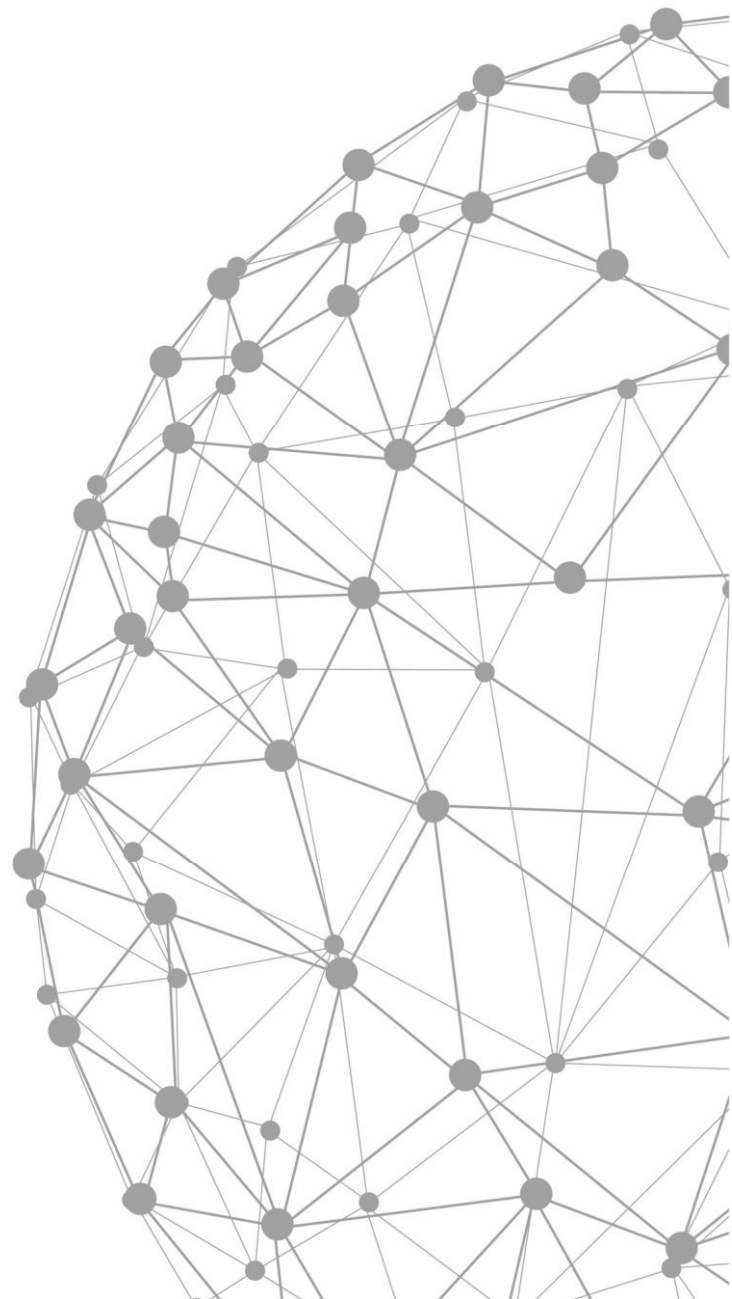___

Project task 1
Pololu Zumo 32U4

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Doc.-Version: A2
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Change History

Doc.-Version	Description of Modification	Date
A1	Initial revision	
A2	Use case diagram, use case description and requirements	20.03.24

Release

	Name	Responsibility	Date	Signature
Creation				i.A.
Verification				i.A.
Approval				i.A.
Release				i.A.

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1 General

1.1 Scope of Document

1.2 Abbreviations

Abbreviation	Description
N/A	Not applicable

Table 1: Abbreviations

1.3 Terminology

Term	Description
N/A	N/A

Table 2: Terminology

1.4 Referenced Documents

Reference	Document-Identification	Description
[1]	N/A	N/A
	N/A	N/A

Table 3: Referenced Documents

1.5 Applicable Standards

Reference	Document-Identification	Description
[1]	N/A	N/A
	N/A	N/A

Table 4: Applicable Standards

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2 Introduction

2.1 System Overview

2.2 Interface Overview

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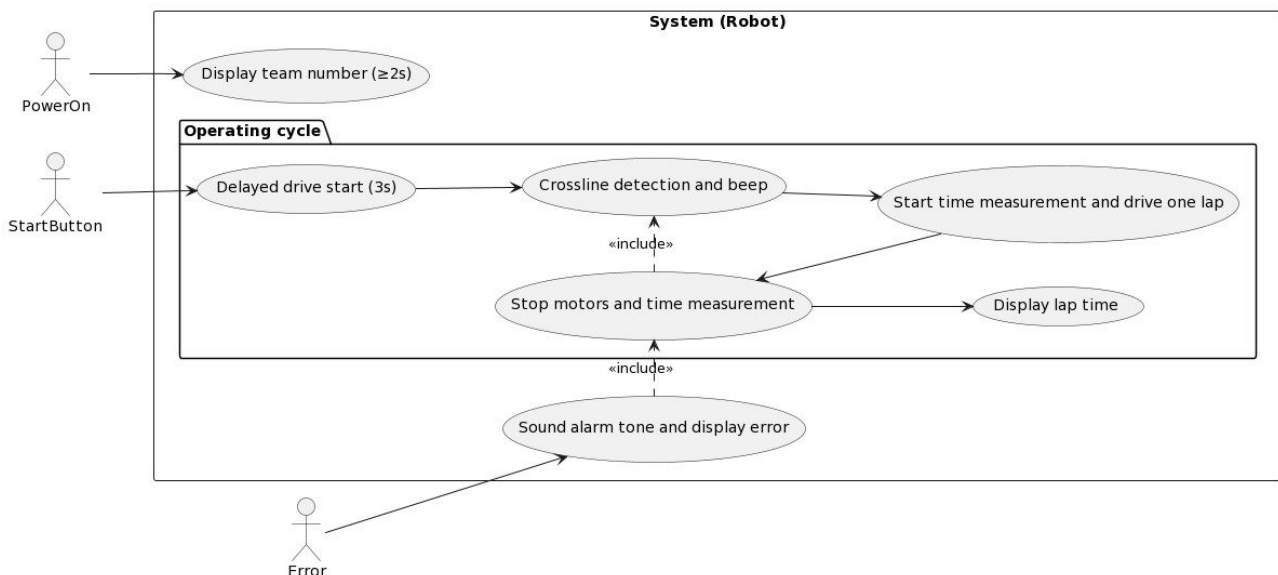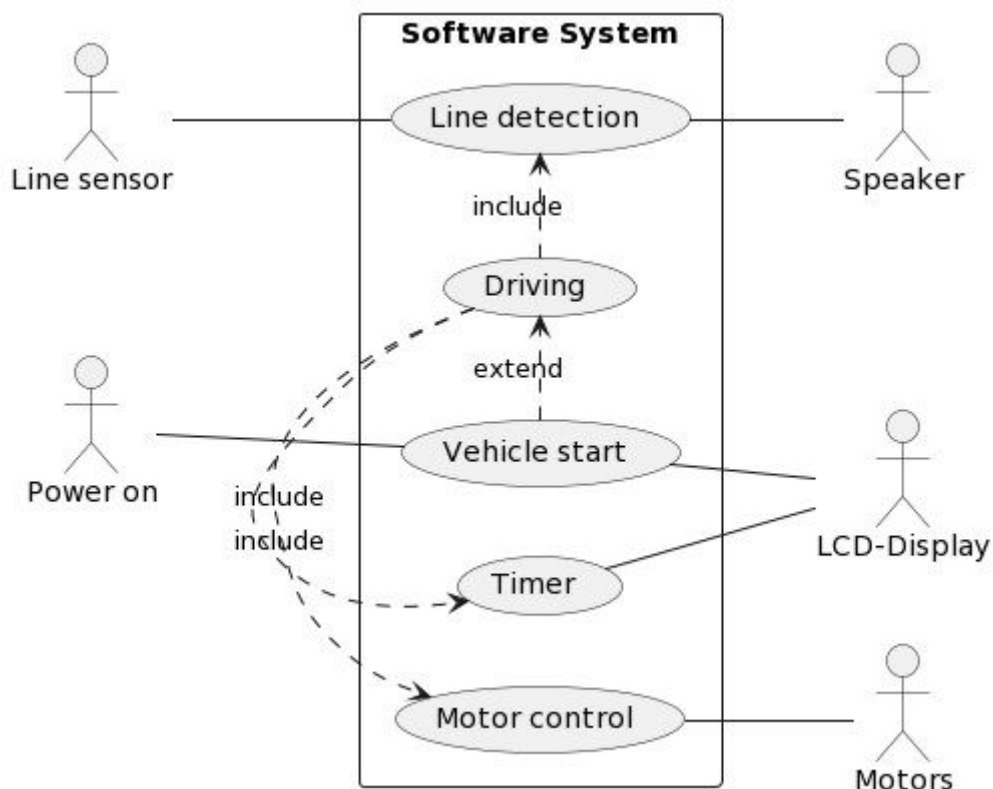
2.3 Scenarios

System Overview

Name	Display team number
Short description	Displays a static team number on the OLED display for at least 2s
Precondition	System boot is finished
Postcondition	none
Error case	none
Actors	PowerOn
Trigger	Finalization of system boot
Stand sequence	The system boot is finished. Then the displays shows a static team number on the OLED display for at least 2s
Alternative sequences	none

Name	Delayed drive start
Short description	The system waits for 3s and then starts to drive
Precondition	No operating cycle is running
Postcondition	none
Error case	none
Actors	StartButton
Trigger	StartButton released
Stand sequence	The StartButton is released. Then the system waits for 3s and then starts to drive.
Alternative sequences	none

Name	Crossline detection and beep
Short description	When the LineSensors detect a crossline the Buzzer sounds a short beep
Precondition	none
Postcondition	none
Error case	none
Actors	none
Trigger	Delayed drive start is finished
Stand sequence	The delayed drive start is finished. As soon as the LineSensors detect a crossline the Buzzer sounds a short beep.
Alternative sequences	none

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Name	Start time measurement and drive one lap
Short description	After reaching the start position the time measurement starts and a whole lap is driven.
Precondition	none
Postcondition	none
Error case	none
Actors	none
Trigger	Crossline is detected for the first time in the operating cycle
Stand sequence	The crossline is detected for the first time in the operating cycle. The time measurement starts and a whole lap is driven.
Alternative sequences	none

Name	Stop motors and time measurement
Short description	After reaching the finish position the motors and the time measurement stop
Precondition	none
Postcondition	none
Error case	none
Actors	none
Trigger	Crossline is detected for the second time in the operating cycle
Stand sequence	The crossline is detected for the second time in the operating cycle. The motors and the time measurement stop.
Alternative sequences	none

Name	Display lap time
Short description	After finishing one lap the OLED display shows the lap time
Precondition	The crossline was detected for two time in the operating cycle.
Postcondition	none
Error case	none
Actors	none
Trigger	The lap was finished without an error
Stand sequence	The crossline is detected for the second time in the operating cycle. The OLED display shows the lap time.
Alternative sequences	none

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Interface Overview

Name	Timer
Short description	Measures the time of a lap
Precondition	none
Postcondition	none
Error case	none
Actors	LCD-Display
Trigger	Usecase "Driving" is active
Stand sequence	Timer is started/stopped as soon as the robot crosses the start/finish line
Alternative sequences	none

Name	Driving
Short description	Controls the direction of travel of the robot through the motors and line sensors
Precondition	Usecase "Vehicle start" was active for at least 2 seconds and
Postcondition	Robot must stand still
Error case	Robot must stop
Actors	none
Trigger	The button to start the lap on the robot was pressed
Stand sequence	The robot starts after 3 seconds and automatically follows the black line from start to finish
Alternative sequences	none

Name	Vehicle start
Short description	The robot remains in this state for at least 2 seconds, during which time the team number is shown on the LCD display and all necessary initializations are carried out
Precondition	none
Postcondition	none
Error case	none
Actors	LCD-Display
Trigger	Power on
Stand sequence	After starting, the group number is shown on the LCD display for 2 seconds and all initializations are made
Alternative sequences	none

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Name	Line detection
Short description	Erkennt die Schwarzelinie und gibt Rückmeldung an den Usecase Driving
Precondition	none
Postcondition	none
Error case	none
Actors	Line sensor
Trigger	none
Stand sequence	The line sensors are read out and the data transmitted to "Driving"
Alternative sequences	none

Name	Motor control
Short description	Controls the motors
Precondition	none
Postcondition	none
Error case	none
Actors	Motors
Trigger	none
Stand sequence	Controls the motors depending on "Driving"
Alternative sequences	none

3 Requirements

3.1 Functional Requirements

The robot shall start driving 3s after the operator presses the startbutton.

If the robot detects the start line ALL of the following instances apply

- the robot shall emit a short beep via speaker
- the robot shall start the time measurement for the lap

If the robot detects the end line ALL of the following instances apply

- the robot shall emit a short beep via speaker
- the robot shall end the time measurement for the lap
- the robot shall display the measured time for the lap on the OLED-display
- the robot shall stop any motion

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The robot shall complete one lap in 20s or less.

If the robot leaves the track, the robot shall redetect the track in 5s or less.

If the robot detects an error ALL of the following instances apply

- the robot shall emit an alarm signal via speaker

- the robot shall display the errorreason on the OLED

- the robot shall stop any motion

After power-on the robot shall display the team-number on the OLED-display for at least 2s.

3.2 Non-Functional Requirements

3.2.1 Safety & Security

authentification, authorisation, integrity

3.2.2 Data

input/output, data characteristics(numeric,etc), data area/border, database

3.2.3 Environmental Conditions

temperature, humidity, atmospheric pressure, shock/vibration, liquids, radiation

3.2.4 Quality

lifetime, availibility, operational readiness, reliability, maintainability

3.2.5 Computer Resources

The software shall be hardware independent.

The programmer shall write the software in the programming language C.

The software shall at most use 80% of the available flash memory.

3.2.6 Design Constraints

standards, technical characteristics, material, marking/naming, electromagnetical compatibility, adaption/flexibility/exchangeability

3.2.7 Product Documentation

Instructions

3.2.8 Production

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3.2.9 Logistic

3.2.10 Commercial Requirements

3.2.11 Further Requirements

4 Interface

4.1 External Interfaces

5 Document Management

5.1 Document Creation

6 Appendix

6.1 (Appendix X)

robot	Zumo32U4
OLED	organic light emitting diode
OLED-display	display on the robot
startbutton	button on the robot, accessible for input
speaker	buzzer on the robot

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