Differential Drive Robot with Obstacle Avoidance

- Subtitle -

Project Report

Group Name/Number

Aalborg University
Electronics and IT

Here you can write something about which tools and software you have used for typesetting the document, running simulations and creating figures. If you do not know what to write, either leave this page blank or have a look at the colophon in some of your books.

Electronics and IT
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AALBORG UNIVERSITY
STUDENT REPORT

Title:
Differential Drive Robot With Obstacle Avoidance

Theme:
Automation

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Abstract:

Here is the abstract

Contents

Todo list

Preface

Here is the preface. You should put your signatures at the end of the preface.

Aalborg University, November 29, 2016

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Chapter 1

Introduction

The Future of Vehicle Automation In recent years, a big emphasis has been put on the development of autonomous or semi-autonomous ground vehicles. It comes as no surprise considering it is no longer a question of *will* this technology be implemented, but rather *when*.The benefits of autonomous vehicle integration can be considered invaluable. Currently 90% of motor vehicle fatalities are estimated to be due to human errors , meaning that vehicle automation could result in substantial decrease of accidents. Furthermore, depending on the percentage of autonomous vehicles on the roads, a research concluded, a drastic reduction in traffic and congestions .

citation needed

citation needed

citation needed

Nonetheless, there is still much work to be done in perfecting the control as well as the sensing capabilities of autonomous ground vehicles, if they are to become the default means of automotive transportation. Some of the issues consist of environmental conditions, which may disturb the sensors accuracy; precise mapping awareness, such as live maps that update when there is ongoing maintenance of infrastructure etc.; improved sensing capabilities (e.g advanced lidars) that can differentiate road damage, liquid spills etc.; ethical choices (as when an accident cannot be avoided), choosing to minimize potential damage and avoid casualties.

Levels of Automation Automated vehicles as defined by the *National Highway Traffic Safety Administration*(NHTSA - USA) are ones in which at least some aspects of a safety-critical control function occurs without the operator's direct input.(e.g steering, throttle,braking etc.)As such they are classified by the **NHTSA** in five levels:

citation Automated Vehicle Policy,pdf

- **Level 0 - No Automation**
  Logically, this level does not include any direct automation functions, however it may include some warning systems such as blind spot monitoring. The operator has the complete control over the vehicle.

Citation from pdf for the whole list

- **Level 1 - Function Specific Automation**
  The system may utilize one or more control functions operating independently from each other, such as cruise control or dynamic brake support. Nevertheless the driver has over control and can limit the functions of the supported aid systems.

- **Level 2 - Combined Function Automation**
  The system utilizes at least two primary control functions, intercommunicating with each other in order to allow the operator's disengagement from physical operation of the vehicle. An example of such is a combination between *adaptive cruise control* and *lane centering*. The driver is still responsible for monitoring the environment, even when automated operating mode is enabled.

- **Level 3 - Limited Self-Driving Automation**
  The driver accepts to cede full control of all safety-critical functions under certain conditions, and rely completely on the vehicle to monitor the environment if a transition toward manual control is required. Such level of control is observed in automated or self-driving vehicles that conclude when the system is unable to handle an environment, such as road construction site, requiring specific manoeuvres. The driver is not expected to fully pay attention to the road, but is advised to pay attention to sudden changes.

- **Level 4 - Full Self-Driving Automation**
  Vehicle is designed to solely operate all safety-critical functions and supervise road conditions. Apart from providing destination input, the driver is not expected to maintain control at any point of the trip

1.1 Examples

You can also have examples in your document such as in example 1.1.

Example 1.1 (An Example of an Example)
Here is an example with some math

$$0 = \exp(i\pi) + 1 \, . \tag{1.1}$$

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1.2 How Does Sections, Subsections, and Subsections Look?

Well, like this

1.2.1 This is a Subsection

and this

This is a Subsubsection

and this.

A Paragraph You can also use paragraph titles which look like this.

A Subparagraph Moreover, you can also use subparagraph titles which look like this. They have a small indentation as opposed to the paragraph titles.

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Chapter 2

Chapter 2 name

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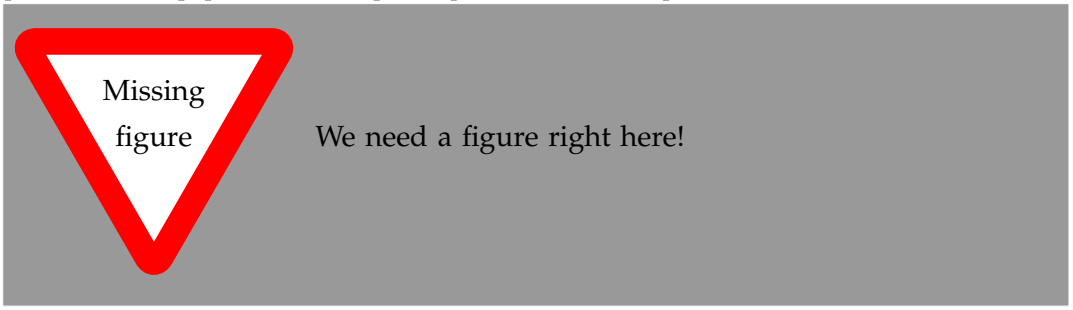
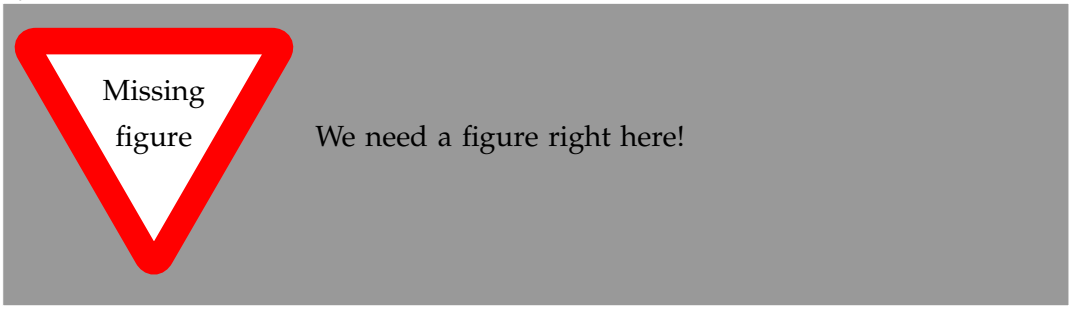


Chapter 3

Modeling

In order to understand the behaviour of the system, a mathematical model followed by a simulation had to be done.



Chapter 4

Conclusion

In case you have questions, comments, suggestions or have found a bug, please do not hesitate to contact me. You can find my contact details below.

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Appendix A

Appendix A name

Here is the first appendix