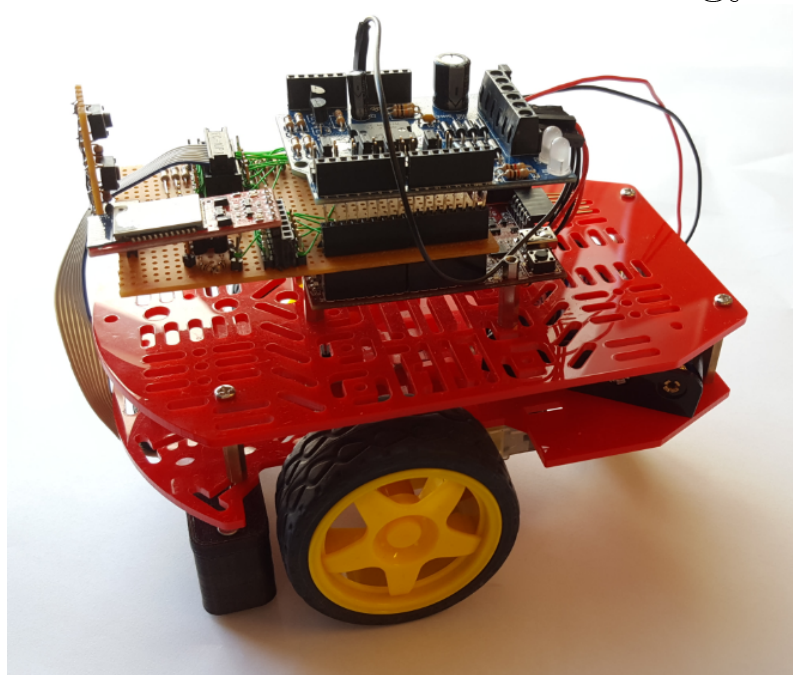


Fall Semester 2016

# Autonomous Object Avoidance Robot

Group 2  
3. Semester IT-Technology



Group members: Benjamin Nielsen - Henrik Jensen - Martin Nonboe - Nikolaj Bilgrau

Supervisor: Jesper Kristensen - Steffen Vutborg

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Title:

Autonomous Object Avoidance  
Robot

Project Period:

3. Semester | Spring semester 2016

Projectgroup:

Group 2

Group participants:

Benjamin Nielsen  
Henrik Jensen  
Martin Nonboe  
Nikolaj Bilgrau

Supervisors:

Jesper Kristensen  
Steffen Vutborg

Pages:

Appendices:

Completed:

# Preamble

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This project was written by group 2, for the third semester on the IT-electronics education at university college Nordjylland, Sofiendalsvej 60. The project goal is to make a line following robot with object avoidance capabilities.

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Benjamin Nielsen

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Henrik Jensen

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Martin Nonboe

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3D print	3-Dimensional printing
ADC	Analog-digital conversion
GUI	Graphical User Interface
IDE	Integrated Development Environment
MCU	Microcontroller Unit
PCB	Printed Circuit Board
PID	Proportional-integral-derivative
PWM	Pulse-width modulation
THT	Through-hole-technology
UART	Universal Asynchronous Receiver/Transmitter

# Introduction 1

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In this section the problems found when trying to get the robot function, will be listed and analysed

## 2.1 Problem statement

The problem presented to the group is how to make a robot move from point A to point B, with the help of different sensors, including ultrasound and infrared, and to make use of autonomous algorithms to avoid obstacles.

Problem statement:

- Bot should be able to move from A to B
- Should be able to stop at a predetermined point
- Manoeuvre around obstacles

## 2.2 Problem analysis

### 2.2.1 Mobility from A to B

The robot receives a coordinate to reach, and will use its own starting point to determine a direction to drive towards the given coordinate. The robot will need a way to control its movement and direct current to function optimal.

The robot needs a way to effectively regulate speed and also steer itself autonomously. To dictate how quickly the robot moves, the robot will need some system that allows it to move around on a flat surface, the robot needs to be able to move around from point A to point B. .

### 2.2.2 Predetermined end point

After starting, the robot needs to know when to stop. The pre-determined end-point consists of a series of circles which the robot needs to detect.

### 2.2.3 Obstacles avoidance

As part of its functionality, the robot needs to be able to see objects that are in front of it and avoid them.



# Requirements specification 3

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This section specifies the requirements. The requirements have been found through the analysis.

[1]

- The robot needs line following capabilities
- The robot needs object avoidance
- The robot should make use of an H-bridge
- The robot should make use of Motors
- The robot needs a way to implement motor control
- The robot should make use of a micro-controller unit
- The robot should make use of the Magician chassis

# Hardware section 4

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Beskrivelse af afsnit

## 4.1 Hardware diagram

Beskrivelse af hardware diagram

### 4.1.1 Object avoidance sensor choices

SR04 Ultrasound GP2Y0A02YK0F

### 4.1.2 Line following sensor choice

QRE1113

## 4.2 Analog-to-digital converter

ADC diagram

This products usage of ADC

## 4.3 The chipKIT Uno32 board

## 4.4 The motor shield - PKA03

### 4.4.1 The H bridge

## 4.5 The Bluetooth transceiver

# Software section 5

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Beskriv Software section

## 5.0.1 Software diagram

## 5.1 Analog to digital conversion

## 5.2 PID controller

### 5.2.1 Proportional control(P)

### 5.2.2 Integral control(I)

### 5.2.3 Derivative control(D)

### 5.2.4 Loop tuning

### 5.2.5 Steady-state error

### 5.2.6 Stability

Table manual explained

### 5.2.7 PID Implementation

## 5.3 Pulse-width modulation

### 5.3.1 Duty cycles

## 5.4 The interface

# Test 6

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Beskriv test section



## 6.1 Unit Testing

### 6.1.1 Sensor

Setup

Results

### 6.1.2 DC Motors

Setup

Results

### 6.1.3 H-Bridge

Equipment

Setup

Results

### 6.1.4 PWM

Equipment

Setup

Results

### 6.1.5 ADC

Equipment

Setup

Results

## 6.2 Integration Testing

### 6.2.1 PWM motor control

Equipment

Setup

Results

### 6.2.2 Robot to Interface communication

Equipment

Setup

Results

## 6.3 System Testing

Equipment

Setup

Results

# Conclusion 7

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Skriv en fucking Conclusion!!

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## 8.1 Group collaboration agreement

### 8.1.1 Contact Information

Table 8.1: Contacts

Benjamin Nielsen	Tlf: 30427645	@: yipiyuk5@gmail.com
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Nikolaj Bilgrau	Tlf: 29802715	@: nikolajbilgrau@gmail.com

### 8.1.2 Workflow

### 8.1.3 Deadline

### 8.1.4 Milestones and goals

Gerne en kalender der viser dage arbejdet!



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## 10.1 C code

main.c:

ADC.c:

## 10.2 C# code - interface

# Bibliography

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- [1] placeholderAuthor. *placeholderTitle*. 2016. URL: <http://www.ucn.dk>.