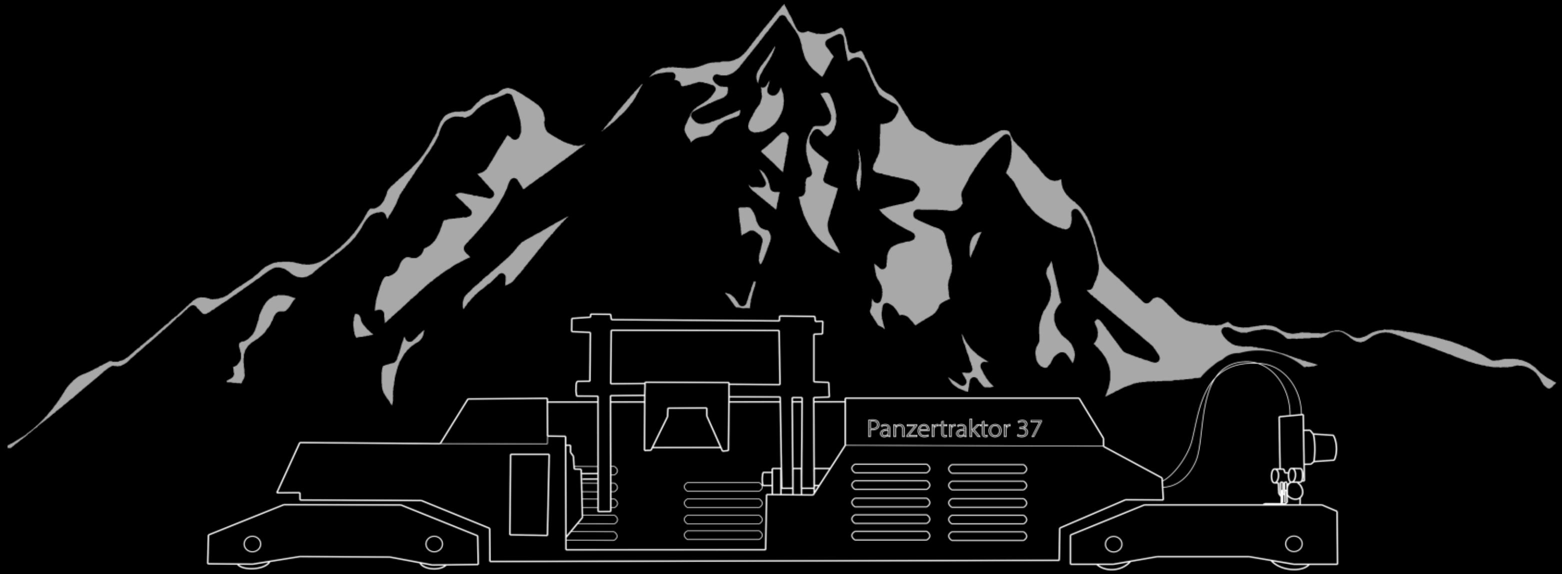
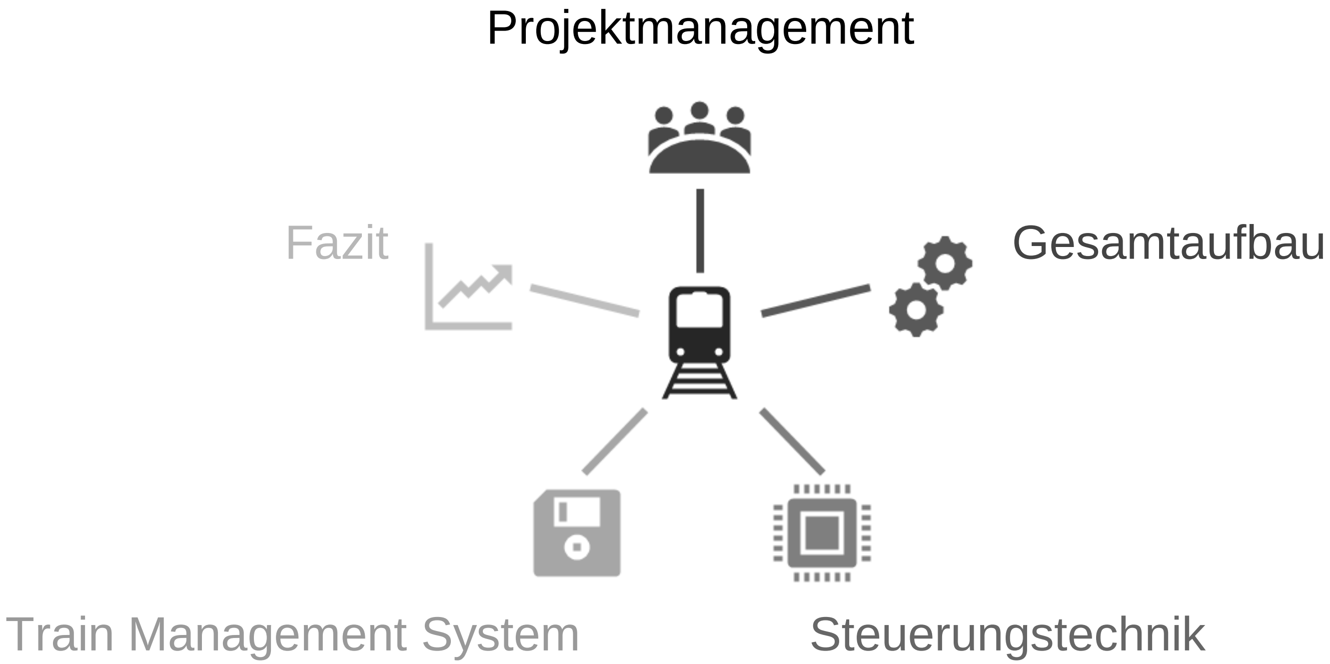
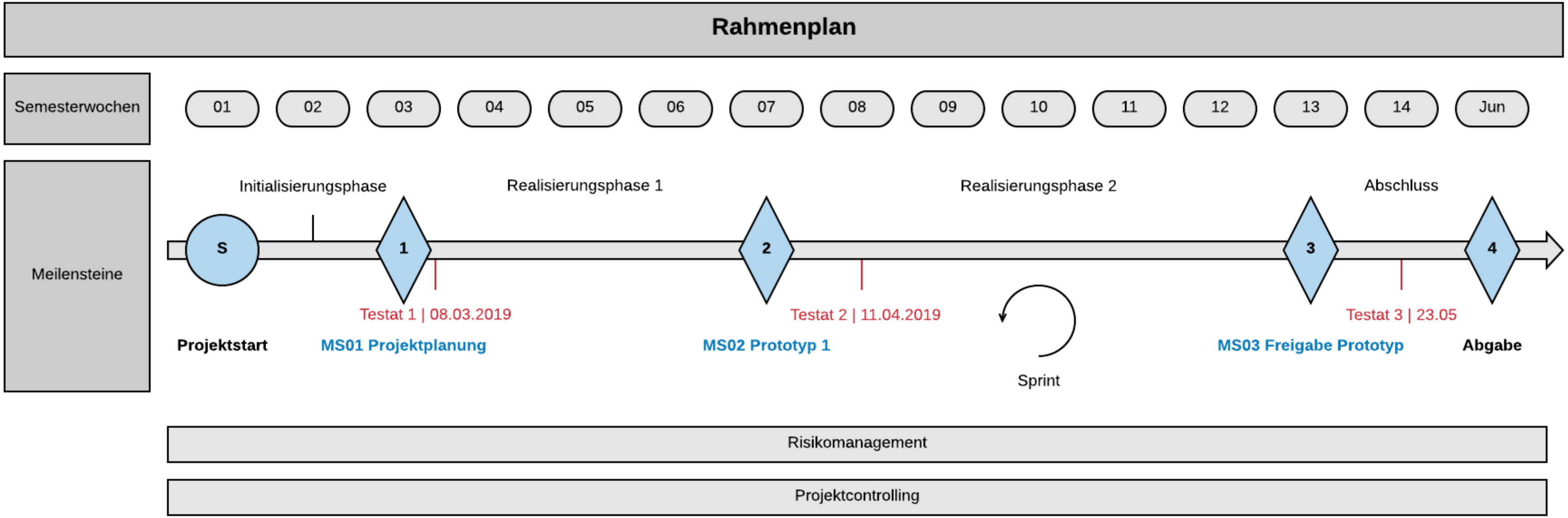


PREN | Gruppe 37

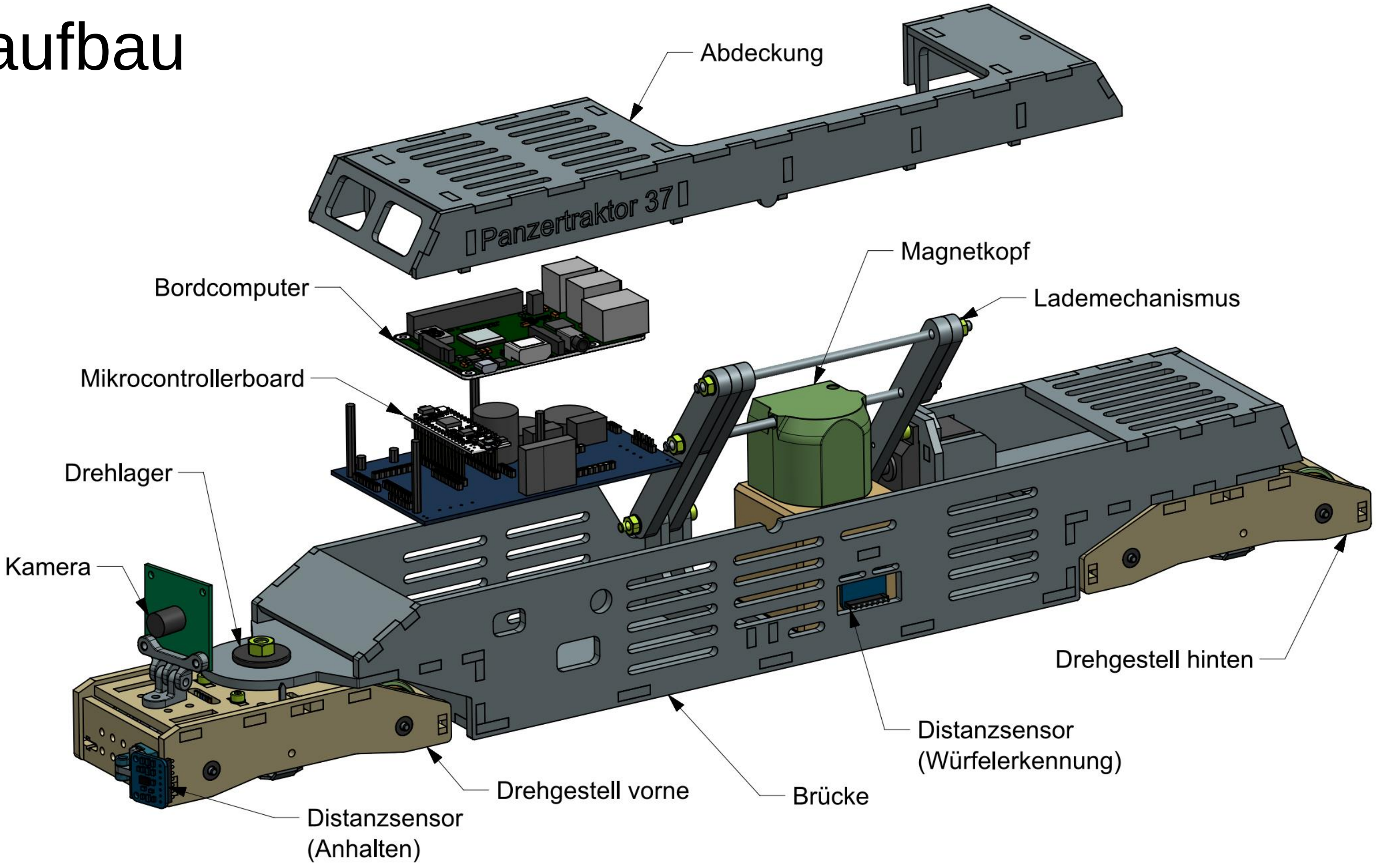
Überblick

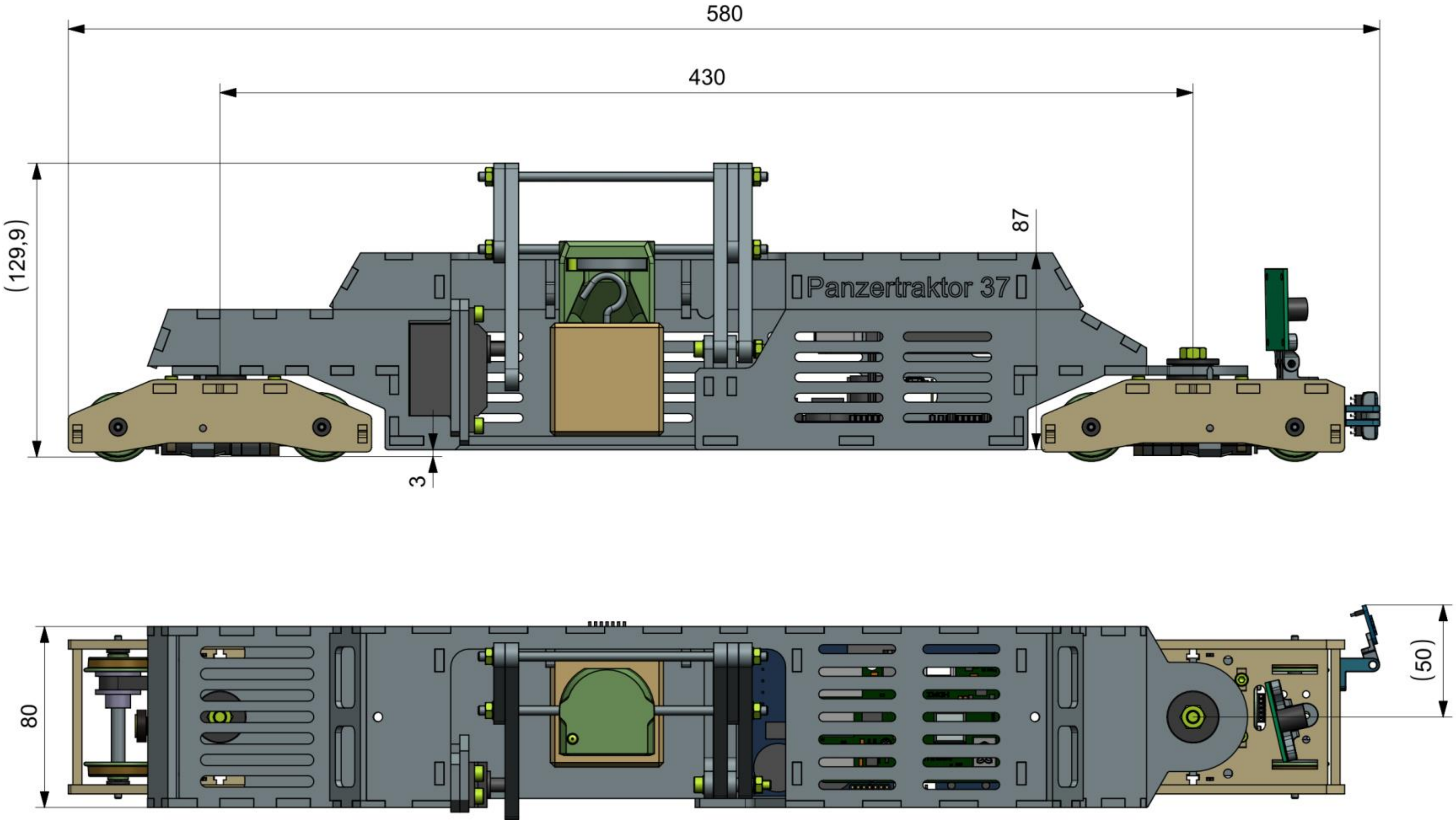

Projektmanagement
Fazit
Gesamtaufbau
Train Management System
Steuerungstechnik

Projektrahmenplanung

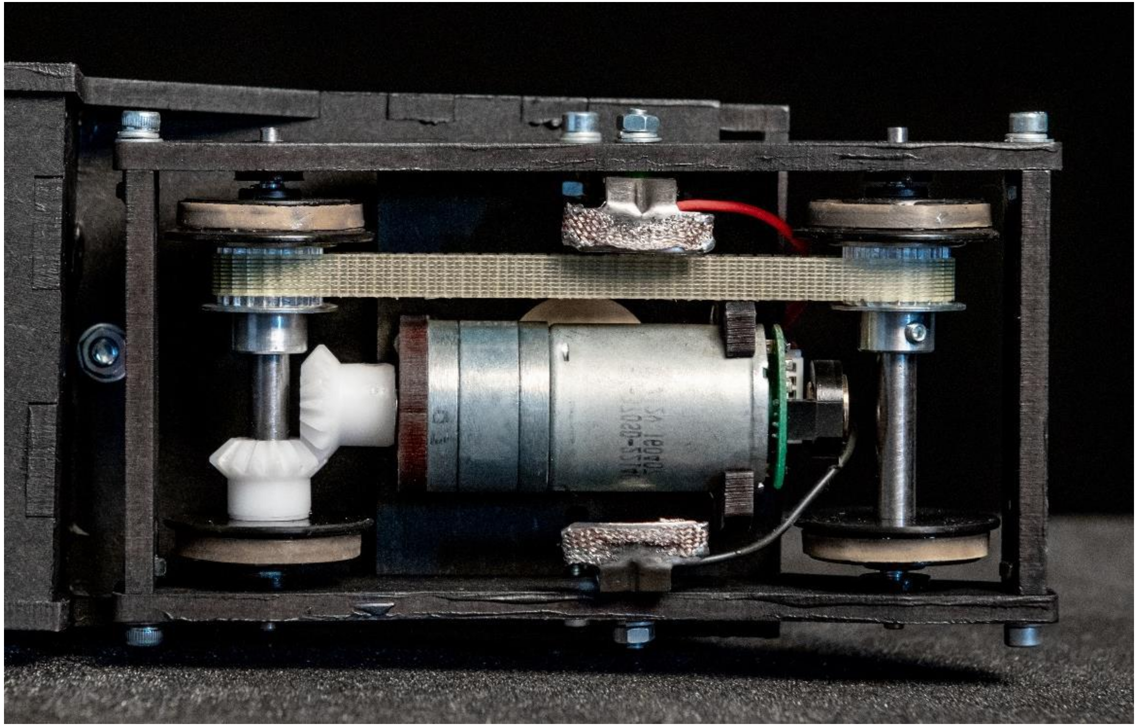


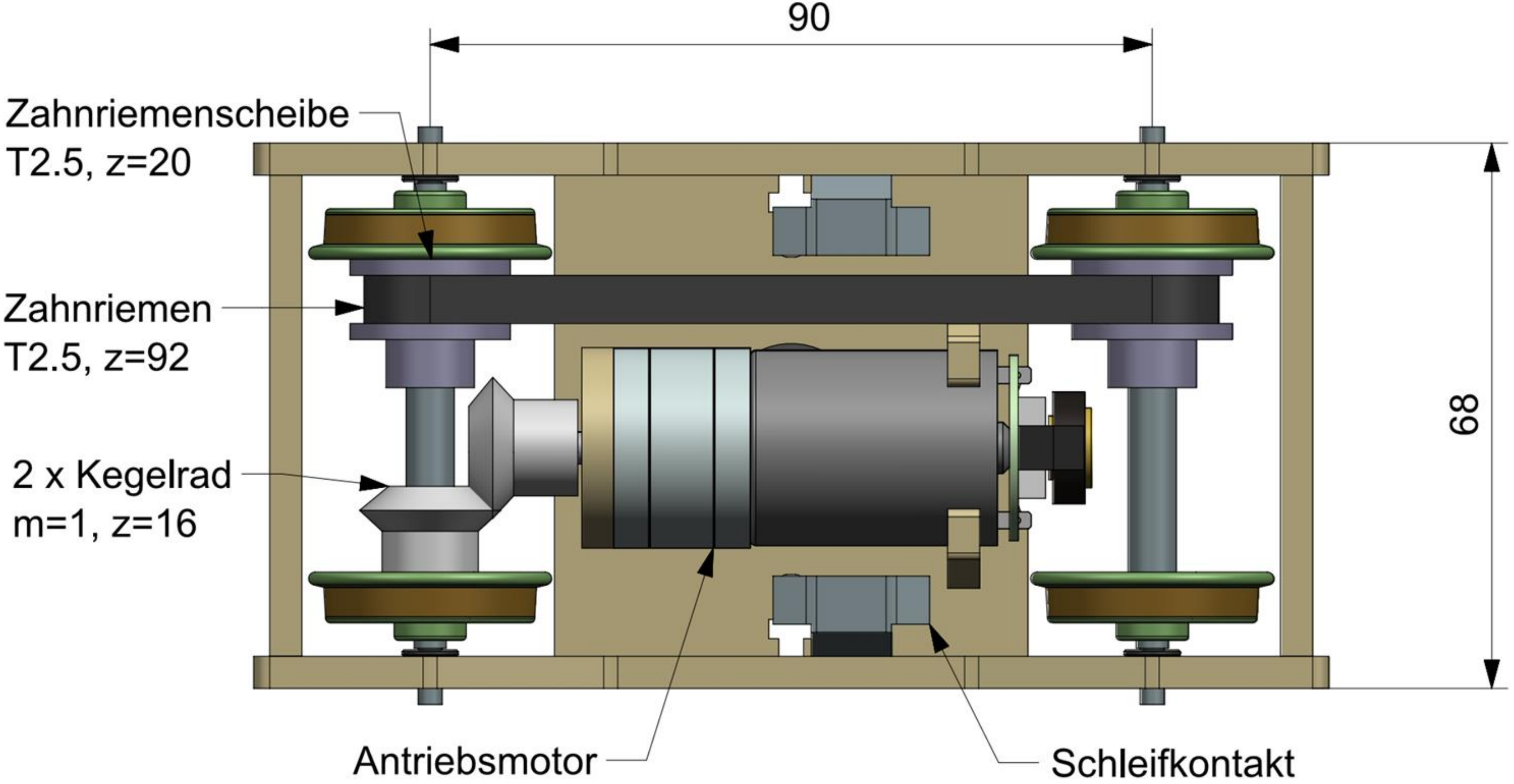
Gesamtaufbau



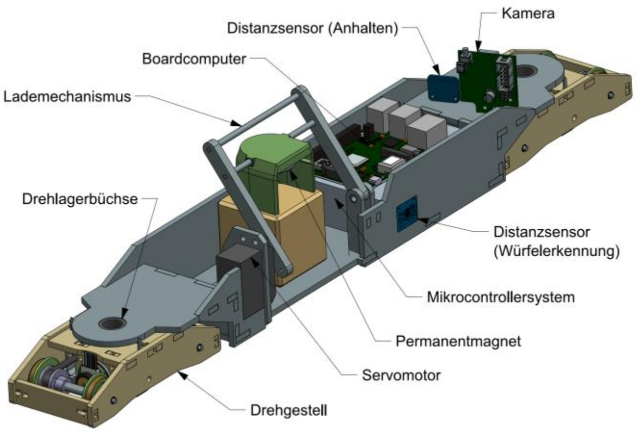

580
430
(129,9)
87
Panzertraktor 37
3
80
(50)

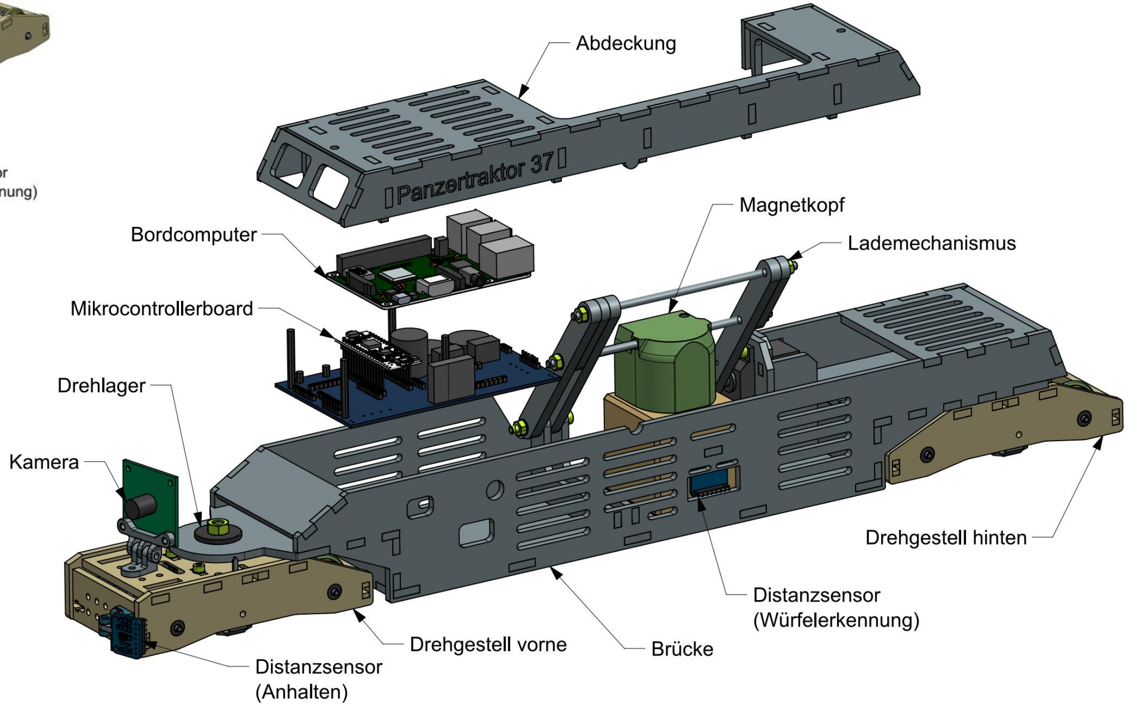
Drehgestell



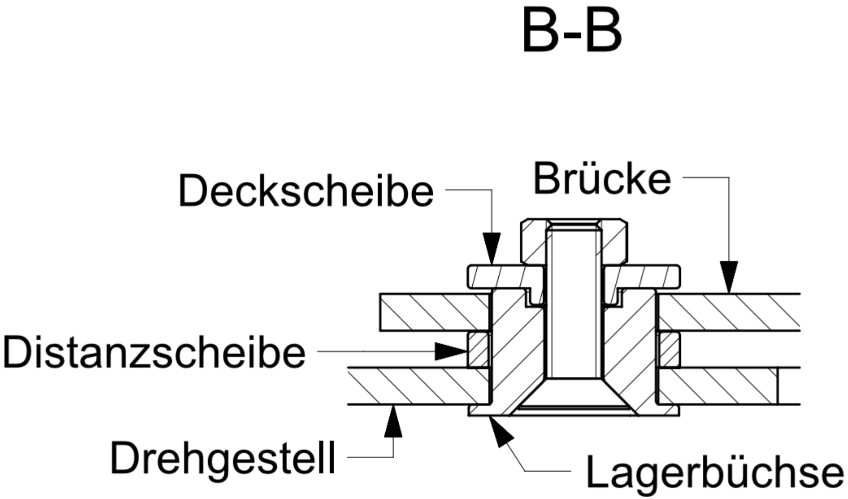

90
Zahnriemenscheibe
T2.5, z=20
Zahnriemen
T2.5, z=92
2 x Kegelrad
m=1, z=16
68
Antriebsmotor
Schleifkontakt

Änderung zu PREN 1

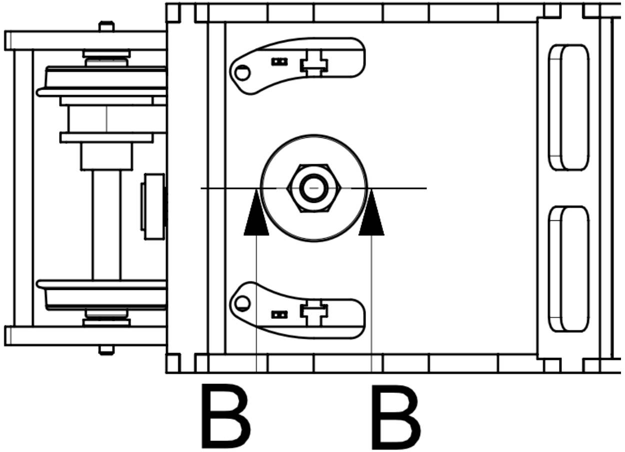




Drehlager

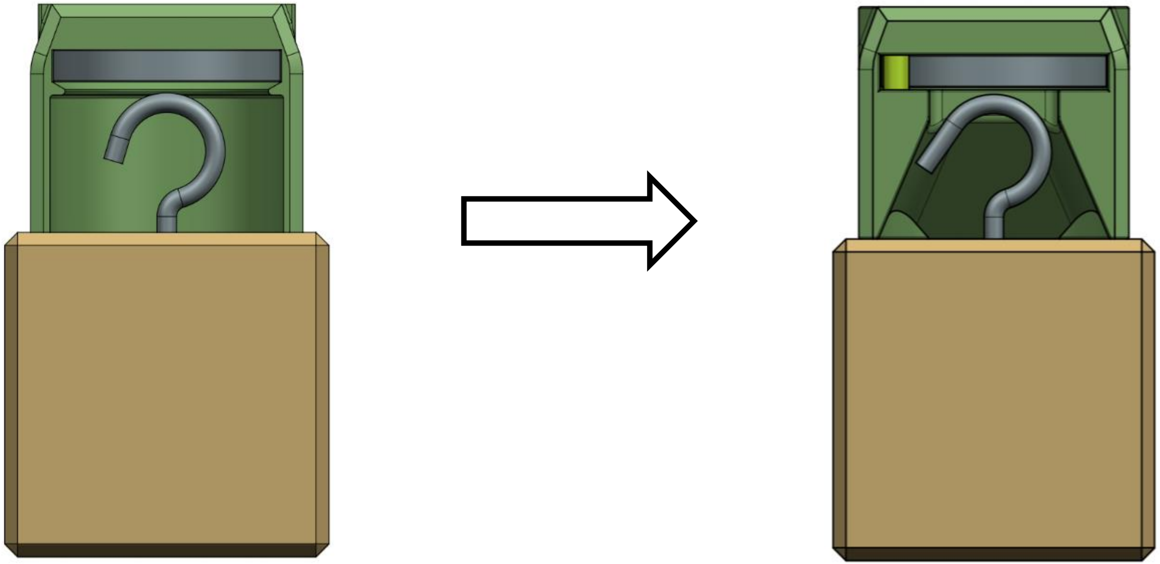


B-B
Brücke
Deckscheibe
Distanzscheibe
Drehgestell
Lagerbüchse

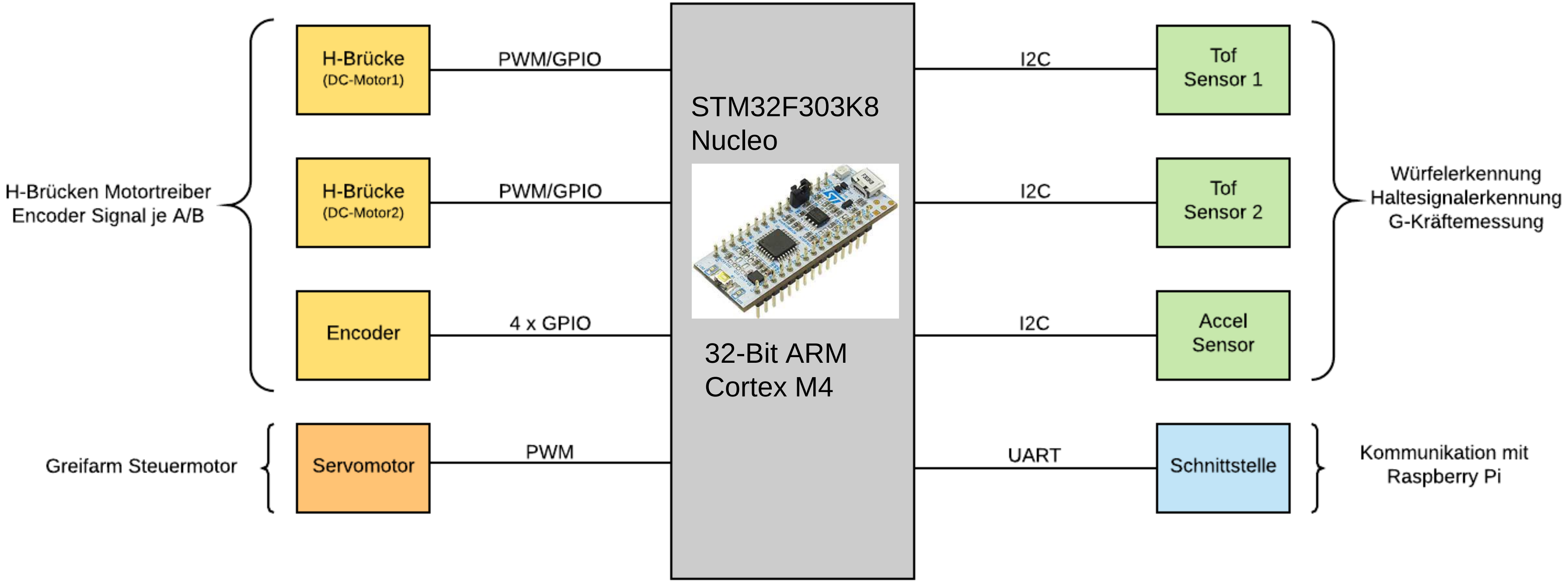


B
B

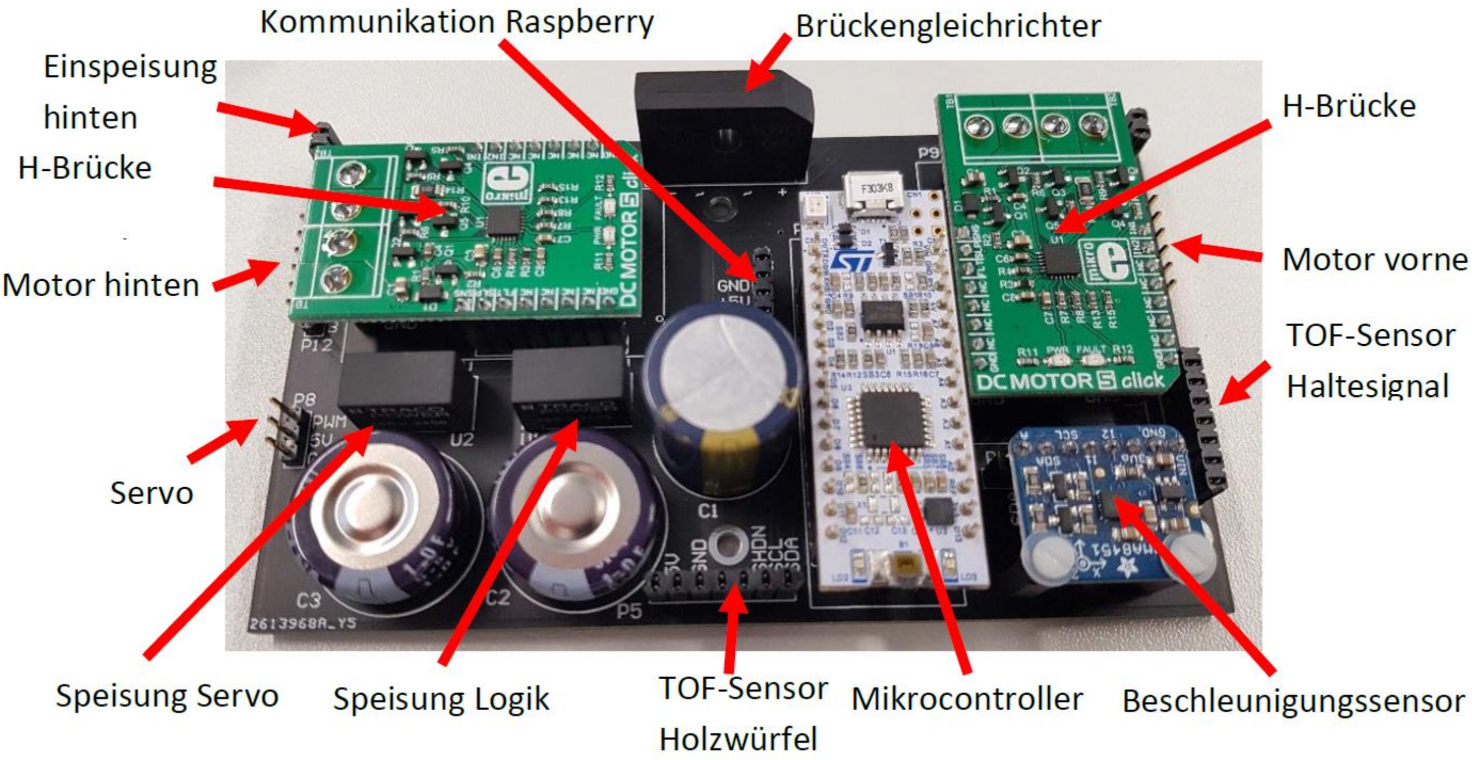
Magnetkopf



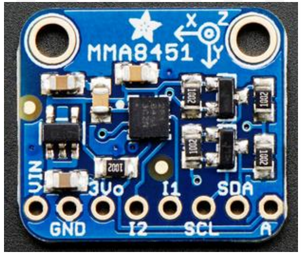
Mikrocontroller-System



Leiterplatte

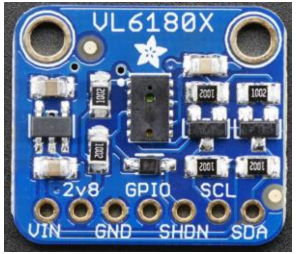


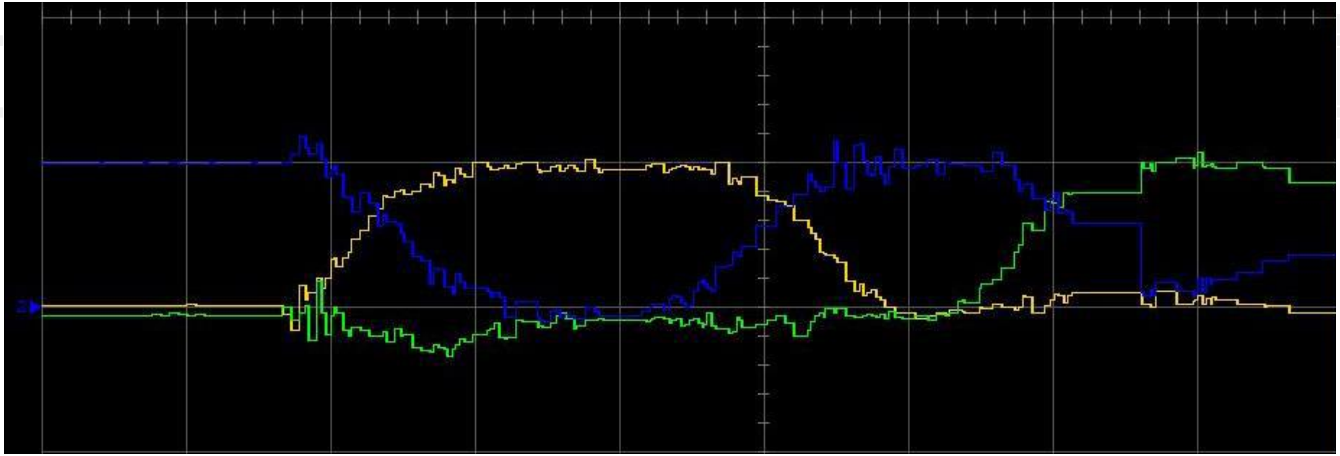
Beschleunigungssensor
MMA8451Q

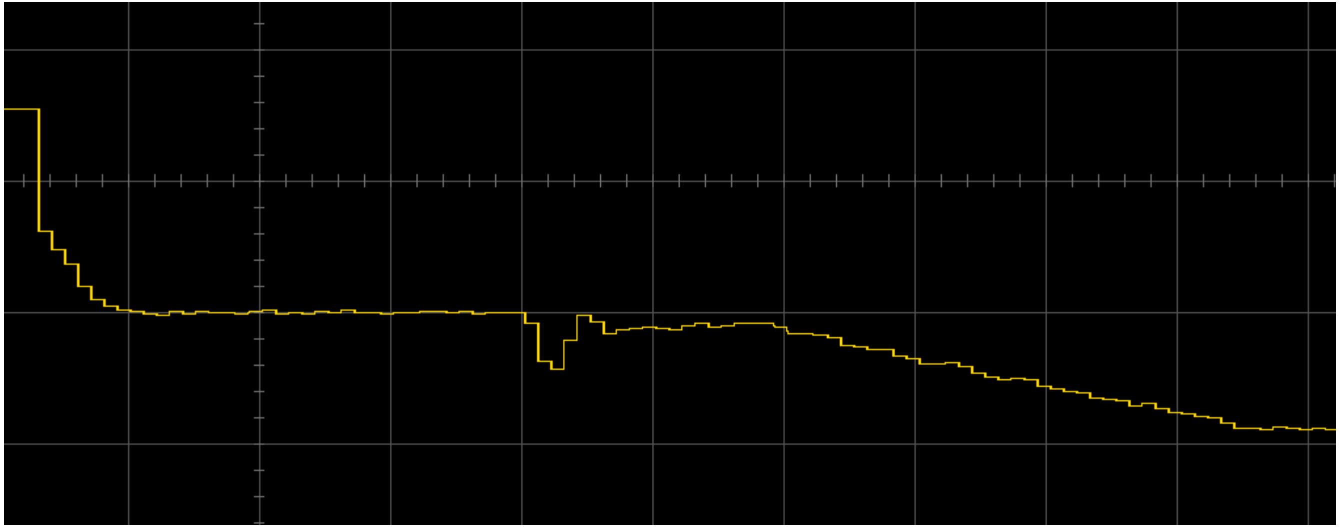


Sensorik

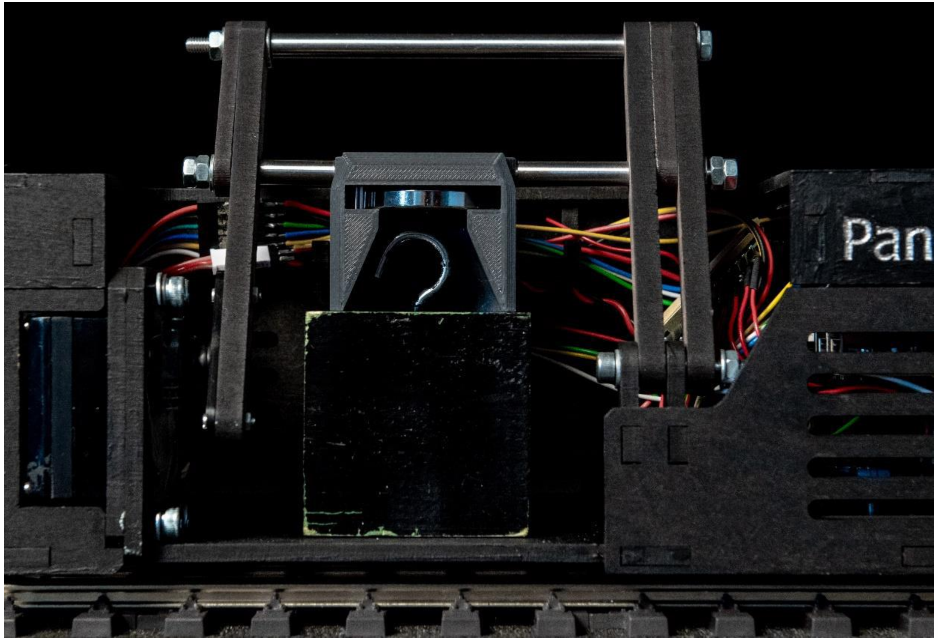
Distanzsensor
VL6180X

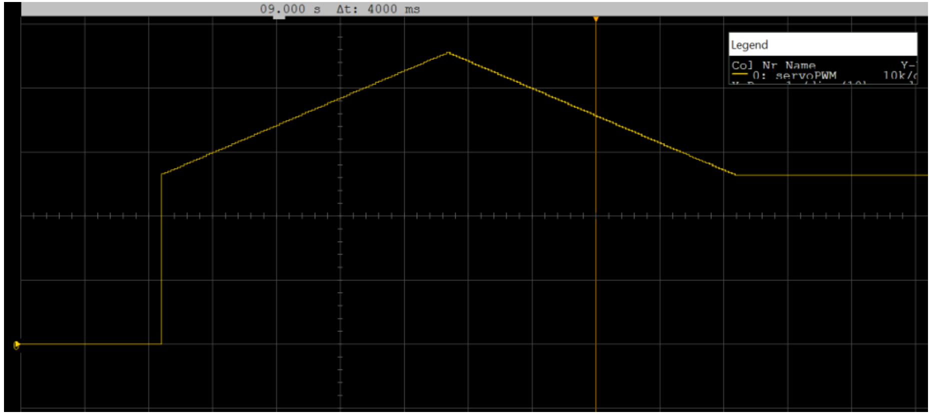


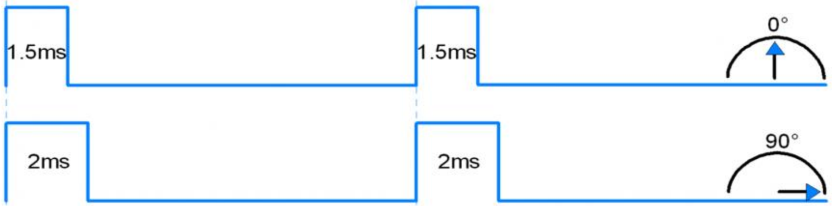




Auflademechanismus

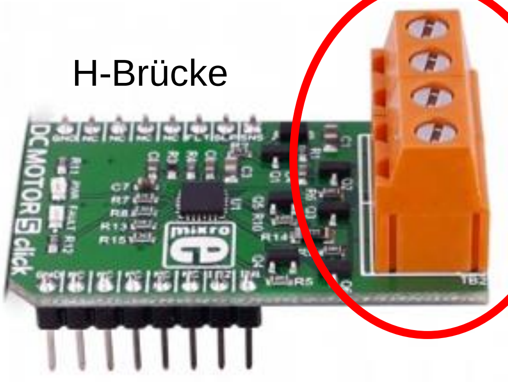




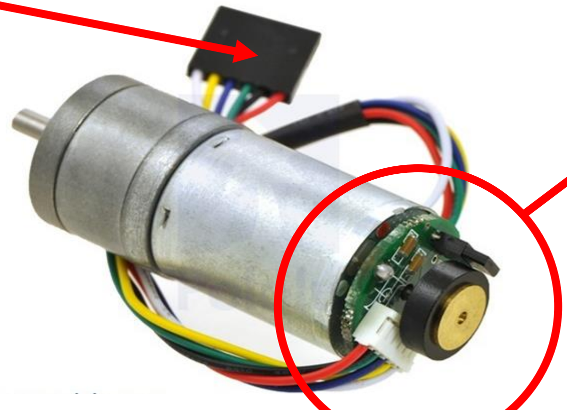


Antriebsmotor

H-Brücke



DC-Motor mit Getriebe



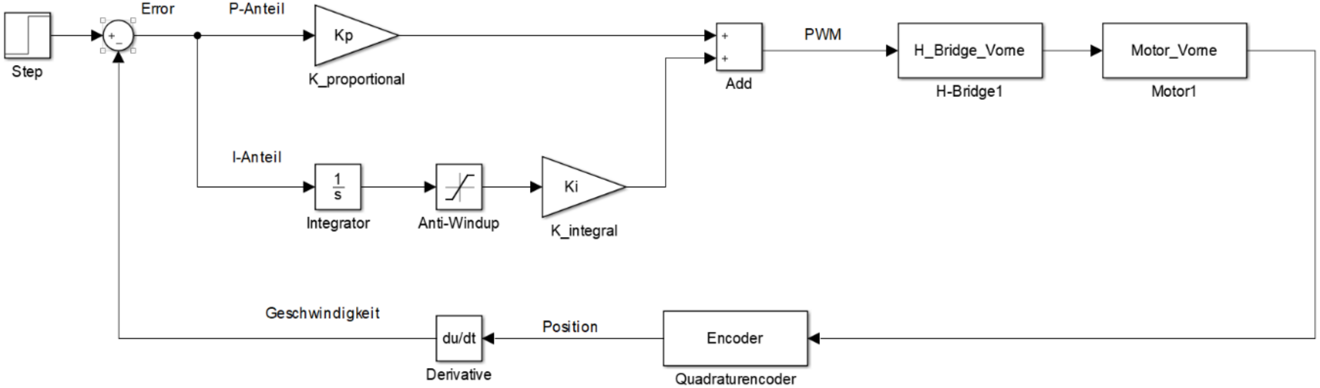
Encoder

48 Counts per Revolution
f = 8kHz

333 U/s @ 20V
i = 9.68
U = 81.7mm
v = 2.81m/s

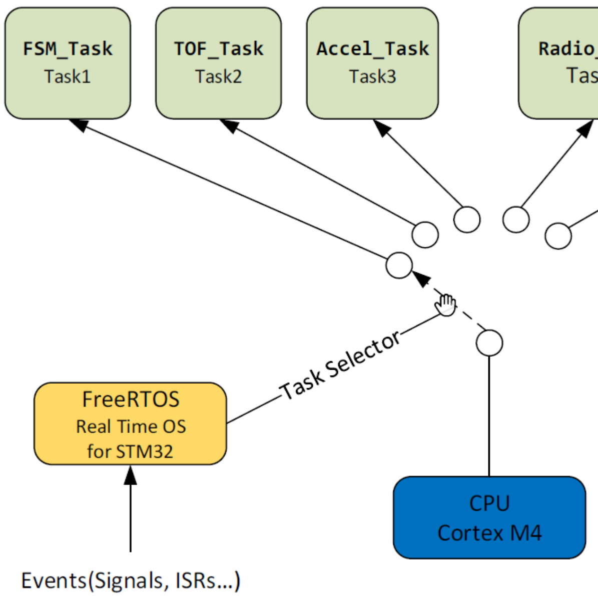
Quelle:
www.pololu.com
www.mikroe.com

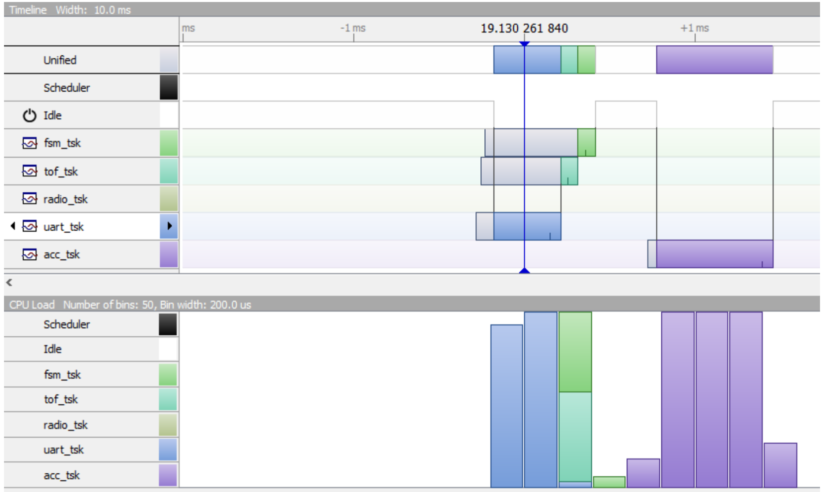
Antriebsregelung

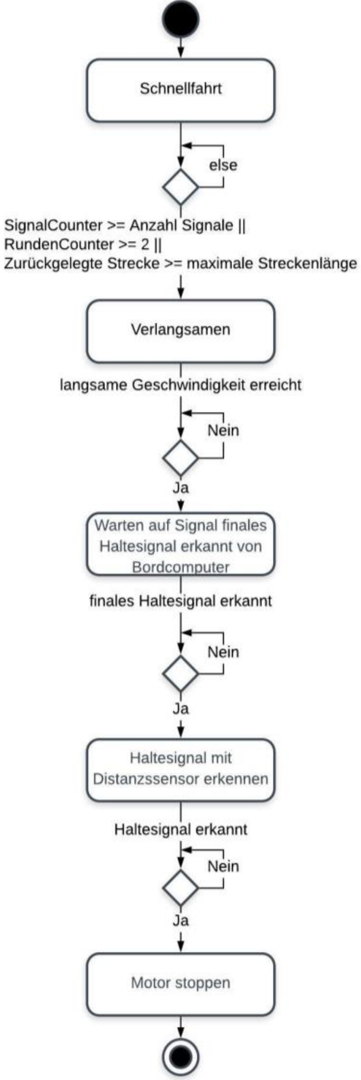



```c
// Geschwindigkeitsregler mm/s
void PID_V_Velo(int32_t set_velo){
	// Umrechnung mm in Ticks (Sollgeschwindigkeit)
	set_velo_ticks_v = (set_velo * iGetriebe * TicksPerRev) / (Wirkumfang);
	meas_velo_ticks_v = Velo_V_GetVelo(); // Istgeschwindigkeit auslesen
	error_v = set_velo_ticks_v - meas_velo_ticks_v; // Regeldifferenz berechnen
	pVal_v = (Kp_v * error_v) / 1000; // P-Anteil berechnen
	integral_v_v += error_v; // Integral
	iVal_v = (Ki_v * integral_v_v) / 1000; // I-Anteil berechnen
	pidVal_v = pVal_v + iVal_v; // Addition P-Anteil und I-Anteil
	// Begrenzung falls PWM-Wert grösser 100% wird
	if (pidVal_v > 100) {
		integral_v_v -= error_v; // Anti Reset Windup
		Motor_V_SetVelo(100);
	} else if (pidVal_v < -100) {
		integral_v_v -= error_v; // Anti Reset Windup
		Motor_V_SetVelo(-100);
	} else {
		Motor_V_SetVelo(pidVal_v);
	}
}
```

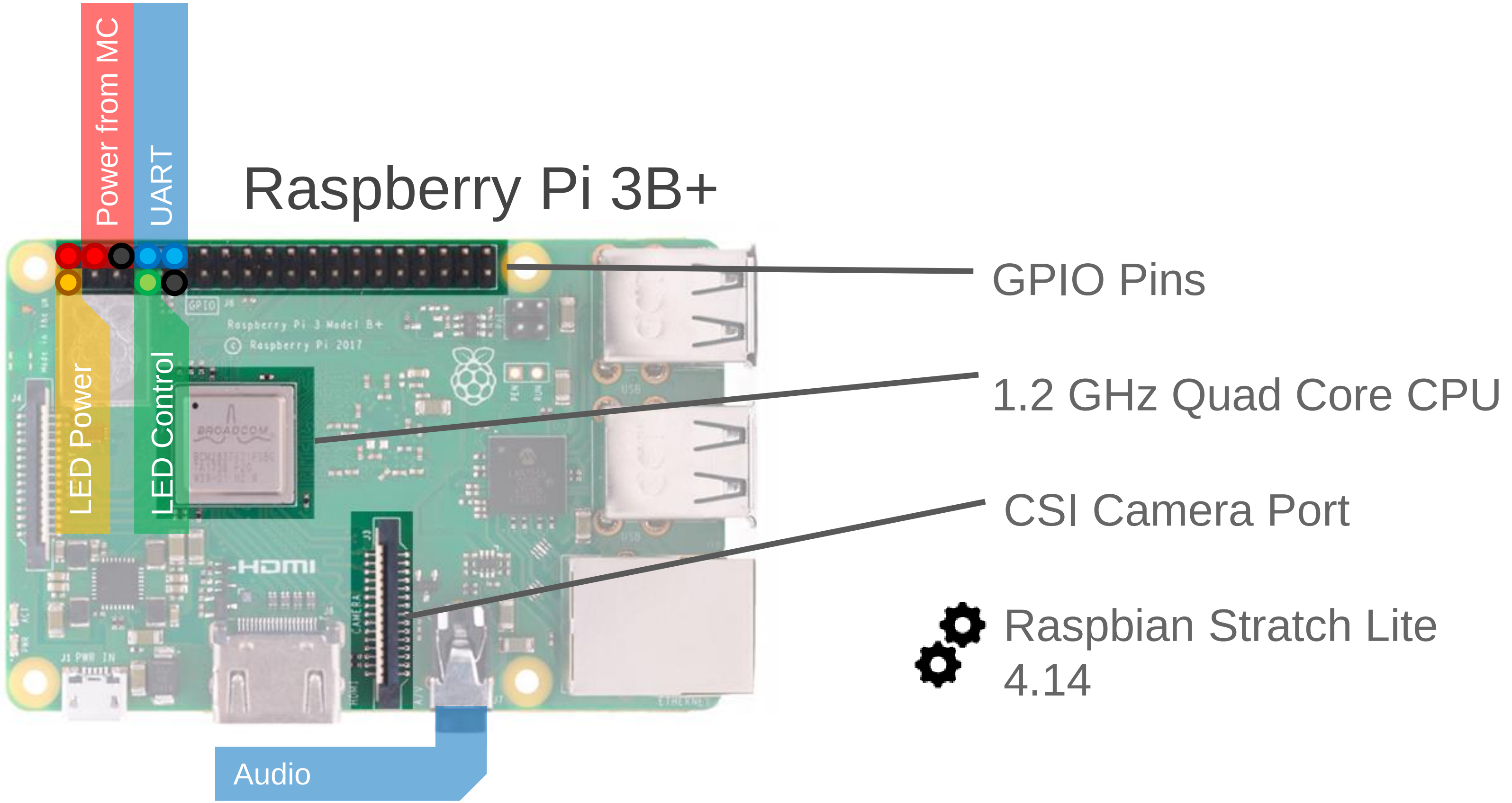
Software

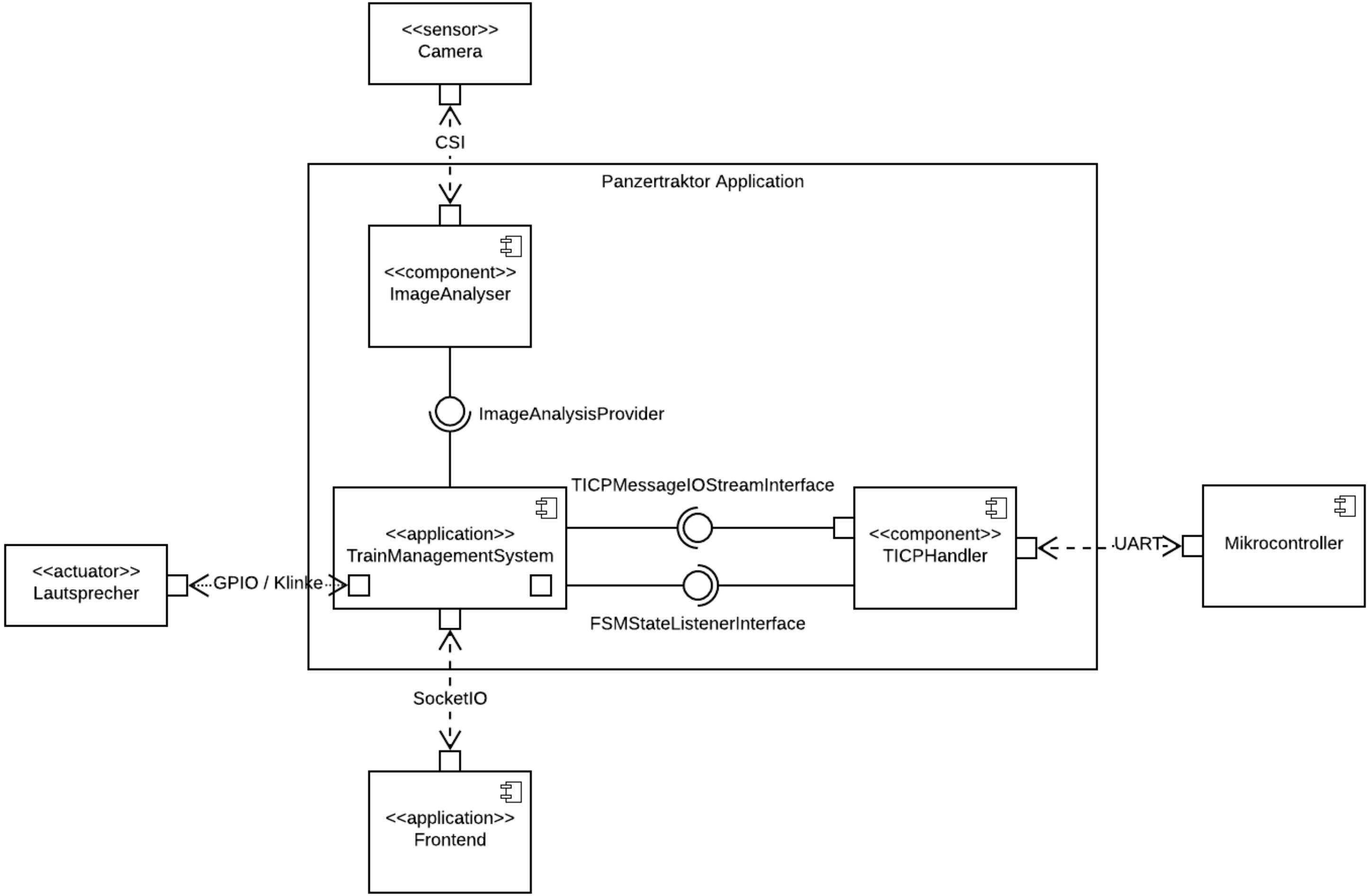

FSM_Task
Task1
TOF_Task
Task2
Accel_Task
Task3
Radio_Task
Task4
UART_Task
Task5
Task Selector
FreeRTOS
Real Time OS
for STM32
CPU
Cortex M4
Events(Signals, ISRs...)

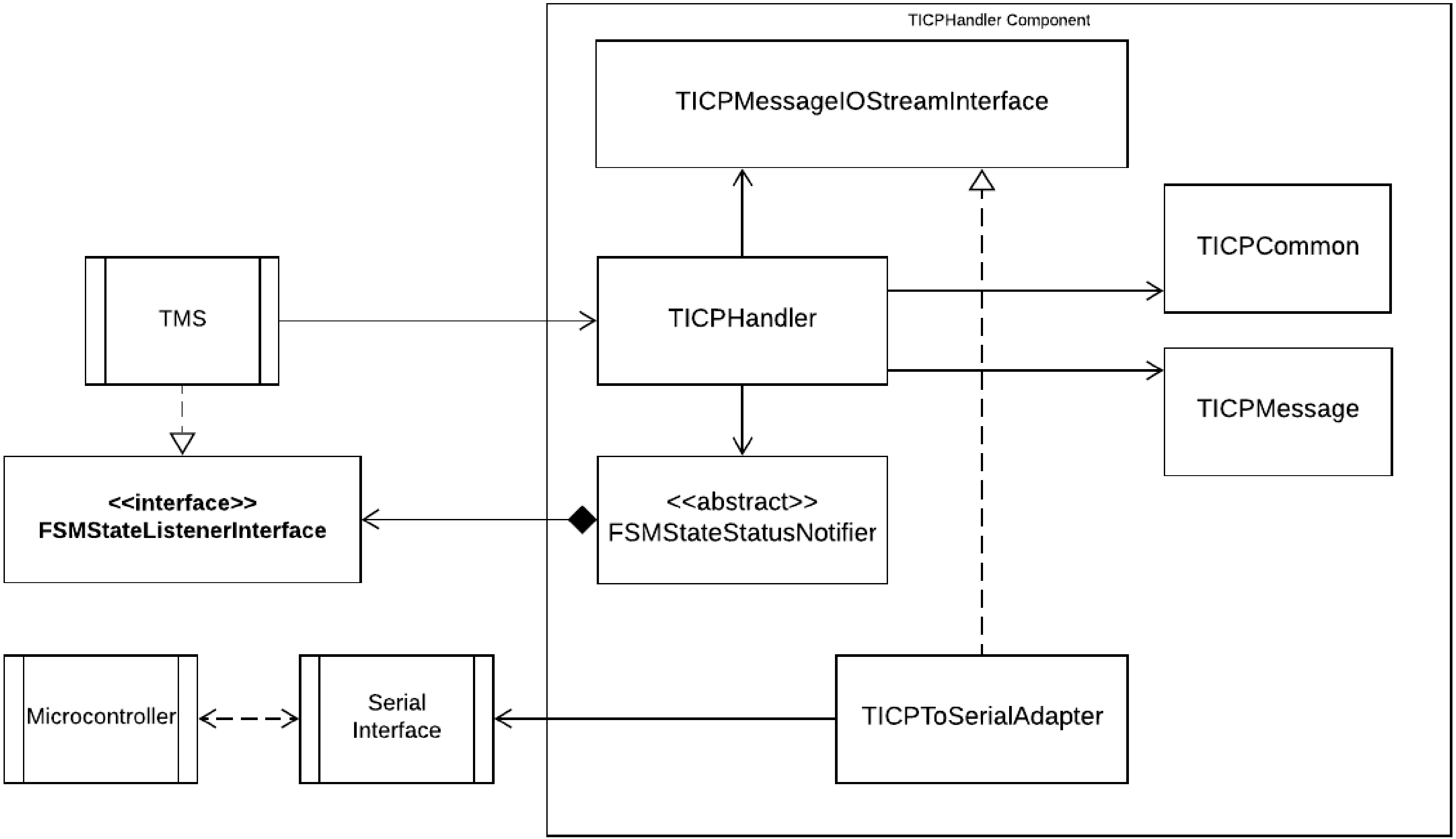

Timeline Width: 10.0 ms
ms
-1 ms
19.130 261 840
+1 ms
Unified
Scheduler
Idle
fsm_tsk
tof_tsk
radio_tsk
uart_tsk
acc_tsk
CPU Load Number of bins: 50, Bin width: 200.0 us
Scheduler
Idle
fsm_tsk
tof_tsk
radio_tsk
uart_tsk
acc_tsk


Schnellfahrt
else
SignalCounter >= Anzahl Signale ||
RundenCounter >= 2 ||
Zurückgelegte Strecke >= maximale Streckenlänge
Verlangsamen
langsame Geschwindigkeit erreicht
Nein
Ja
Warten auf Signal finales Haltesignal erkannt von Bordcomputer
finales Haltesignal erkannt
Nein
Ja
Haltesignal mit Distanzssensor erkennen
Haltesignal erkannt
Nein
Ja
Motor stoppen

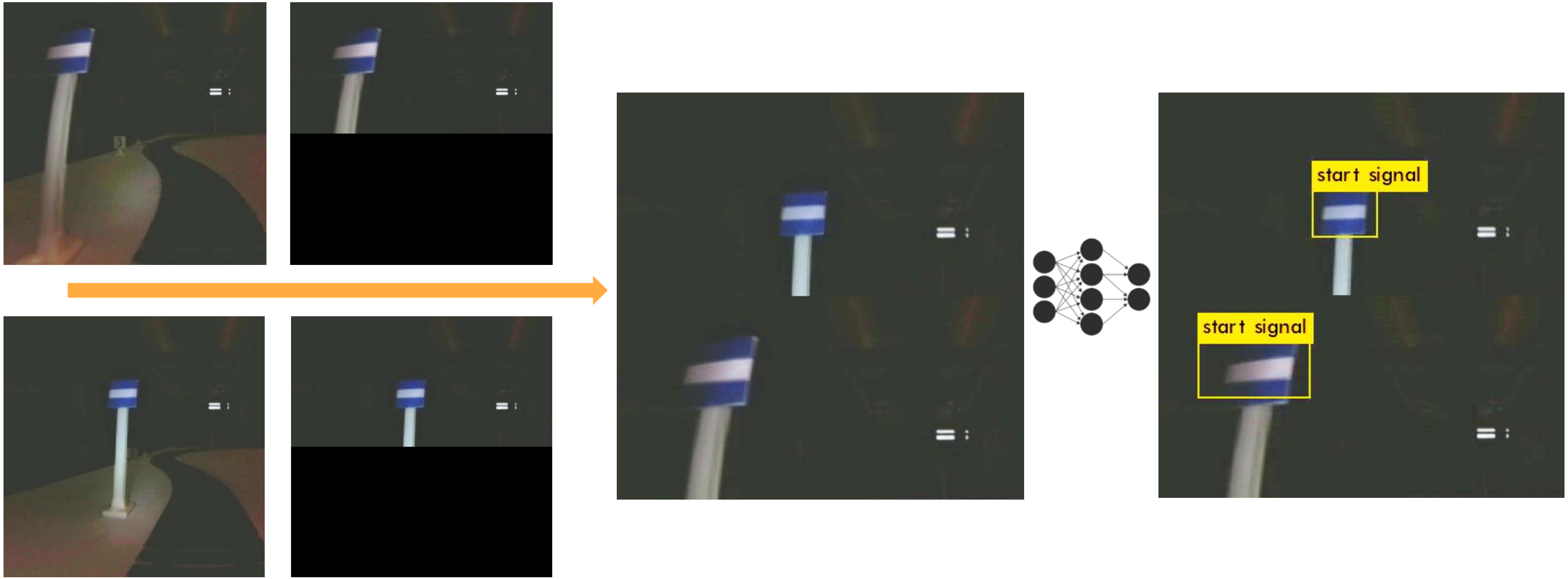
Train Management System



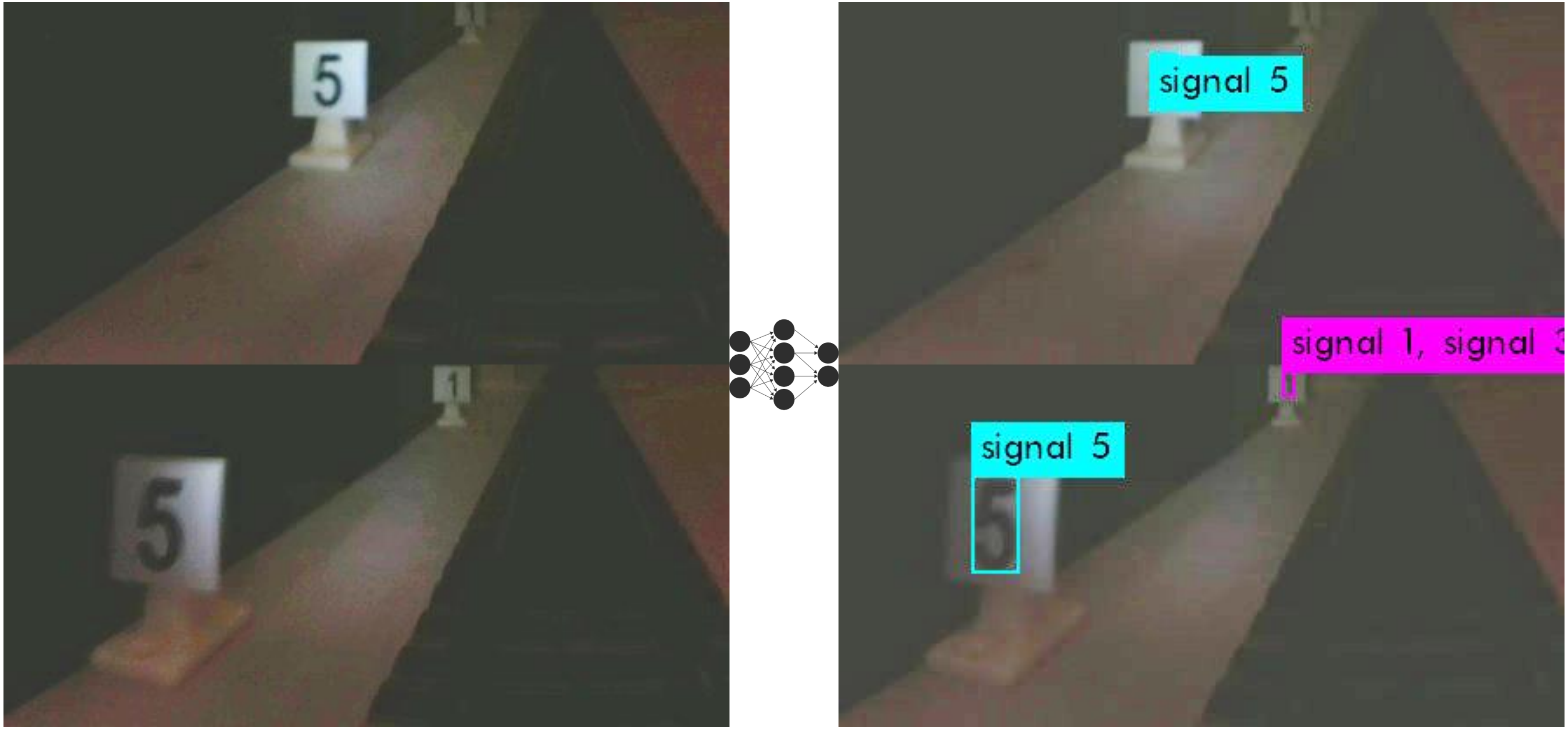

<<sensor>>
Camera
CSI
Panzertraktor Application
<<component>>
ImageAnalyser
ImageAnalysisProvider
TICPMessageIOStreamInterface
<<application>>
TrainManagementSystem
<<component>>
TICPHandler
UART
Mikrocontroller
<<actuator>>
Lautsprecher
GPIO / Klinke
FSMStateListenerInterface
SocketIO
<<application>>
Frontend


TICPHandler Component
TICPMessageIOStreamInterface
TICPCommon
TMS
TICPHandler
TICPMessage
<<interface>>
FSMStateListenerInterface
<<abstract>>
FSMStateStatusNotifier
Microcontroller
Serial
Interface
TICPToSerialAdapter

Signalerkennung - Lösungsansatz



Signalerkennung - Lösungsansatz



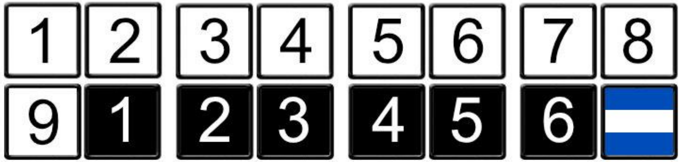
Signalerkennung - Umsetzung

- Trainiert mit Darknet Framework
- YOLOv3 Tiny Architektur
- Dataset mit 5000 Bildern

Signalerkennung - Transfer Learning

- Vortrainiertes Neuronales Netzwerk umtrainieren

COCO: Common Objects in Context
330k Bilder mit 1.5mio Objekten



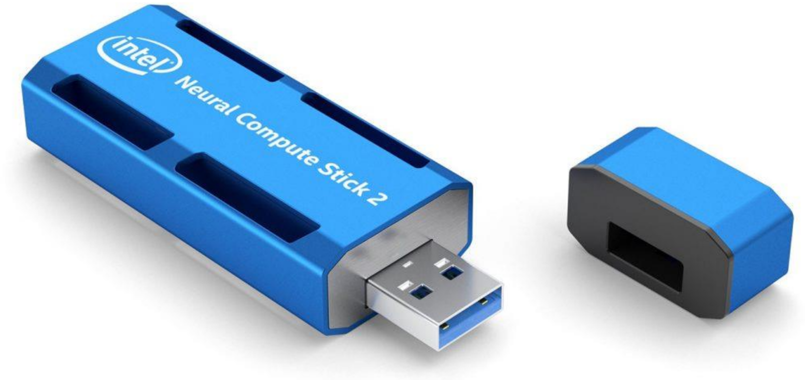
PREN Signale

Signalerkennung - Performance

Problem: Netz braucht zu viel Rechenleistung für Raspberry Pi CPU

Lösung: Intel Neural Compute Stick 2

- MYRIAD VPU auf USB Stick
- Optimiert für Neuronale Netze
- Release: Dezember 2018
- Unterstützung von YOLOv3: April 2019



Fazit

- Arbeiten mit cutting-edge technology
- Real-Time OS hat sich bewährt
- Anforderungen umgesetzt
- Teamarbeit ☺


Panzertraktor 37