
Autonomous Car



Selbstfahrendes Modell Auto



Agenda

1. Projektvorstellung - ein kurzer Einblick
2. OpenCV - die Python Bibliothek für Bildbearbeitung
3. Lane Detection - und deren Funktionsweise
4. Object Detection - YOLO - You Only Look Once
5. SELMA - SELbstfahrendes Modell Auto



1. Projektvorstellung



Link zum Video

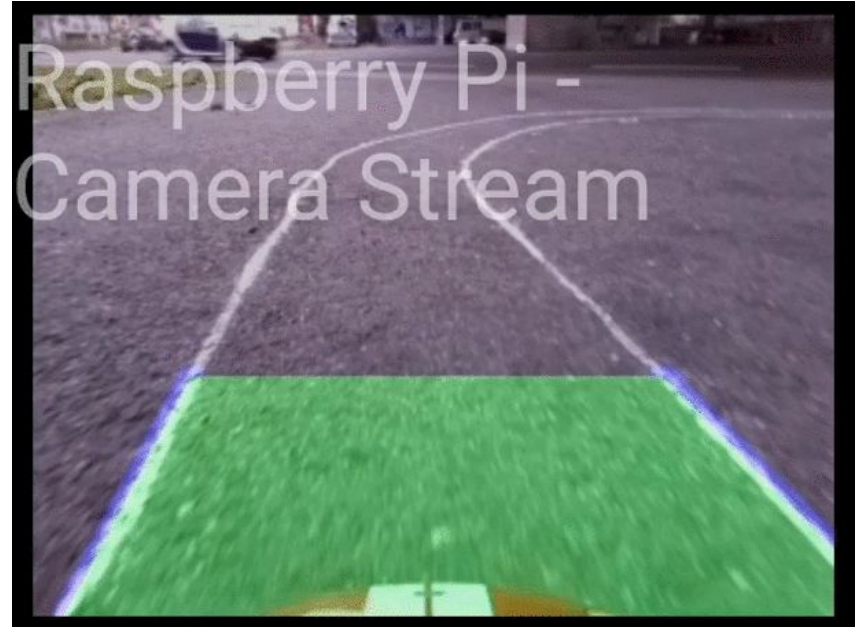


2. OpenCV

- Open Source Programmierbibliothek
- 1999 von Intel entwickelt
- Enthält Algorithmen zur Computer Vision
 - 2500 optimierte Algorithmen
- Wichtiger Teil der Lane und Object Detection



3. Lane Detection



3. Lane Detection

Input

Input Image



Grayscale



3. Lane Detection

Preprocessing

Brightness & Contrast



Gaussian Blur



3. Lane Detection

Detection

Canny Edges



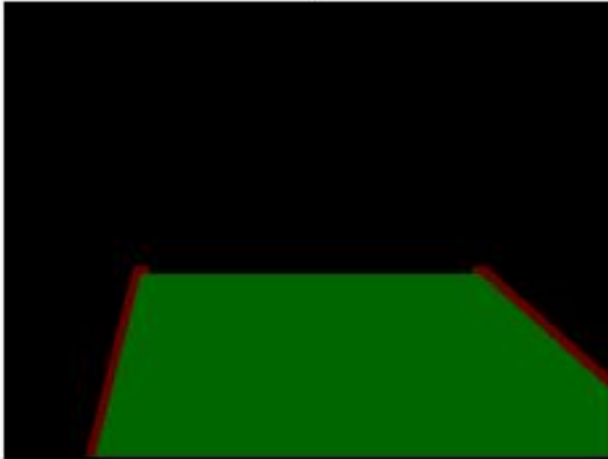
Region of Interest



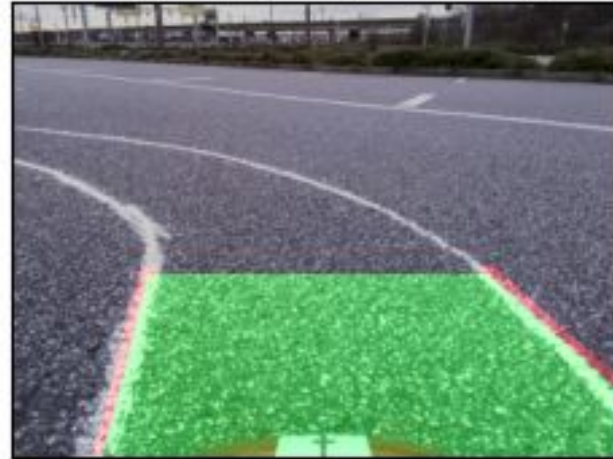
3. Lane Detection

Output

Slope



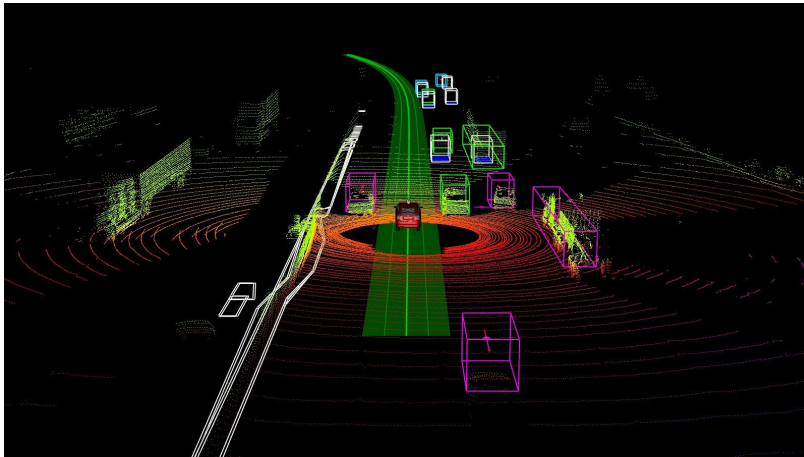
Weighted/Output Image



3. Lane Detection

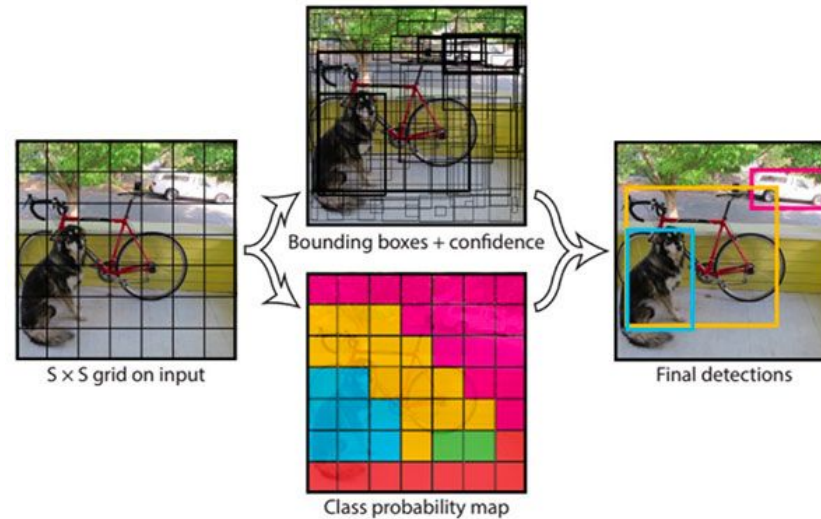


4. Object Detection



Quellen: https://miro.medium.com/max/3200/0*M5JNCGWJ9ox37i-E.jpg, <https://i.ytimg.com/vi/aJGCAOTCXxw/maxresdefault.jpg>

You Only Look Once - YOLO Object Detection



Quelle: https://pyimagesearch.com/wp-content/uploads/2018/11/yolo_design.jpg

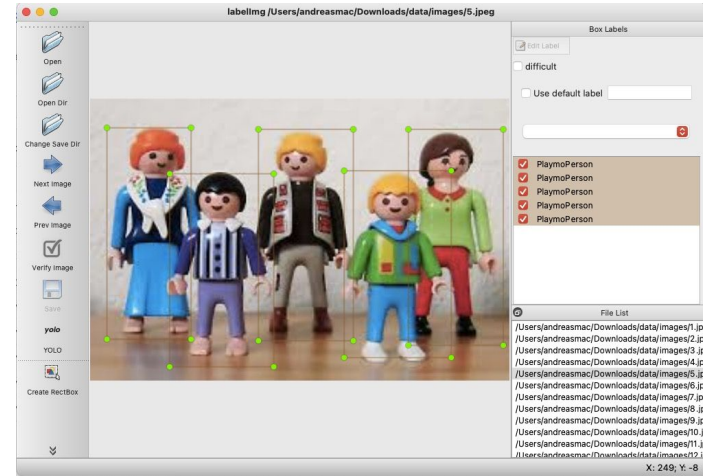
YOLO tiny vs normal



Quelle:
<https://images.portal.muenchen.de/000/000/221/848/versions/neuhauser-strasse-detail.jpg>

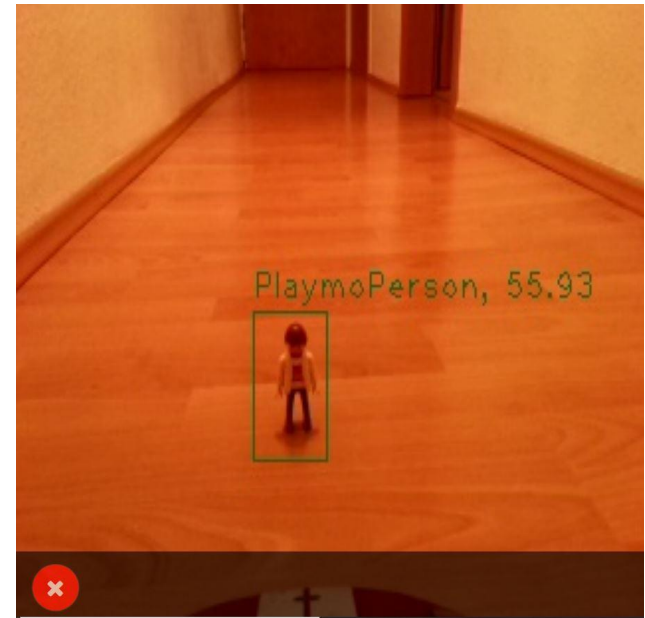


Custom YOLO



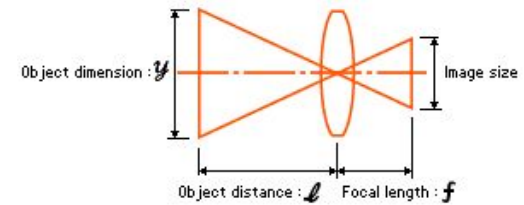
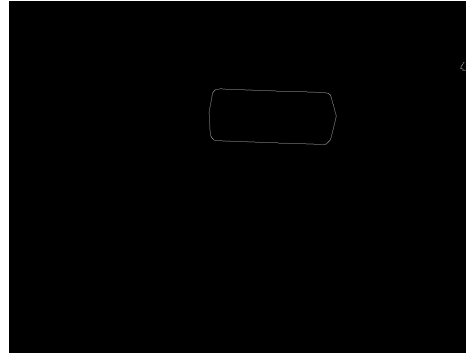
Quelle: https://m.media-amazon.com/images/I/71G2hRuTJLL_AC_UY218_.jpg

Ergebnis



Quelle: <https://www.youtube.com/watch?v=vbc9spoCrMI&t=199s>

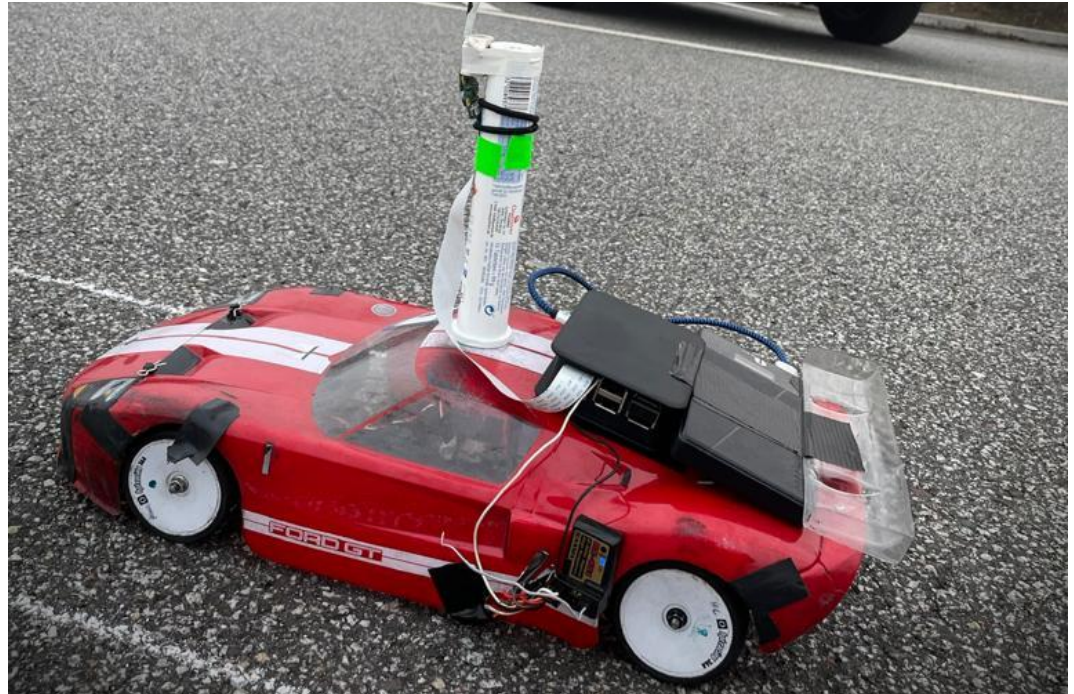
Distanzberechnung



Quelle:

<https://www.usa.canon.com/internet/portal/us/home/explore/learning-center/electronic-range-calculators/bctv-range-objectdimension>

5. SELMA



5. SELMA

Modellauto

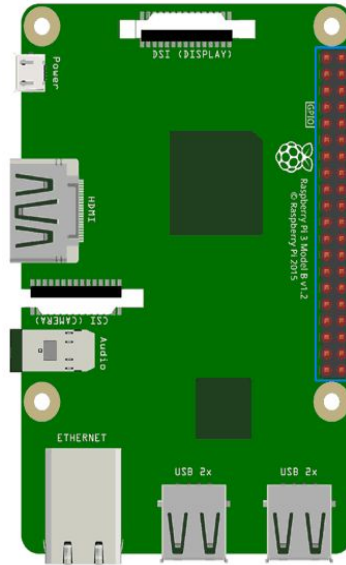
Raspberry PI

Kamera

Powerbank



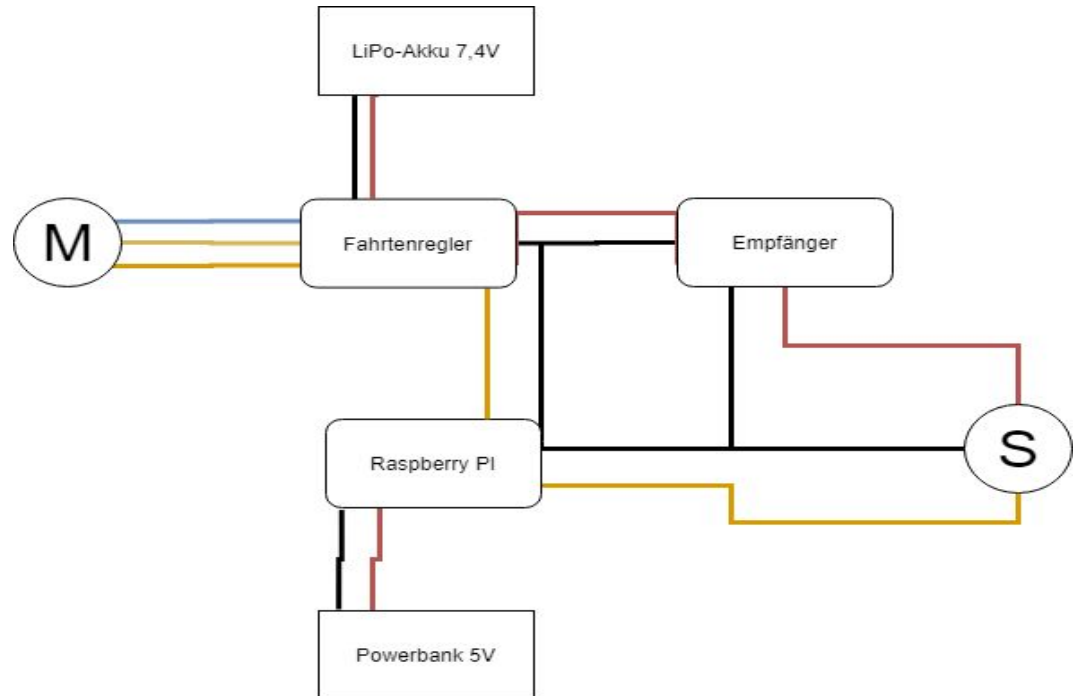
Raspberry Pi



3.3V	1	2	5V
GPIO2 (SDA1)	3	4	5V
GPIO3 (SCL1)	5	6	GND
GPIO4 (GPIO_GCLK)	7	8	GPIO14 (UART_TXD0)
GND	9	10	GPIO15 (UART_RXD0)
GPIO17 (GPIO_GEN0)	11	12	GPIO18 (GPIO_GEN1) PWM0
GPIO27 (GPIO_GEN2)	13	14	GND
GPIO22 (GPIO_GEN3)	15	16	GPIO23 (GPIO_GEN4)
3.3V	17	18	GPIO24 (GPIO_GEN5)
GPIO10 (SPI0_MOSI)	19	20	GND
GPIO9 (SPI0_MISO)	21	22	GPIO25 (GPIO_GEN6)
GPIO11 (SPI0_CLK)	23	24	GPIO8 (SPI_CE0_N)
GND	25	26	GPIO7 (SPI_CE1_N)
ID_SD (I2C EEPROM)	27	28	ID_SC (I2C EEPROM)
GPIO5	29	30	GND
GPIO6	31	32	GPIO12 PWM0
PWM1 GPIO13	33	34	GND
PWM1 GPIO19	35	36	GPIO16
GPIO26	37	38	GPIO20
GND	39	40	GPIO21

https://www.electronicwings.com/public/images/user_images/images/Raspberry%20Pi/RaspberryPi_PWM/Raspberry%20pi%203%20PWM%20pins.png

Verkablung



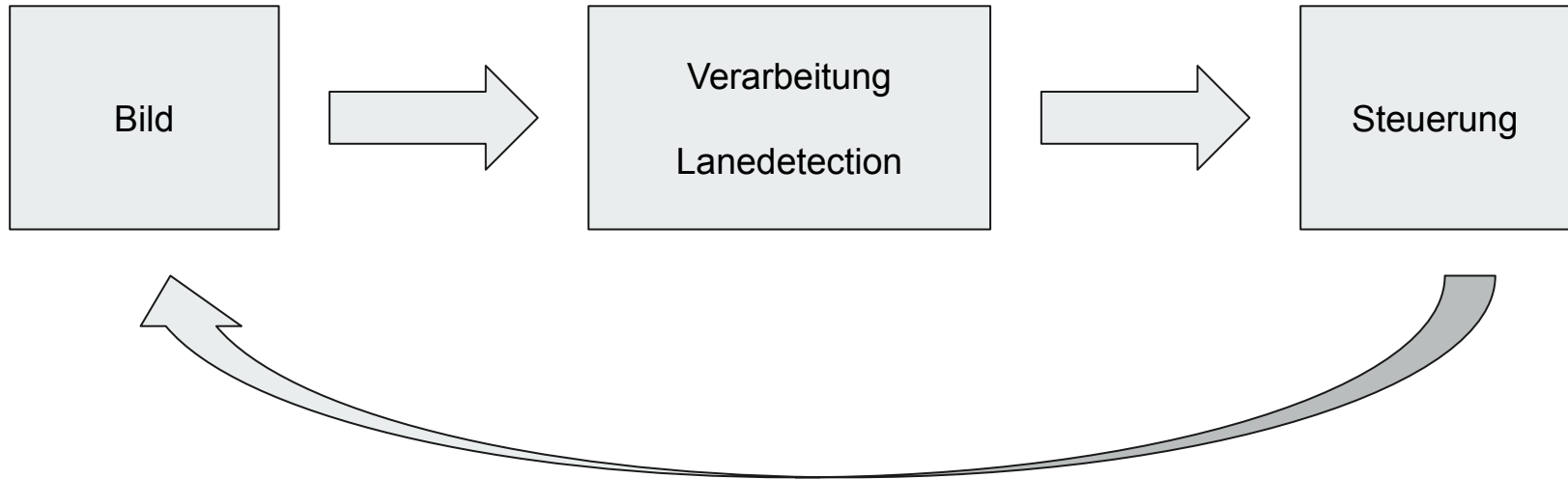


Signale

```
1  IO.setmode(IO.BOARD)
2  IO.setup(35, IO.OUT)
3  steering = IO.PWM(35, 50)
4  steering.start(0)
5  steering.ChangeDutyCycle(10)
6  steering.stop()
```



Steuerung

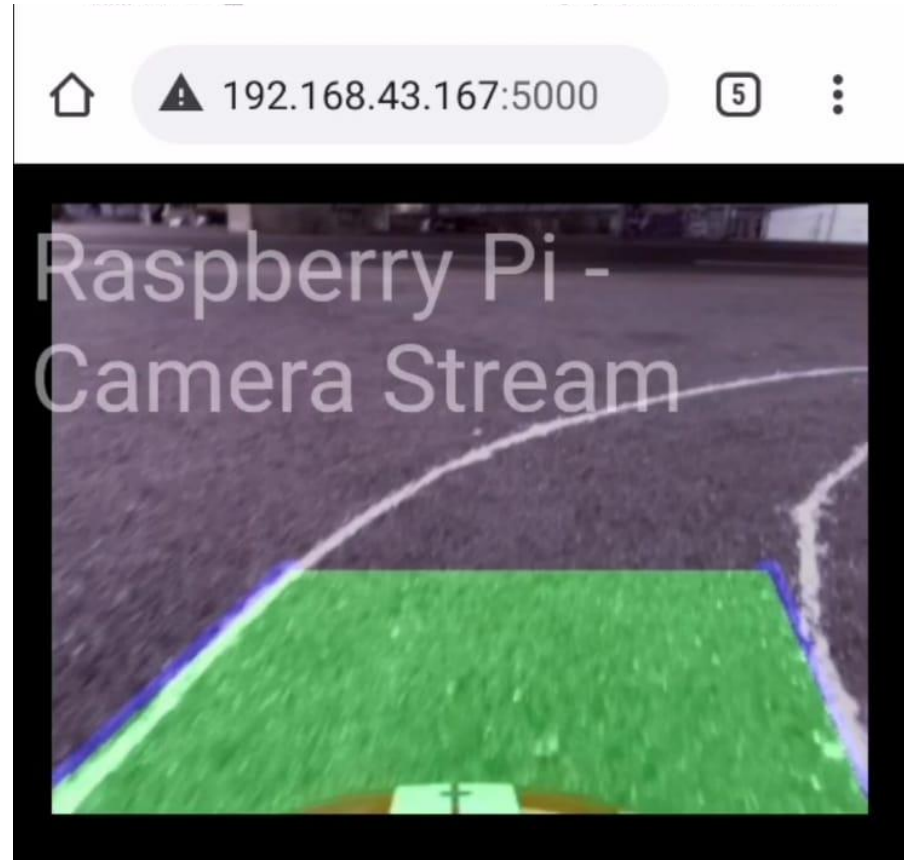


Testsetup

loakles Netzwerk

SSH zum Raspberry PI

Commands über Shell





Vielen Dank!