# HOCHSCHULE LANDSHUT
## HOCHSCHULE FÜR ANGEWANDTE WISSENSCHAFTEN

**The Freescale Cup**
Intelligent Car Racing
freescale

# Technical Report

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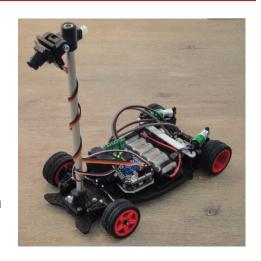
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# Table of Contents

## 1. Description of mechanical design of vehicle model

The car has the original chassis with the suspension at a maximum. All wheels are parallel and filled with other Foam. As microcontroller board we use the FRDM-KL25Z. The motor driver board is a FRDM-TFC. For the circuit boards we installed a plastic plate. The camera fixture is made with a 3D-printer and a carbon tube. For a better suspension we installed two spring-dumper between the chassis and the drive unit. To improve the steering we use two steering rods with reverse threads.

## 2. Description of control circuit design

The control circuit design for the servo motor is based on a control-algorithm that uses a P-control. The control circuit design for the drive motors is based on a PI-controller.

## 3. Description of the electronics design

We reduce the interferences of the engine with some bypass-capacitors and soldered the motor cable directly to the motor. We used 8 ceramic capacitors. From each pole to the motor casing per motor there are two 47 nF capacitors. With this construction the interferences of the motor no longer mess with the camera values.

## 4. Description of control software design

The camera image is read every 2.5 ms. The received gray-values are converted to logic 0 for black and logic 1 for white by edge detection. Using this we define the center of the widest black line. With the FRDM-KL25Z controller the appropriate steering angle is calculated by the P-control to control the servo motor per PWM.

Button usage:

- Button 1:     DC Motor start
- Button 2:     DC Motor stop

DIL usage:

- DIL 1 to 4:     Sets a specific speed (slow to fast).

## 5. Total weight and dimensions of the reengineered vehicle

Length/   width/   height:

29 cm  x  16,5 cm  x  30,4 cm

weight:

ca. 850g

## 6. Power consumption

The default configuration for the motors is used. Nothing changed there.

## 7. Count and type of sensors used

1x given line scan camera which delivers 128 gray-values

## 8. Numbers of servo motors besides the existing driving motors and rudder motors of the vehicle model

No additional servos are used beside the original servo and the two driving motors.