Edition, Artech House , Boston, MA., 2005

[2] P. Peebles, *Probability, Random Variables and Random Signal Processing*, 4th Ed., McGraw Hill,New York, 2001.

**Journal Papers:**

[3] K. Berbra, M. Barkat, and A. Anou, “PN Code Acquisition Using Smart Antenna and Adaptive Thresholding CFAR Based on Ordered Data Variability for CDMA Communication”, *Progress In Electromagnetics Research,* vol. 57, pp. 25-33, January 2014.

[4] S. Dib, M. Barkat, J. M. Nicolas, and M. Benslama, “Chaotic Staggered PRF and Reduced Rank STAP for Airborne”, *International Review of Aerospace Engineering (IREASE),* vol. 7, No. 1, pp.8427-445, February 2015.

**Conference Papers:**

[5] C. E. Shannon, “Two-Way Communication Channels”, *Proceedings of the fourth Berkeley Symposium on Probability and Statistics*, pp. 611-644, Berkeley, CA, 1961

[6]S. Dib, M. Barkat, J. M. Nicolas, and M. Grimes, “Two-Dimensional Adaptive Signal Processing for Airborne Radar”, *ICDIPC 20111, Part II, CCIS 189, Springer-Verlag* Berlin Heidelberg, pp. 244-257, 2011

**Technical Reports and Theses:**

[7] M. Barkat and P.K. Varshney, *On Adaptive Cell-Averaging CFAR Radar Signal Detection*, Technical Report, RADC-TR-87-160, Rome Air Development Center, Air Force Systems Command, Syracuse, NY., April 1987.

[8] L. G. Kraft, *a Device for Quantizing, Grouping and Coding Amplitude Pulse,*MS Thesis, Department of Electrical Engineering, MIT, Cambridge, MA, 1965

**Electronic Sources from Internet:**

[9]Name of author(s) as above, “Title of content”, page, if any, and year. On Line, Available at: Address of link.

**Note** that if one uses the link given, he/she will be able to access the information as suggested; that is the link is **not** disabled.

**Appendix A**

**Title**

Equations should be written with the equation editor and having the following numbers.

Similarly for Equation (A.2), we have

And so on…

**Appendix B**

**Title**

**Summary**

In this appendix we present the MATLAB codes for …..

The codes should have a description at the beginning and the lines commented.

If one reads the introductory comment (or description) of the code, he should be able to know clearly the task or tasks that can be achieved by using the code. That is, state clearly what this code is designed for.

**B1. MATLAB code for…**

**B2. MATLAB Code for…**

**Some Final Remarks**

* Note that a senior design project report, which is a report for an undergraduate work, should not have many chapters. It is suggested **five chapters,** including the non technical issues chapter**,**  as follows:
  + 1. General introduction containing definition of problem
  + 2. Background topics to the problem considered (Pedagogy chapter)
  + 3. The contribution with results and discussion
  + 4. Discuss the non technical issues
  + 5. Conclusion containing a summary along with conclusions, and

suggestions for future work

* Do not underline anything in the text.
* Always use word for spell checking the report. Since the spell-check can automatically correct the spelling of the words, spelling errors are not tolerated, and if they appear in the text makes you look *careless*.
* Make the corrections suggested by your advisor properly and avoid making mistakes in making corrections; otherwise it is an infinite loop...
* Write the names of people cited in the report (references, acknowledgements, etc.) correctly. Misspelling the names of people makes look careless.
* Keep in mind that at the end it is your report and it is in your interest that you give it the greatest attention since the report is the face you presentof a whole year of work on the project.

You may have **at the back the last cover of the reportpictures of the authors with ashort biographyin bullets** if you wish. For example,

**Student Name**

**Photo**

* Graduated from …June 2011(with GPA…)
* Research interest
* Honors…
* Graduated from ….high school in … with honors…
* Anything related to you professional work that makes you look good

**Student Name**

**Photo**

* Graduated from …June 2011(with GPA…)
* Research interest
* Honors…
* Graduated from ….high school in … with honors…grade x%
* Anything related to you professional work that makes you look good