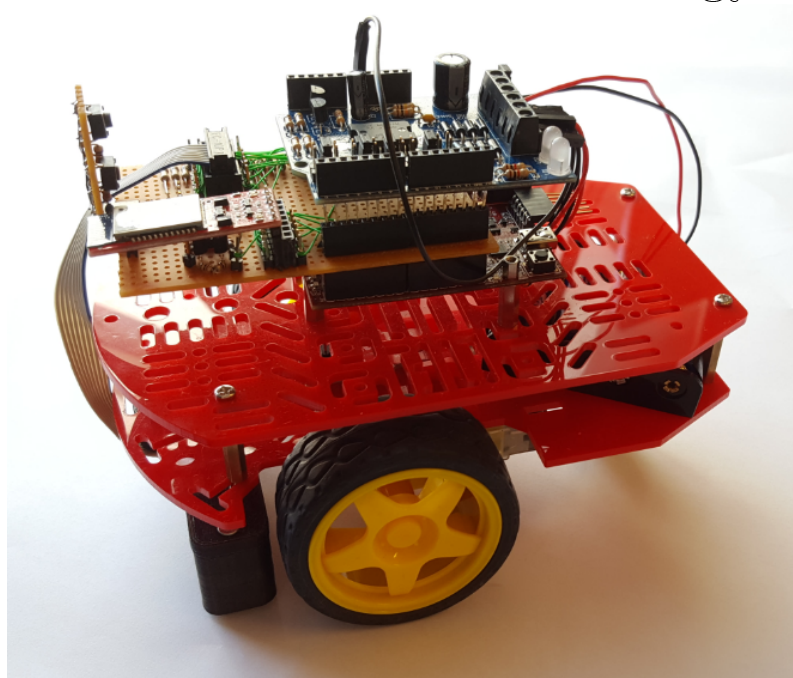


Fall Semester 2016

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

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

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.

Benjamin Nielsen

Henrik Jensen

Martin Nonboe

Nikolaj Bilgrau

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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

Indledning til afsnittet af analyse

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

2.2.3 Obstacles avoidance

Requirements specification 3

Beskriv section [1]

Hardware section 4

Beskrivelse af afsnit

4.1 Hardware diagram

Beskrivelse af hardware diagram

4.1.1 Sensor choice

4.1.2 Another sensor choice?

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

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

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

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
Henrik Jensen	Tlf: 28568934	@: henrik_kort@hotmail.com
Martin Nonboe	Tlf: 23827566	@: nonsens_4@hotmail.com
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

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