

EITN90 Radar and Remote Sensing

Project instructions

February 19, 2020

Abstract

We describe the requirements for the final project to be performed in the course. The project should demonstrate the students' ability to make engineering trade-offs in the design of a realistic working radar system.

1 General requirements

The projects are typically done in groups of two students. Discuss with Daniel if you have other suggestions.

In the project, you are asked to identify an application which requires a radar sensor. You should then analyze the scenario that the radar would be operating in, to identify the requirements the radar system has to satisfy. Given these requirements, you shall give a suggestion on implementation of the radar system, and explain the different trade-offs you have used, typically referring to the radar range equation. Please consider the text under "Written report" below to have an understanding of the requirements.

Think of this as a situation in your work life as engineer: your company has been charged with the task to handle the total application, and your job is to present a feasible radar sensor part of the solution.

You will need to make your own literature study, google searches etc to find background for the chosen application. You may also have to make your own specifications (with motivations) for some parameters when no information can be found. Some suggestions on applications are given below (some are very broad and you may need to restrict the scope), but feel free to also propose your own.

- Door opener
- Air traffic control
- Remote sensing of Earth from satellite
- Weather monitoring
- Detection and tracking of meteors
- Police radar gun
- Sensors for autonomous vehicles

- Gesture recognition
- ...

You will be assigned one report to review and ask questions on at the oral presentation, and another group will be assigned your report.

2 Deadlines

Send your various submissions as below by email to `daniel.sjoberg@eit.lth.se`.

- 2020-02-25: Submit a draft description of your chosen project, and how you intend to deal with it.
- 2020-03-06: Send your draft written report, directly by email, to the group appointed as reviewers.
- 2020-03-09: Presentation date. Have your own presentation ready, as well as suitable questions to the report you have reviewed.
- 2020-03-09: Send your comments to the group whose report you have reviewed (preferably by giving them an annotated copy at the presentation). Focus on constructive comments: what is good (and why), what can be made better (and how).
- 2020-03-10: After revising the report according to comments from your reviewers and at the presentation, submit your final report.

3 Written report

The written report should be about 10 pages, and submitted in PDF format using L^AT_EX, Word, LibreOffice, or any other suitable program. It should be structured as a scientific paper with the following headings:

- **Title and authors**

- **Abstract**

A short abstract (at most a few hundred words) giving an overview of the report.

- **Introduction**

Introduce the application, and how the general principles of a radar system can help solve some particular task for the application. Make use of references to literature and the web.

- **Application description and requirements**

Describe the application, and where the radar sensor fits in. Derive the requirements for the radar sensor from an analysis of the application. For instance, if the application is a door opener or an airport surveillance system, what kind of ranges and velocities do you need to be able to detect, and with what resolution? There can also be constraints on available power or physical space to implement the radar in, for instance on an autonomous airborne drone.

- **Radar system implementation**

Present the details of a radar system that would satisfy the application requirements. The presentation should be on block level rather than electronic implementation, but should be detailed enough to give for instance all factors in the radar range equation, size of antenna, bandwidth, total power consumption etc. Describe the different trade-offs that can be made, and motivate the choices you made. Illustrate with relevant figures and tables.

- **Discussion**

Discuss your system. Can you identify any critical parts of the system, where a minor improvement can lead to a large benefit for the application? Could the system be useful for some other application, possibly after some alterations?

- **Conclusions**

Give short presentation of your conclusions.

- **References**

A list of the references used.

4 Oral presentation

The project will be presented orally.

- Prepare a presentation for 10 minutes. This usually means 10 slides or less.
- Make sure not to include too much detailed material on each slide. Make sure figures and tables are readable, do not use too small font size.
- Put extra emphasis on explaining the application, and how the application requirements affect the design of the radar system.
- Remember to practice before the presentation, think through who is going to say what, where to stand, and so on.