



2024 자율주행 모형차량 경진대회

Autonomous

백재민, 박준아

목차

01 Develop Process

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01 Develop Process

차량 설계

조향장치 변경

에커먼 조향
조향장치의 유격으로 인한
떨림 보완

카메라 변경

곡선 주행 시 도로 한쪽이
보이지 않는 문제 발생
광각카메라로 변경함



실제 표지판 사진,
블랙박스 사진 위주로
데이터셋 구성

Edge 검출 방식
플라스크를 이용한 원격제어
방식으로 연습주행

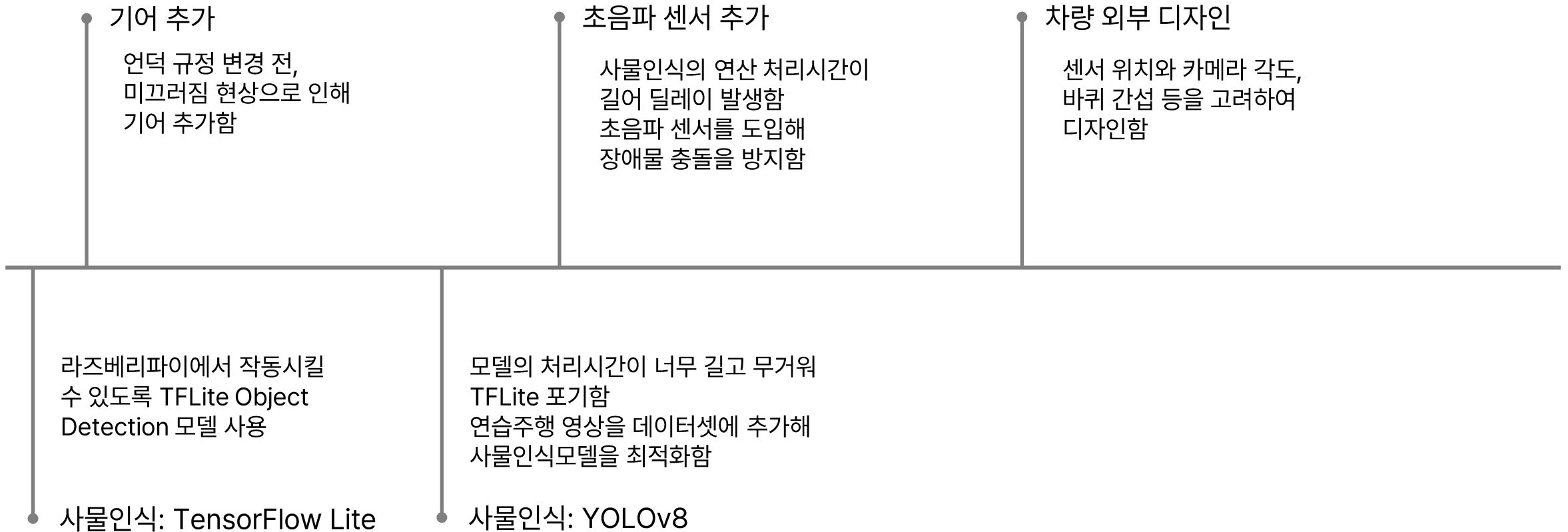
낮은 프레임 속도와 딜레이 발생
대회용 주행트랙에 맞춰 Deviation(%) 값만
출력하도록 중간단계 생략함

사물인식: YOLOv5

차선인식

차선인식 경량화

01 Develop Process



01 Develop Process

주행

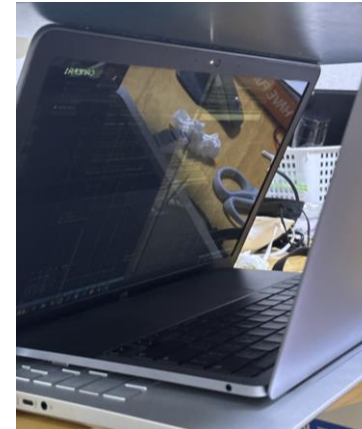
안전한 완주를 위해
사물인식을 포기하고,
초음파 센서로 해결가능한
장애물 타파에 집중함

연습주행을 통해 최적의
파라미터 값을 도출함

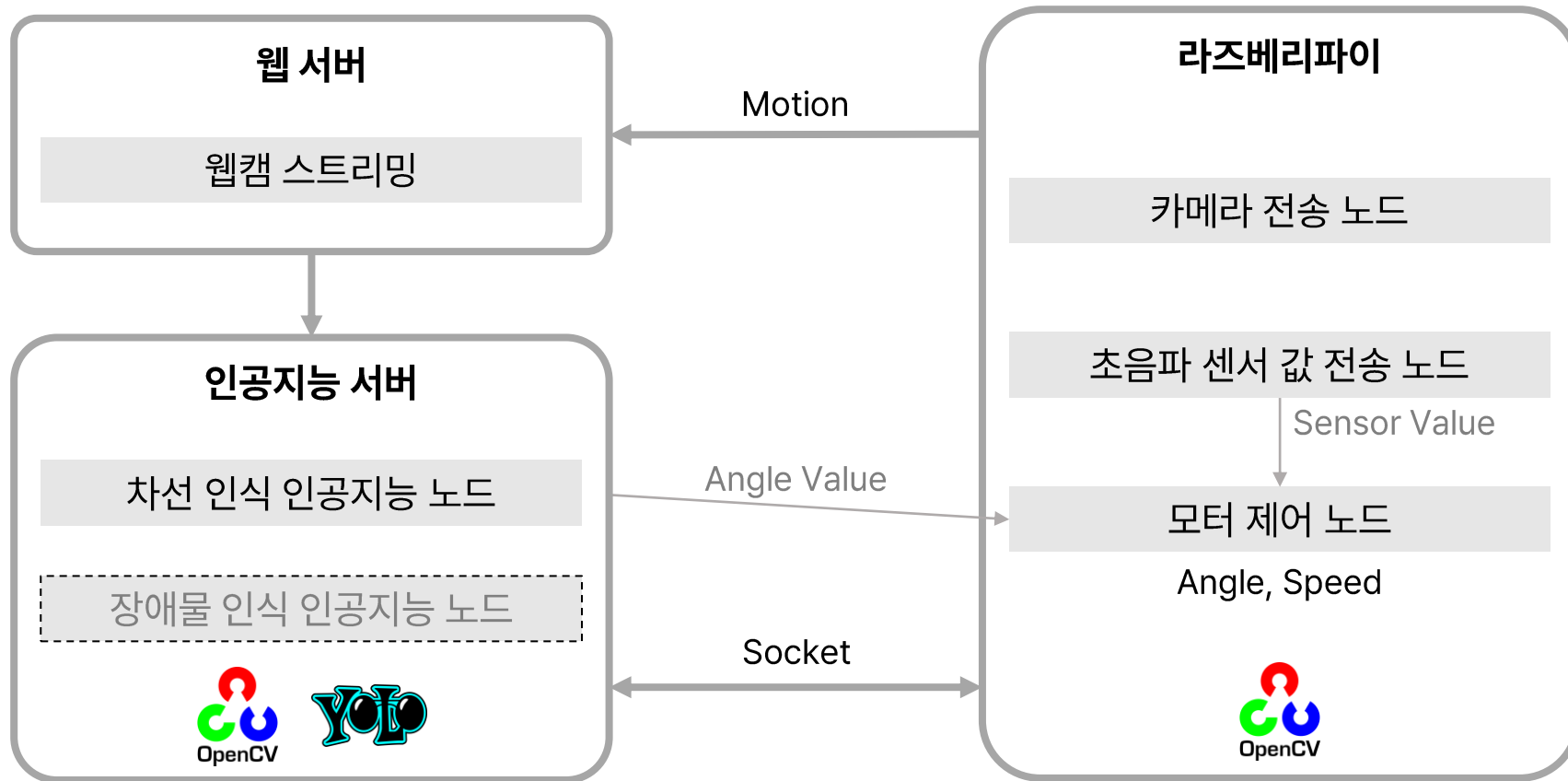
차선인식 정밀화

영상 이미지를 동시에 받아오기
위해 두 개의 파일을 합쳤으나,
딜레이 현상이 심함
다양한 해결방안을 시도함

차선인식과 사물인식 파일 단일화



02 Model Description



02 Model Description

차선 인식 : Edge 검출 방식

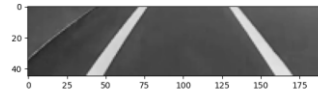
인공지능 서버

차선 인식 인공지능 노드

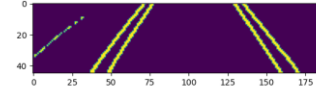
장애물 인식 인공지능 노드



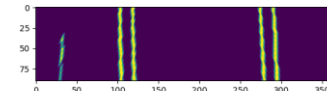
Region Of Interest



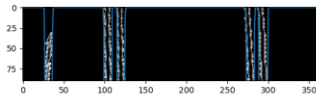
Sobel Filter



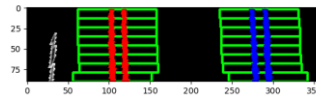
Perspective Transform



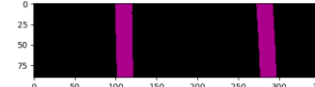
Blind Search



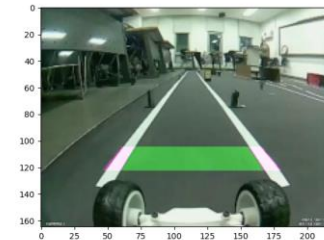
Sliding Window



Draw Line



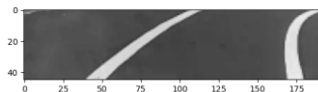
Overlap



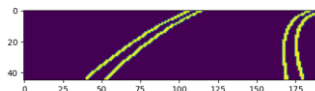
02 Model Description

차선 인식 : Edge 검출 방식

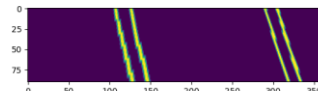
Region Of Interest



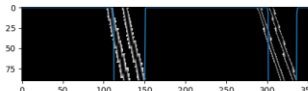
Sobel Filter



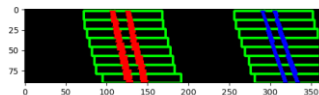
Perspective Transform



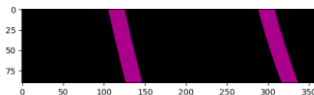
Blind Search



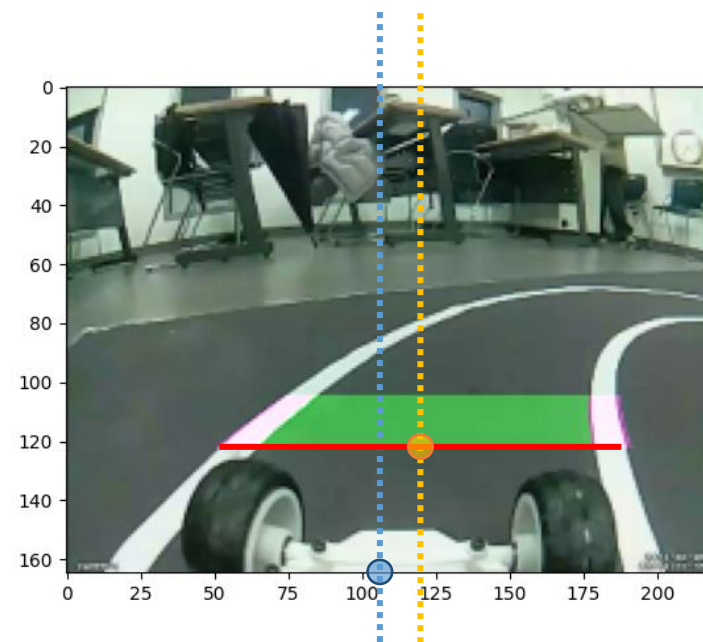
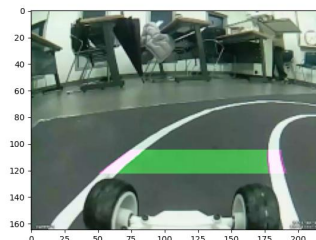
Sliding Window



Draw Line

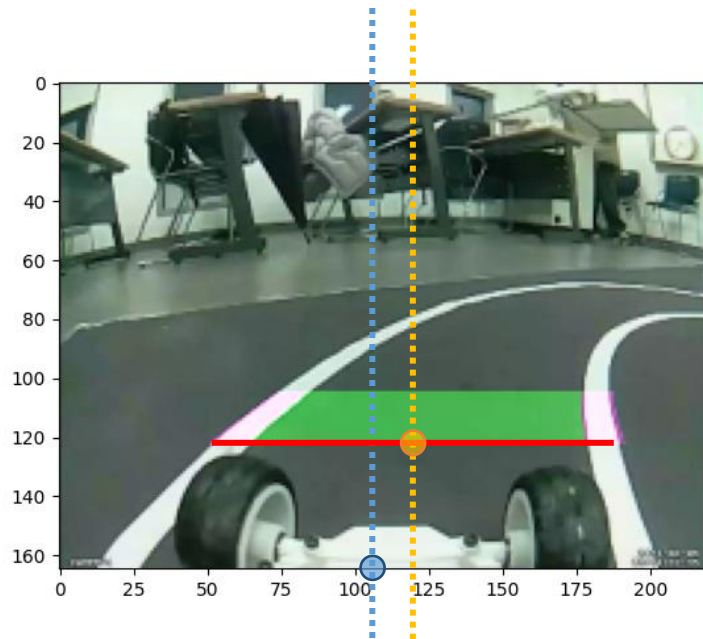


Overlap



02 Model Description

차선 인식 : Edge 검출 방식



```
center_lane = (right_line.startx + left_line.startx) / 2
```

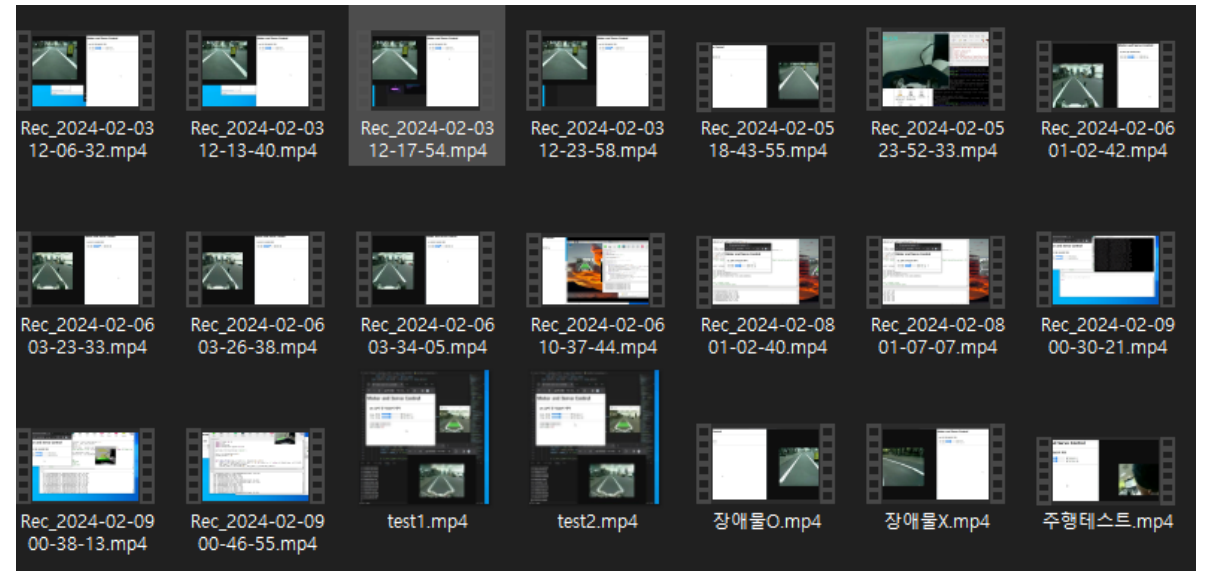
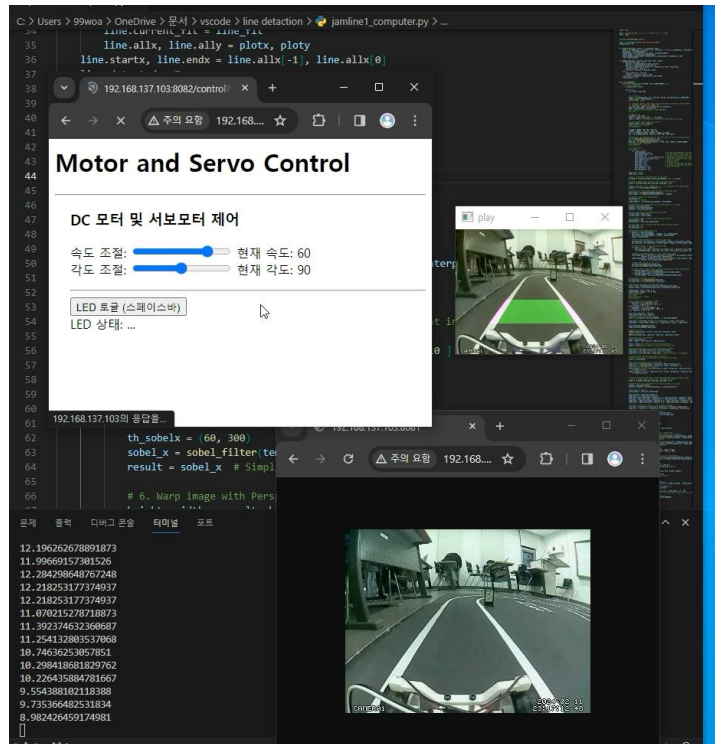
```
lane_width = right_line.startx - left_line.startx
```

```
center_car = warp_img.shape[1] / 2
```

```
deviation_percent = abs(center_lane - center_car) / (lane_width / 2) * 100
```

02 Model Description

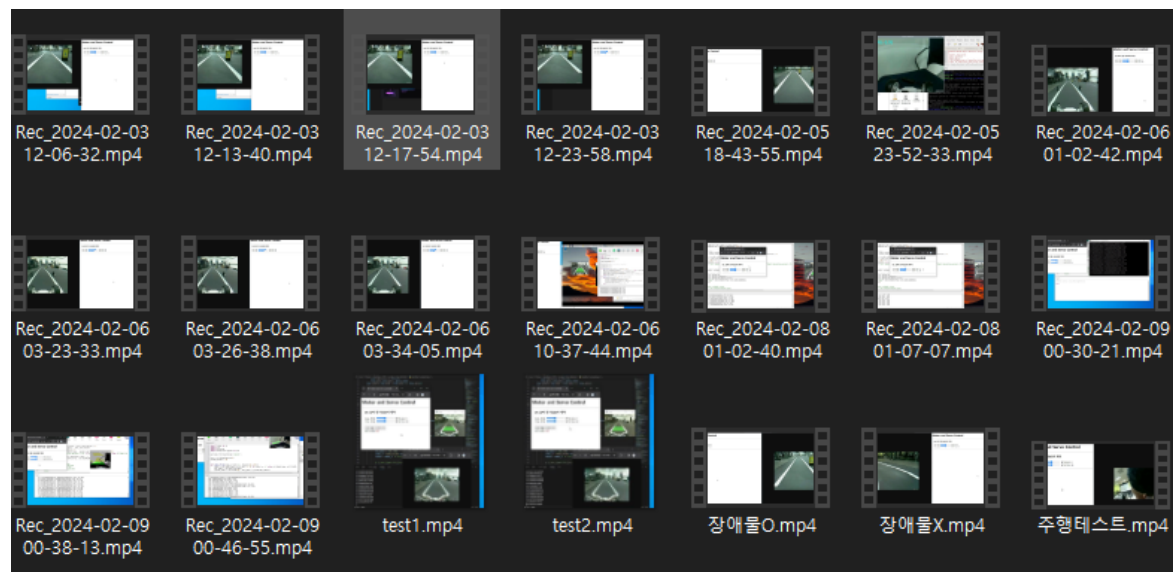
서보모터의 각도 - 선형보간법



02 Model Description

서보모터의 각도 - 선형보간법

주행 데이터



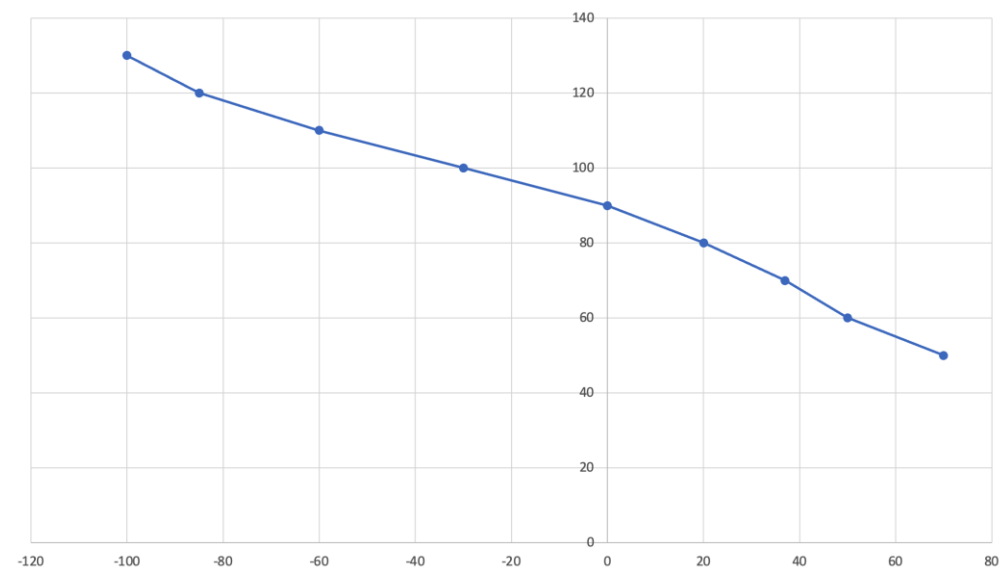
→ deviation (0)	→ angle (90)
-100	130
-85	120
-60	110
-30	100
0	90
20	80
37	70
50	60
70	50

02 Model Description

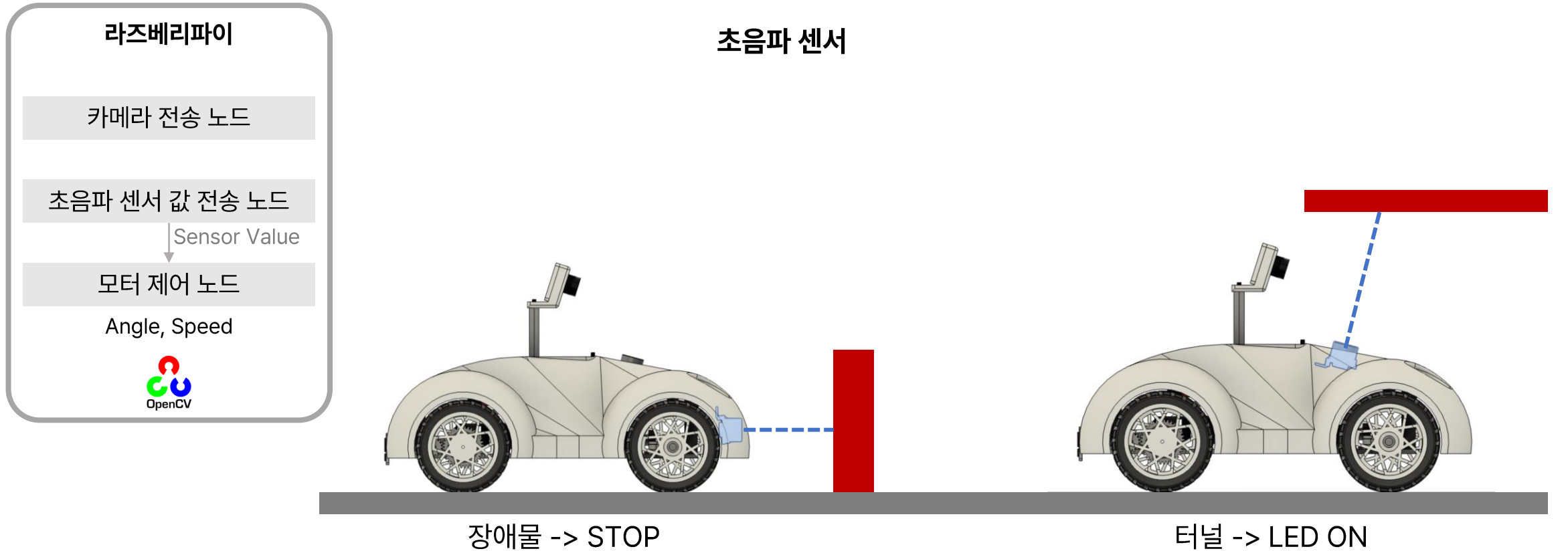
서보모터의 각도 - 선형보간법

deviation (0) → angle (90) →

-100	130
-85	120
-60	110
-30	100
0	90
20	80
37	70
50	60
70	50

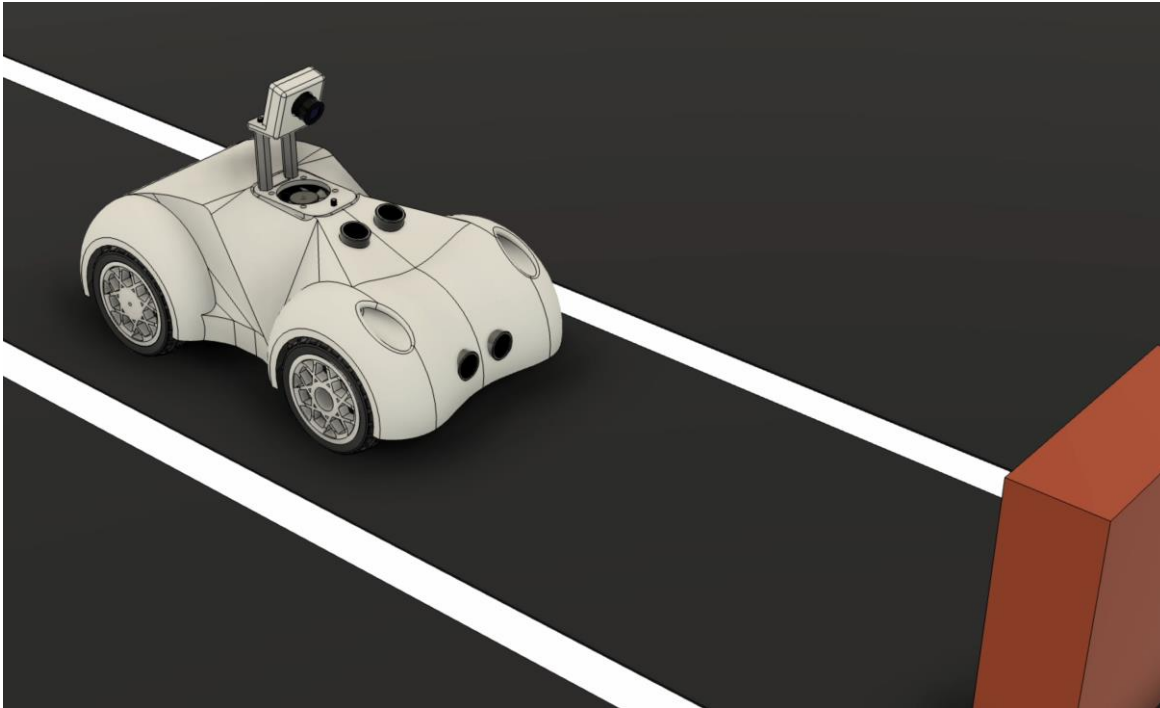


02 Model Description



02 Model Description

초음파 센서



02

Model Description

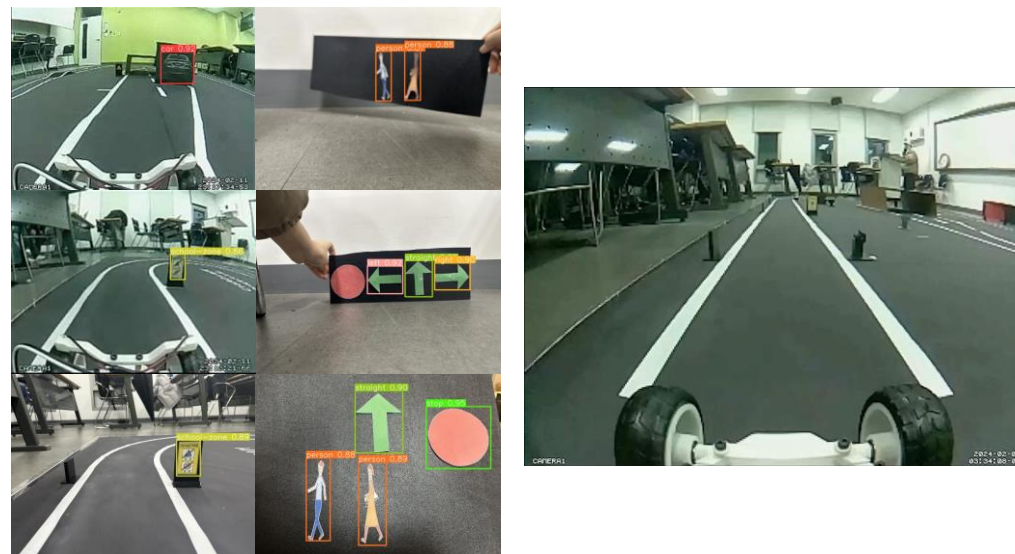
장애물 인식 : YOLOv8n Custom Dataset

```
!yolo task=detect mode=train model=yolov8n.pt data={dataset.location}/data.yaml epochs=100 imgsz=220 plots=True
```

학습데이터 : 640*480 리사이징, 밝기 -20%~+20%

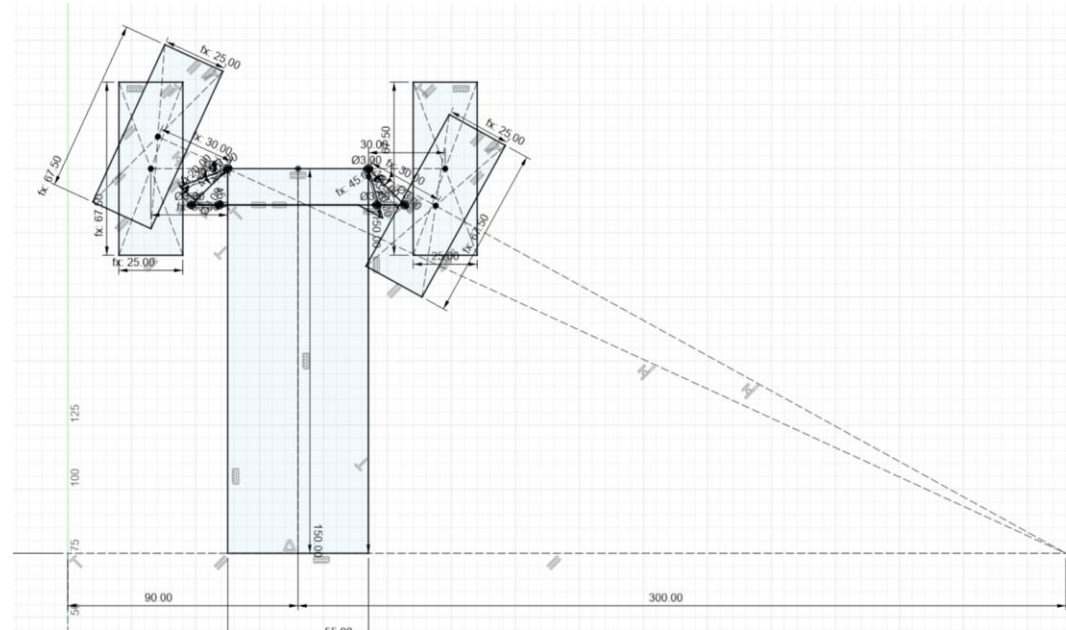


학습 결과



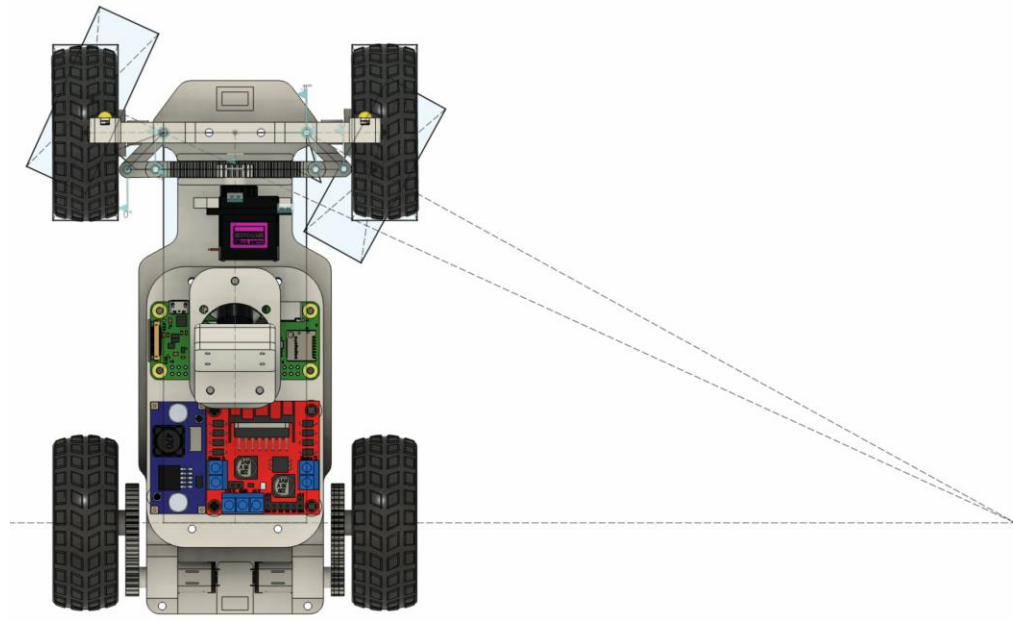
03 Design

Ackermann steering Kinematics



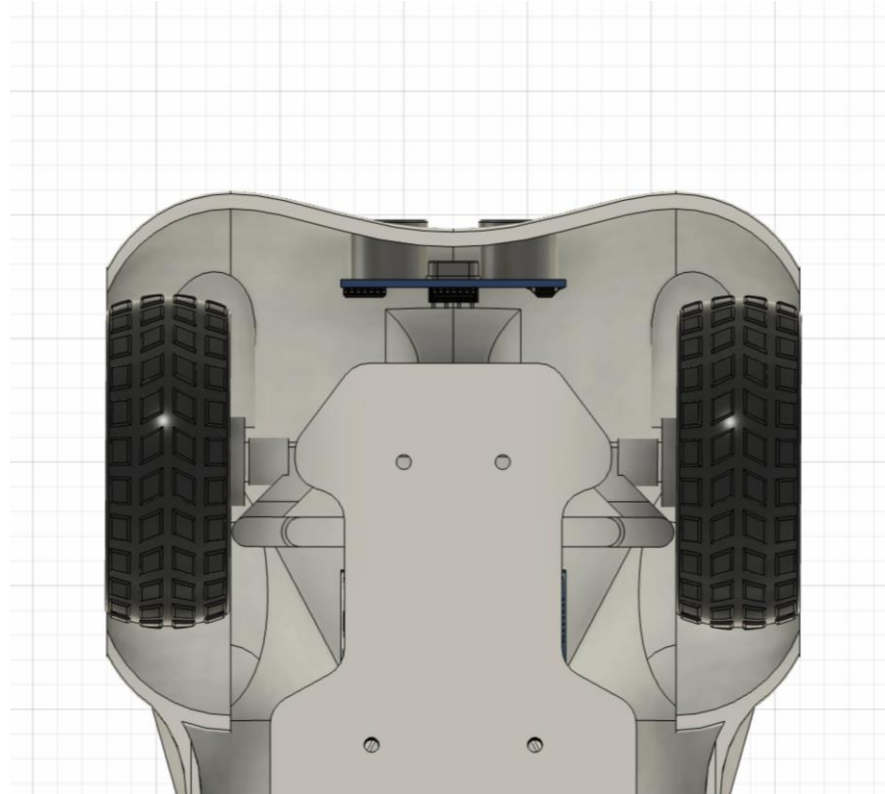
03 Design

Ackermann steering Kinematics



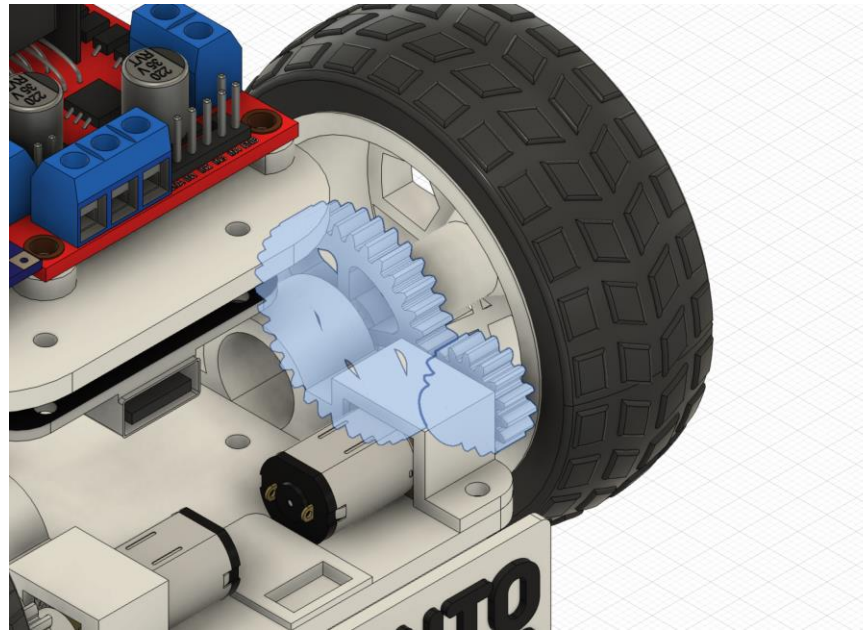
03 Design

Ackermann steering Kinematics



03 Design

2.25

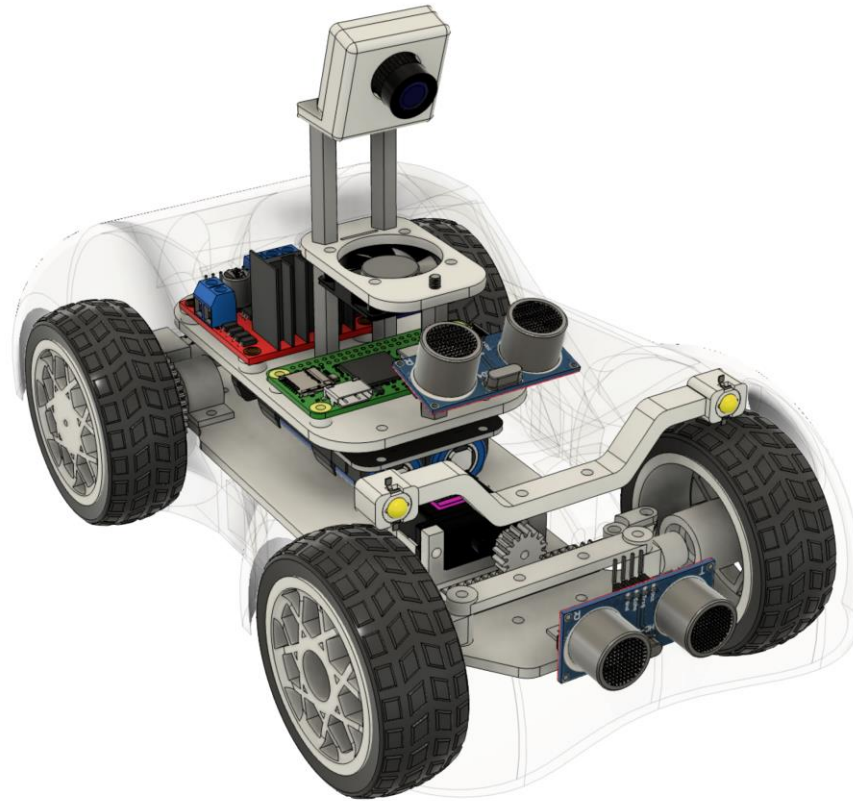


03 Design



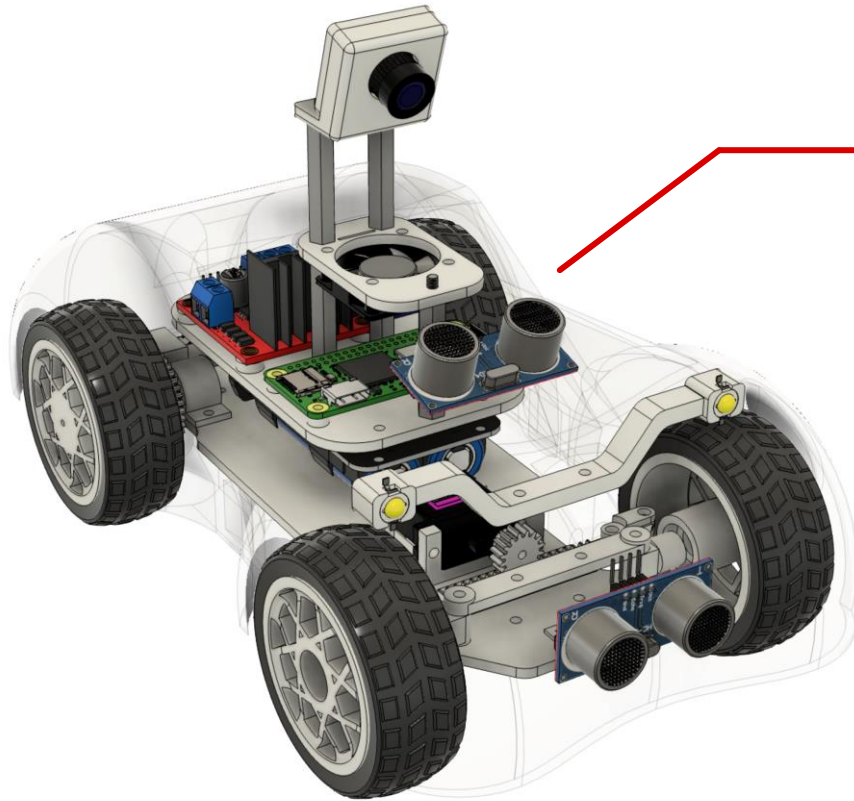
Autonomous

03 Design



Autonomous

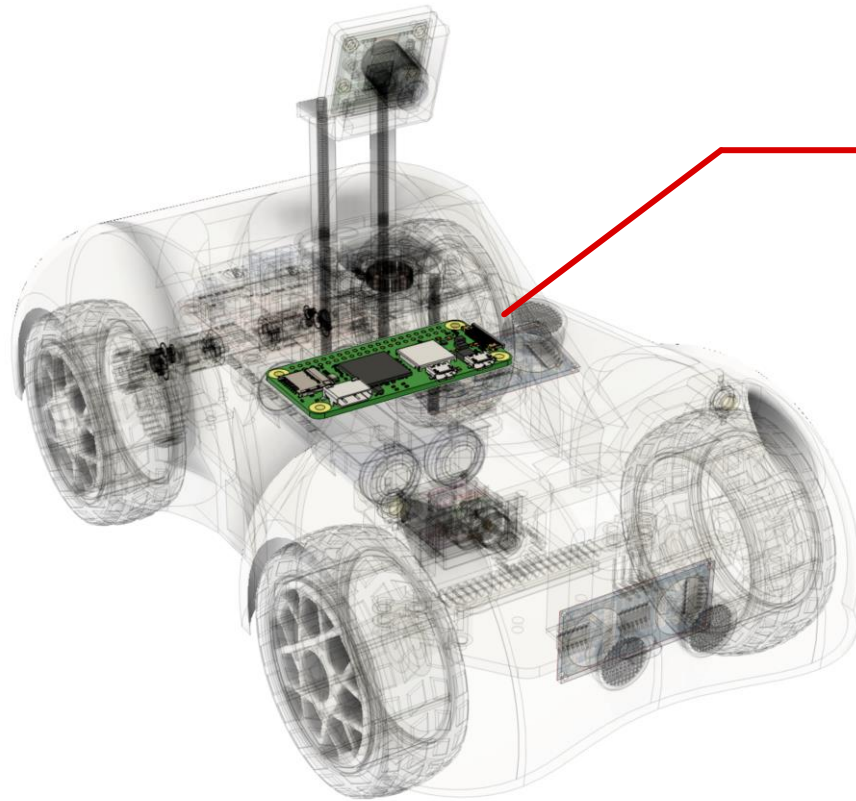
03 Design



3D모델링 & 출력

최소 30%. 최대 60% 내부채움으로
내부 경량화 및 내구성 확보

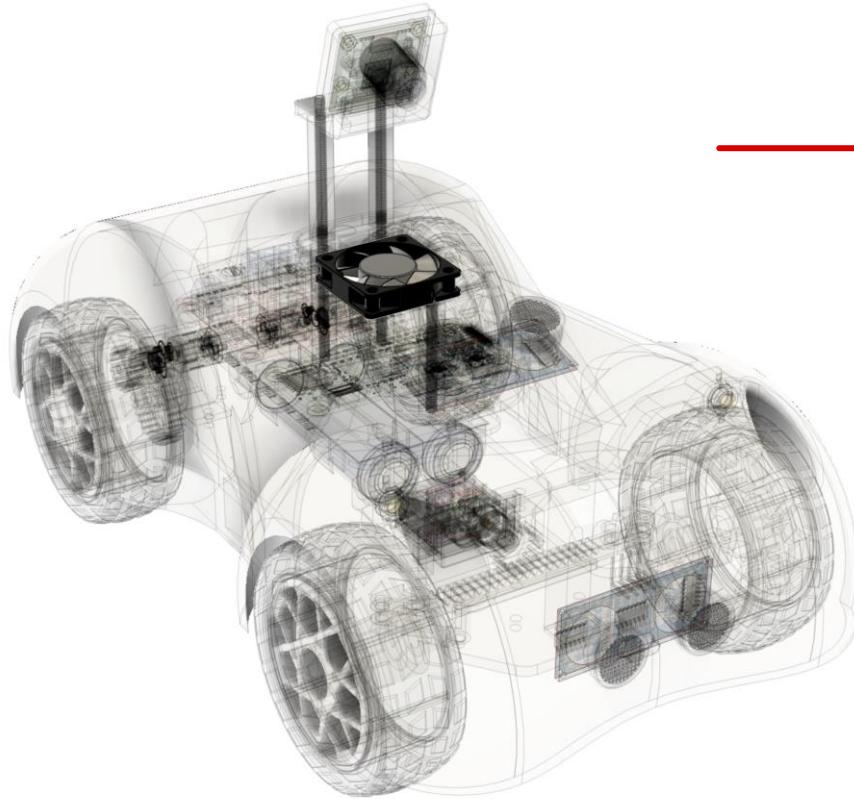
03 Design



라즈베리파이

방열을 위한 상단배치

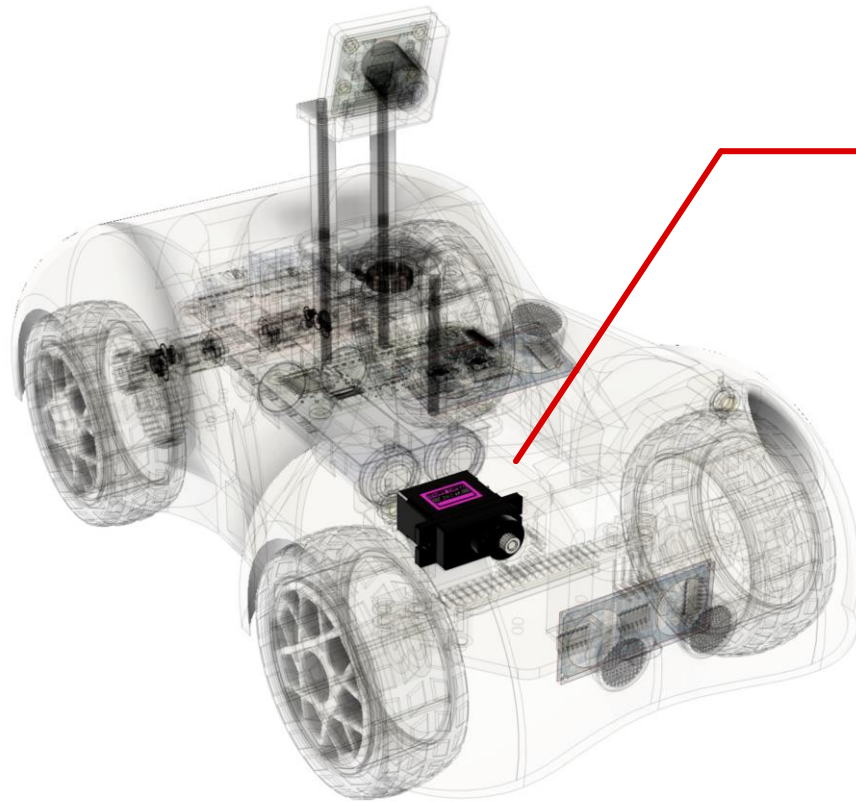
03 Design



쿨링팬 & 방열판

효과적인 방열을 위한 설치

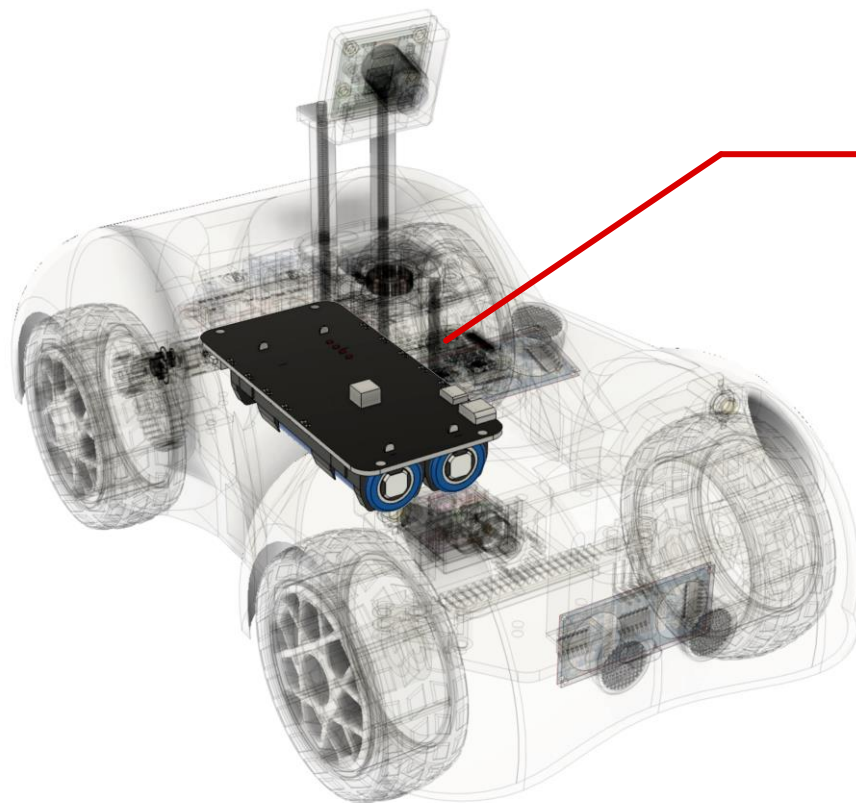
03 Design



서보모터

전륜조향(애커만조향)을 위한 모터

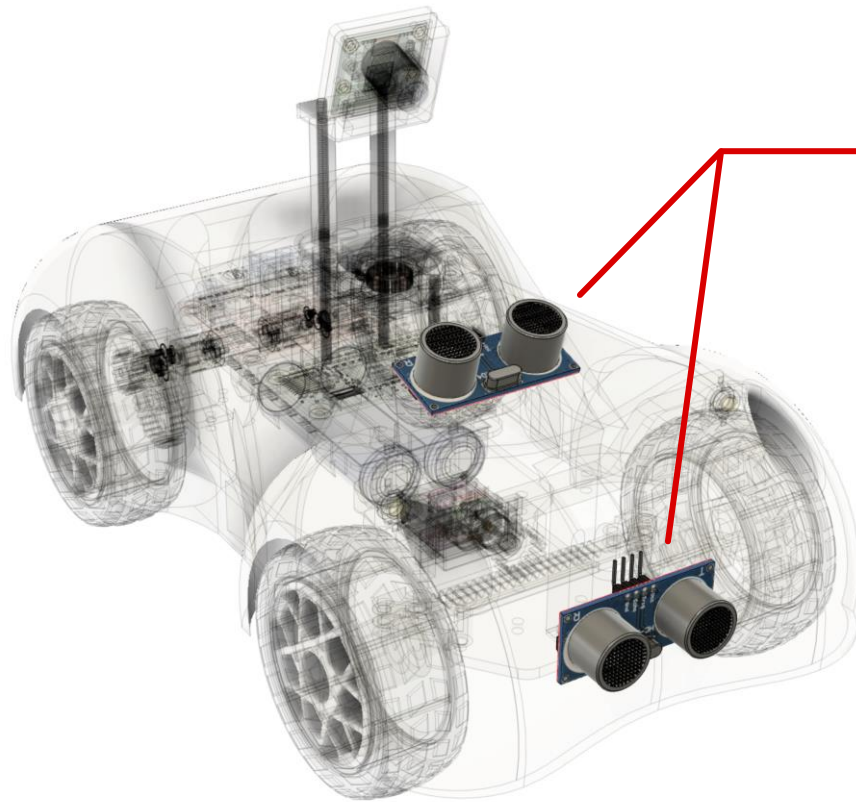
03 Design



배터리

무게중심을 고려해 하단 후면에 배치

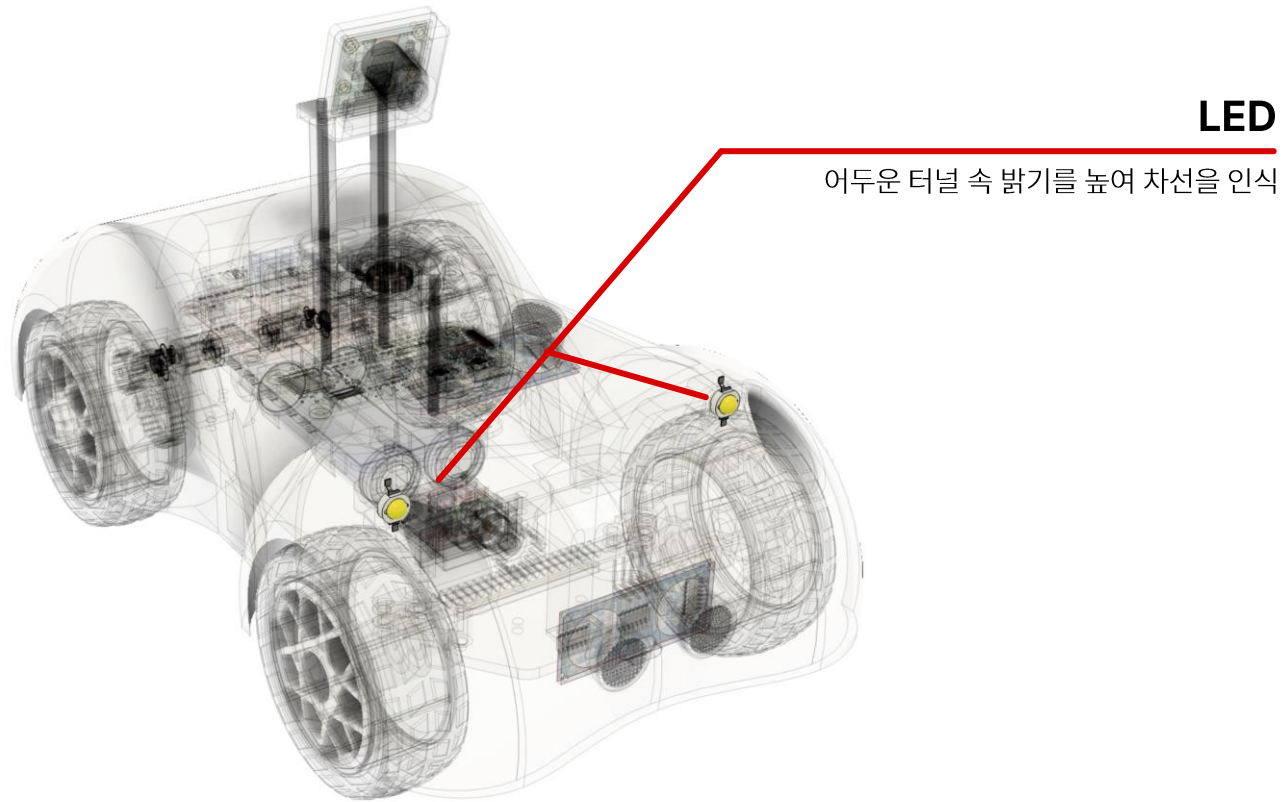
03 Design



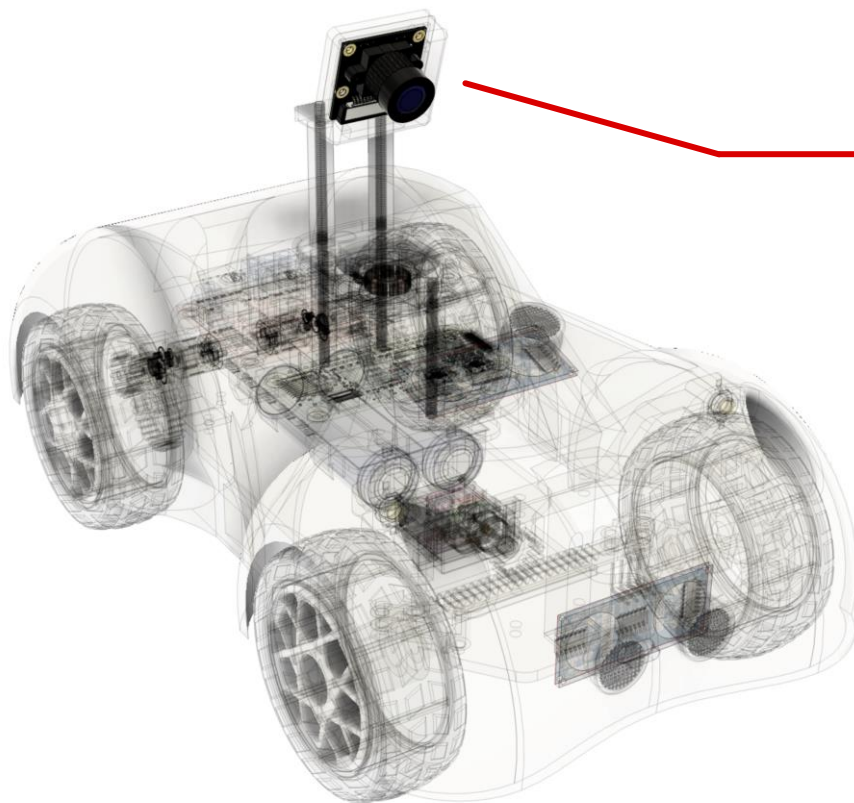
초음파 센서

장애물 및 터널 감지를 위한 센서

03 Design



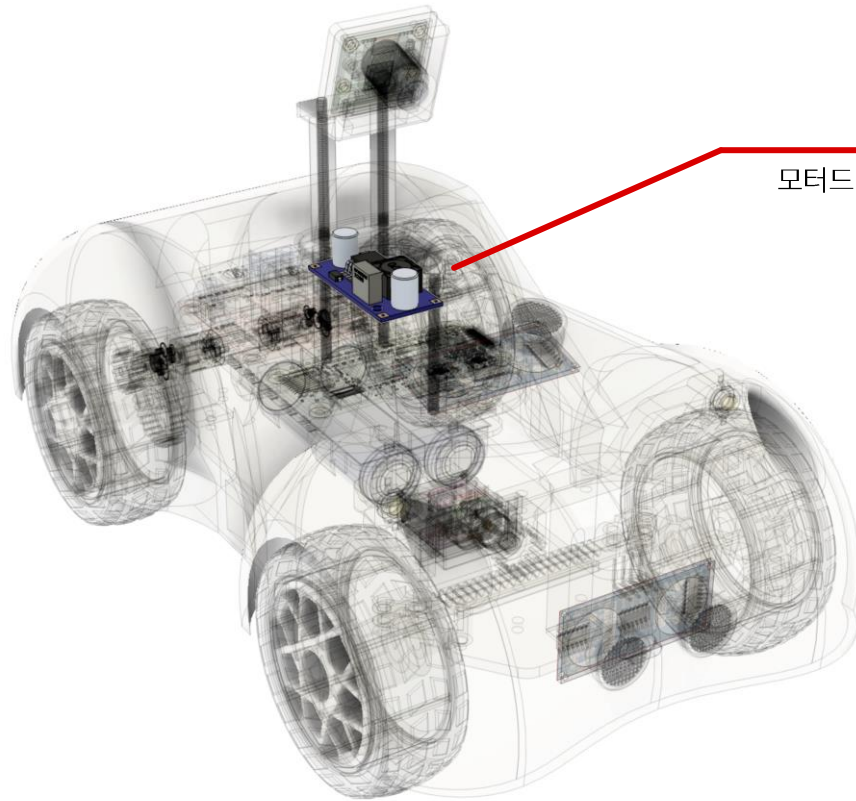
03 Design



광각 카메라

넓은 시야로 차선을 효율적으로 인식

03 Design



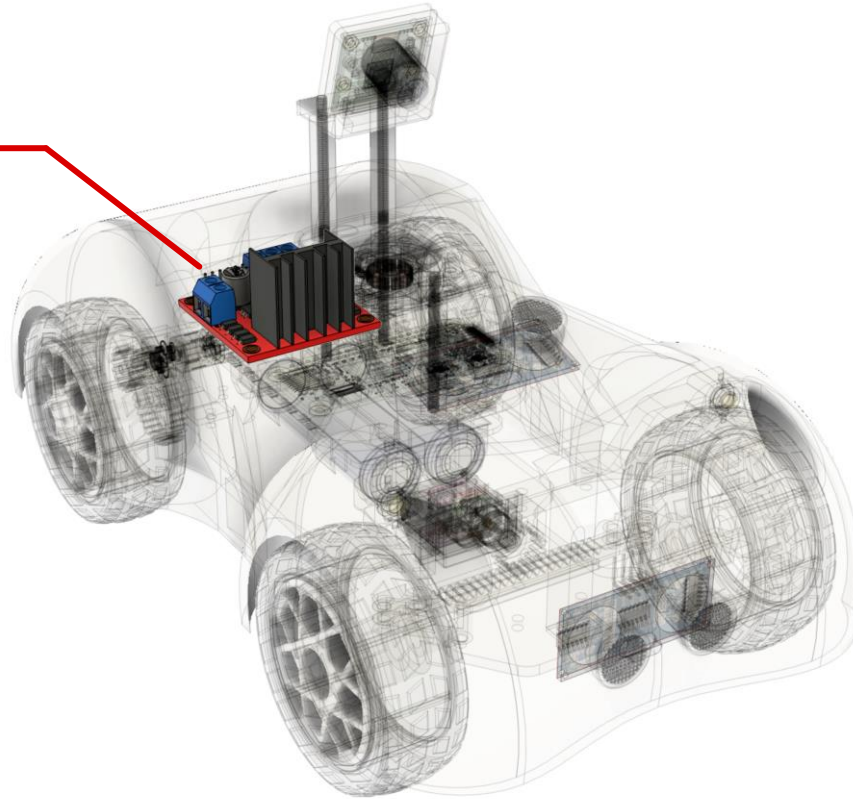
스텝업

모터드라이버에 6V를 공급해주기 위한 모듈

03 Design

모터드라이버

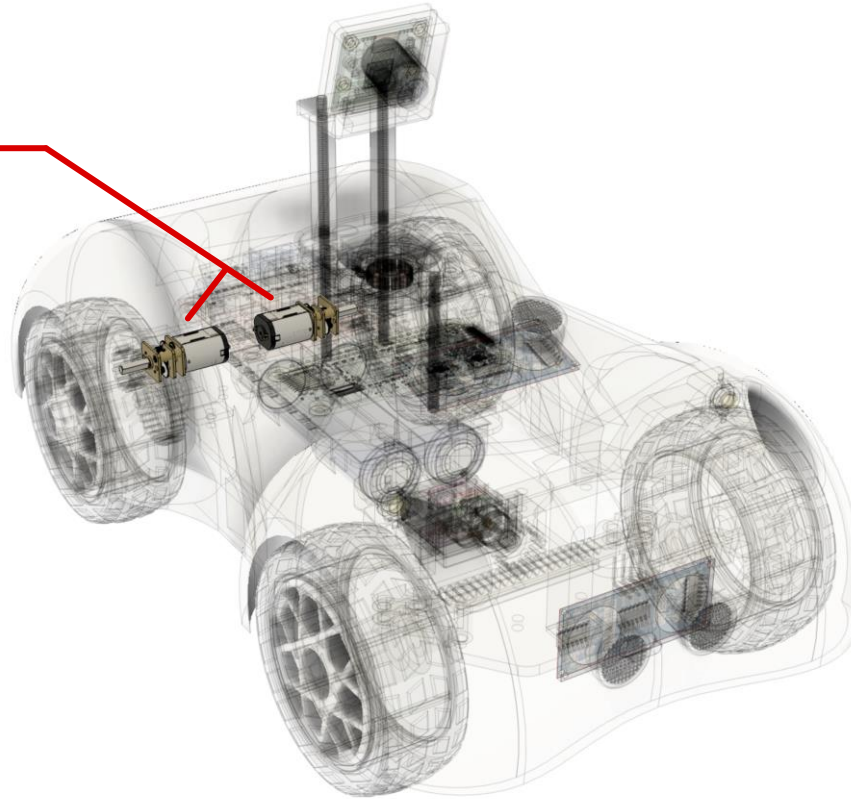
n20 모터를 작동시키는 모듈



03 Design

n20 모터

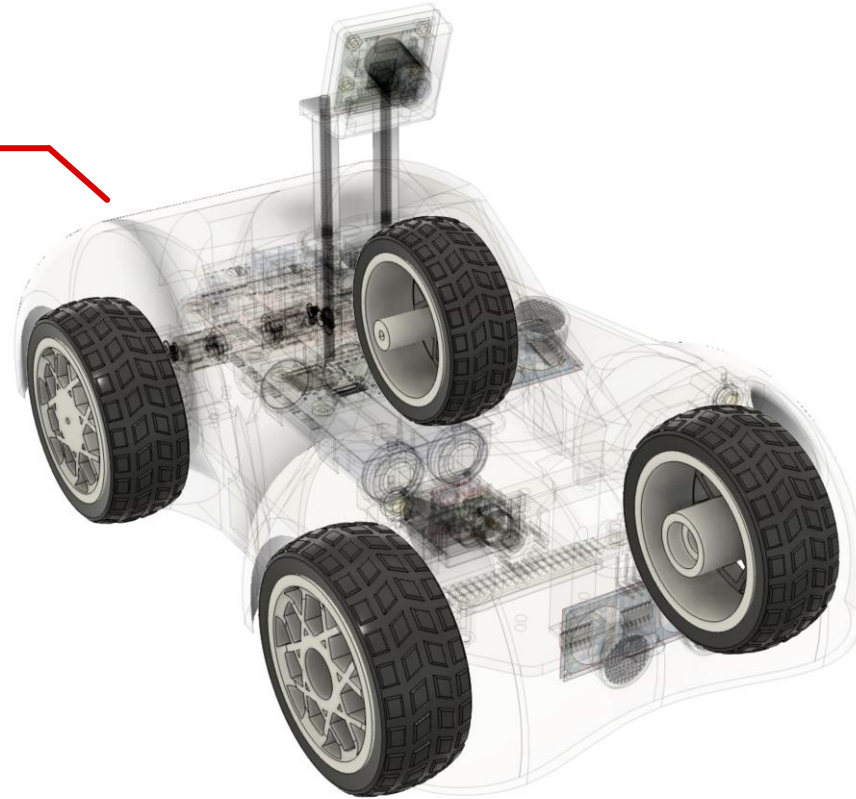
2개의 모터를 사용한 후륜구동 방식



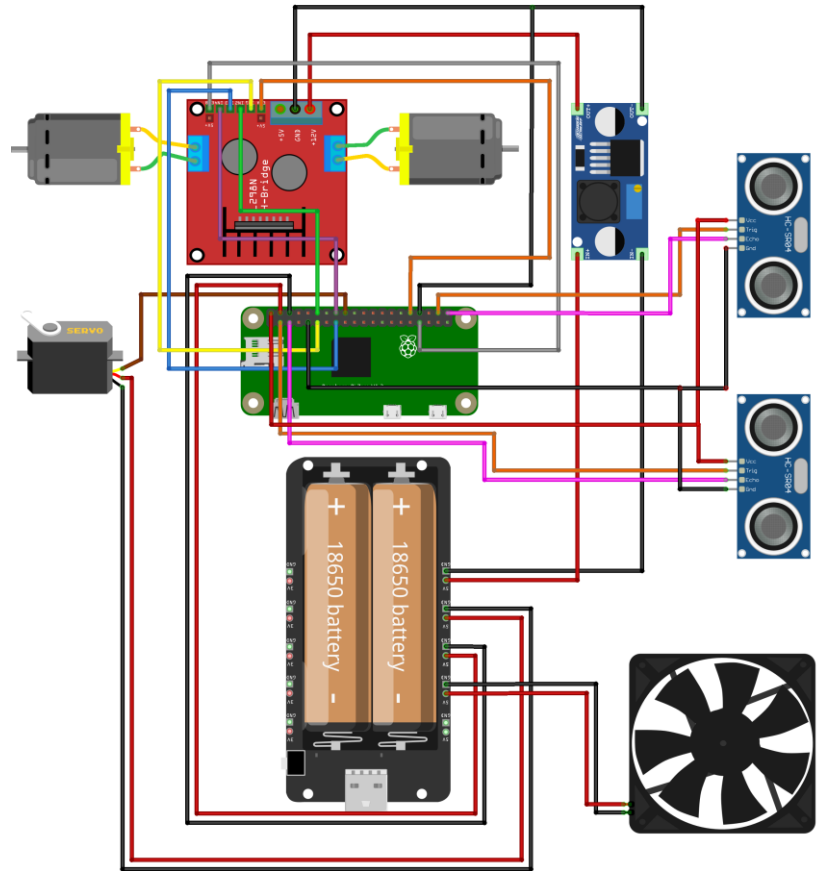
03 Design

바퀴

사륵구동 방식
베어링을 활용한 안정성 확보



03 Design



fritzing

2024 자율주행 모형차량 경진대회

THANK YOU

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