오토믹 자동차

Android 앱을 이용한 주행

서강원
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김채진
옥진해
전고은

Contents

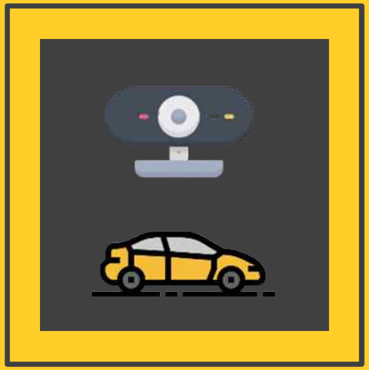
01 목표

02 회로 연결 & 추가 변동 사항

03 Application

04 DEMO

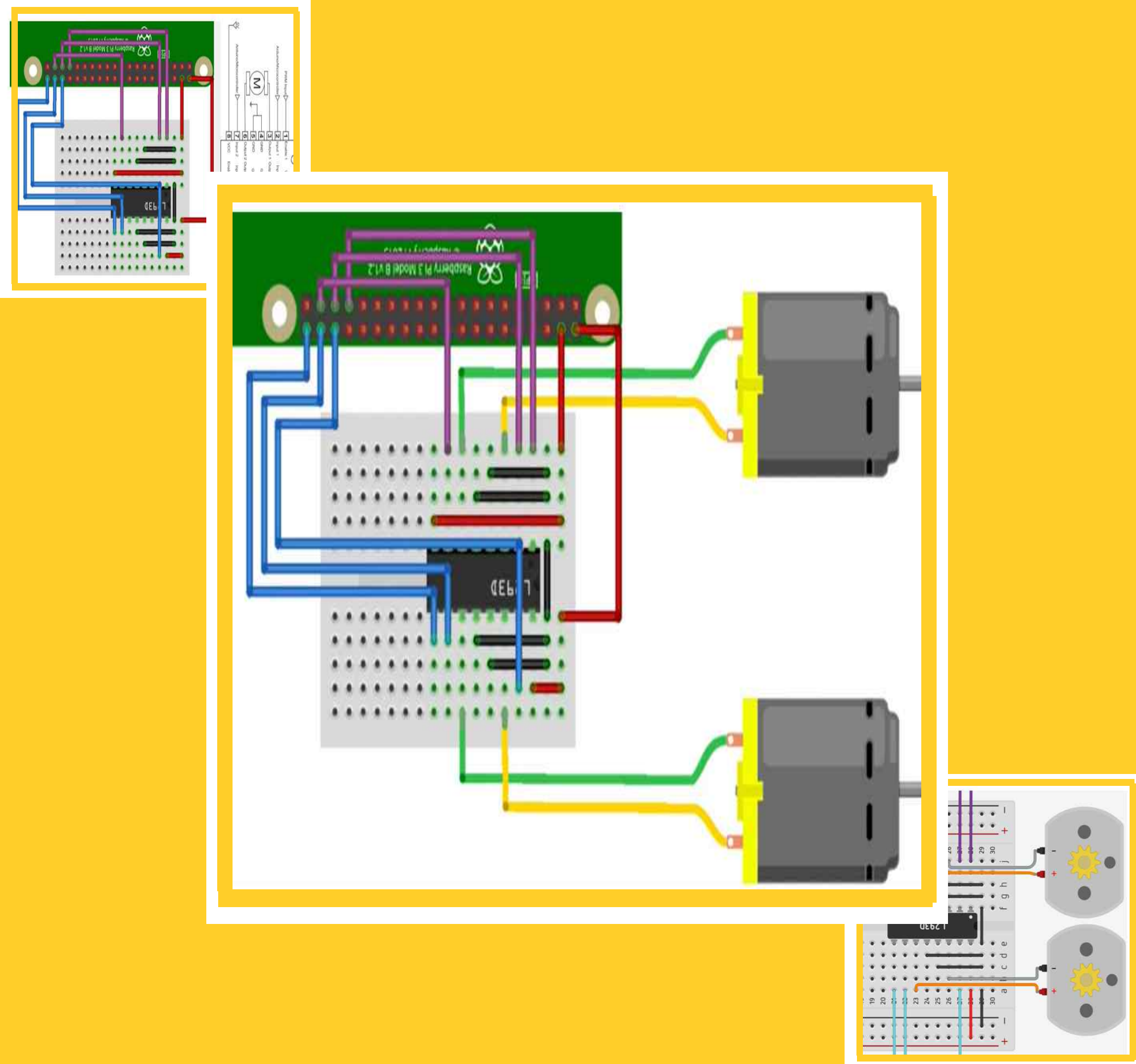
목표



Line Tracking

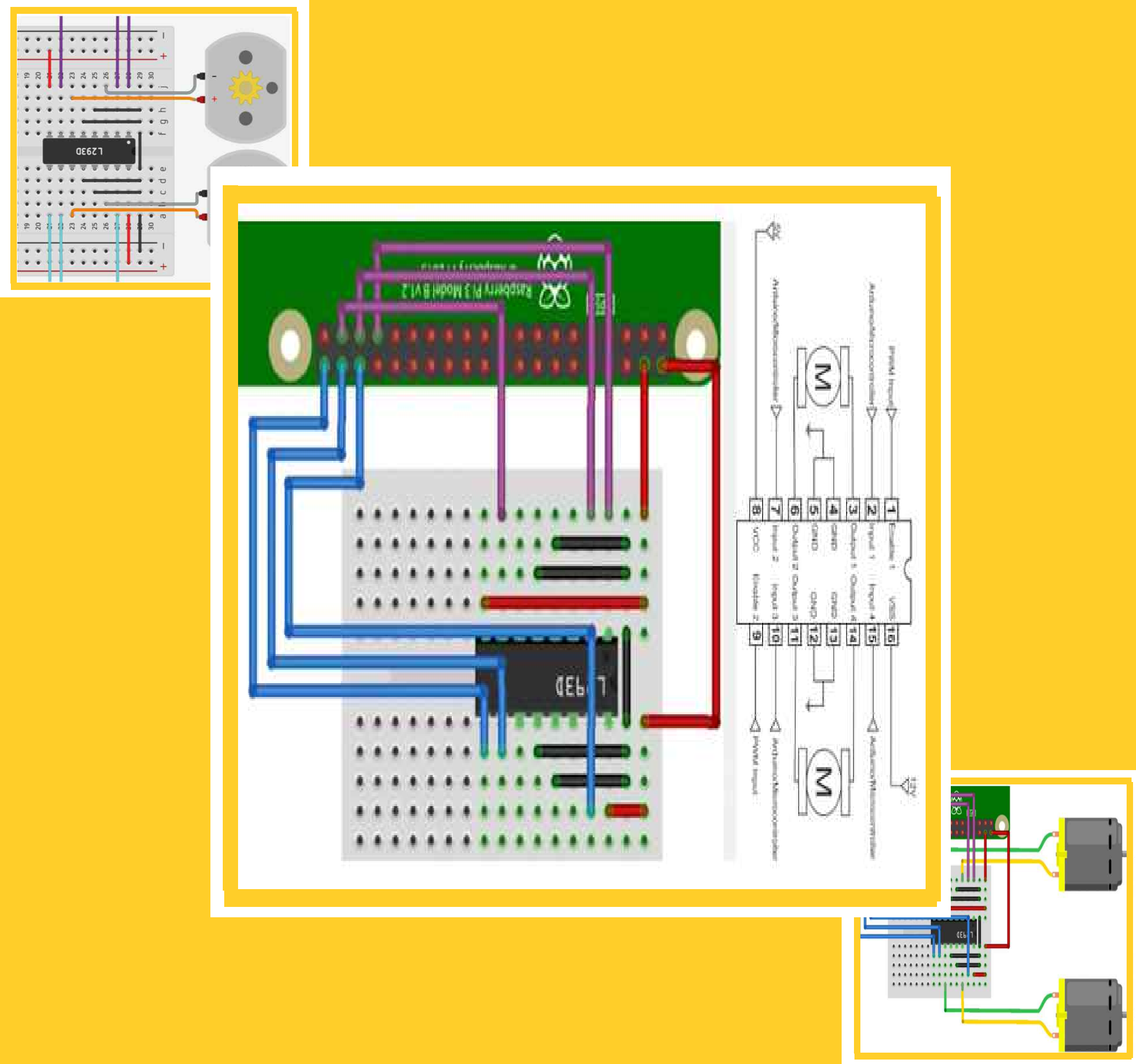
Joystick Controller

회로 연결 과정



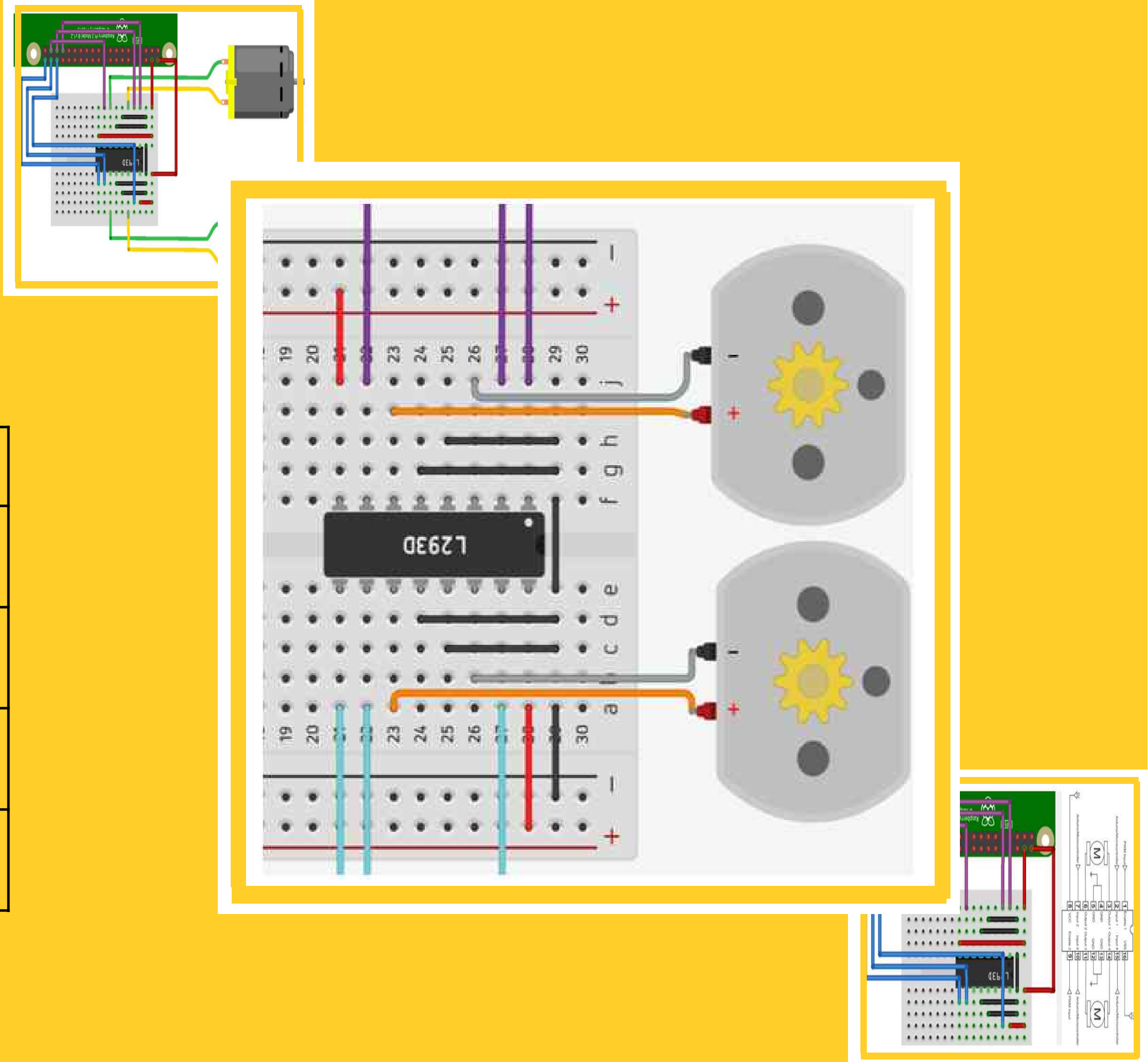
회로 연결 과정

Rpi	L293D	Direct ion
5V	8,16	
GND	4,5,12,13	
GPIO13	1	LEFT_PWM
GPIO19	2	LEFT_FORWARD
GPIO26	7	LEFT_BACKWARD
GPIO21	9	RIGHT_PWM
GPIO16	15	RIGHT_FORWARD
GPIO20	10	RIGHT_BACKWARD

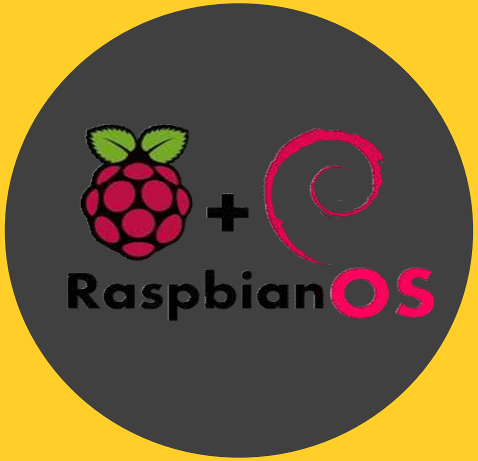


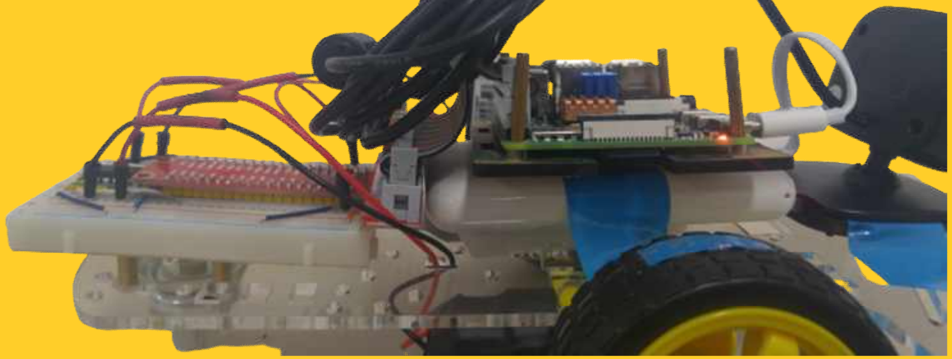
회로 연결 과정

Rpi	L293D	Mot or
5V	6	5V(Orange)
GND	3	GND(Gray)
5V	11	5V(Orange)
GND	14	GND(Gray)

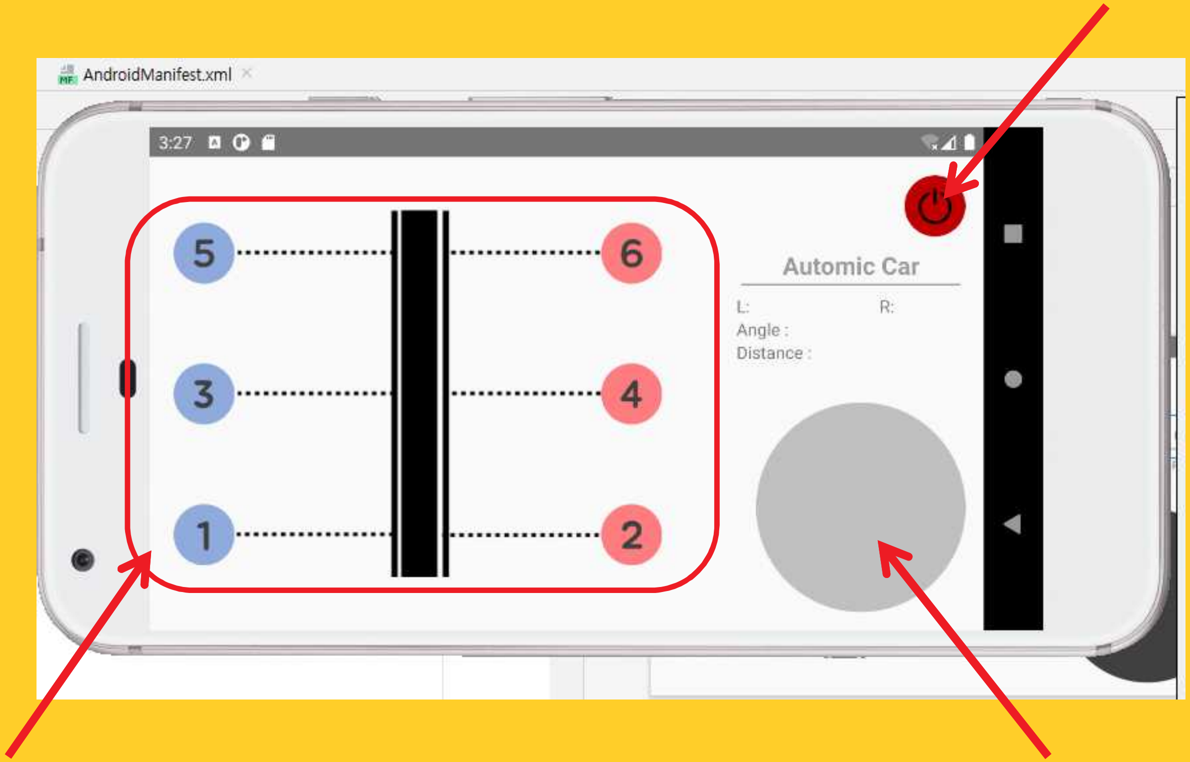


추가 변동 사항





Application



종료 버튼 (실행 종료)

Line Tracking 버튼

Joystick Controller

힘들었던 점(H/W)

i) 모터드라이버

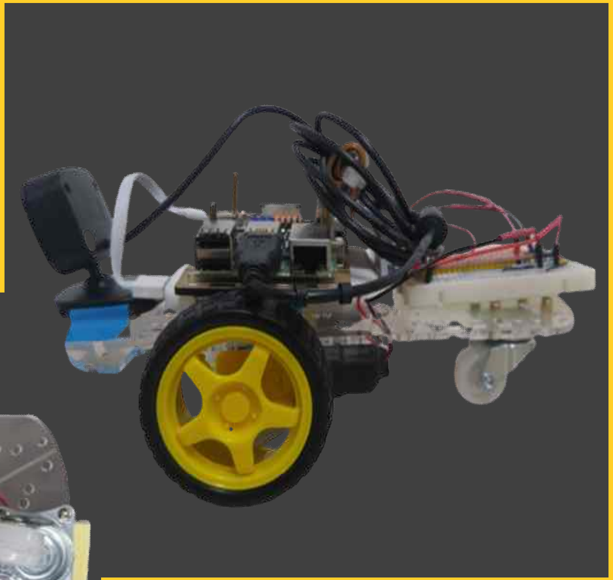
- 성능에 따른 불균형

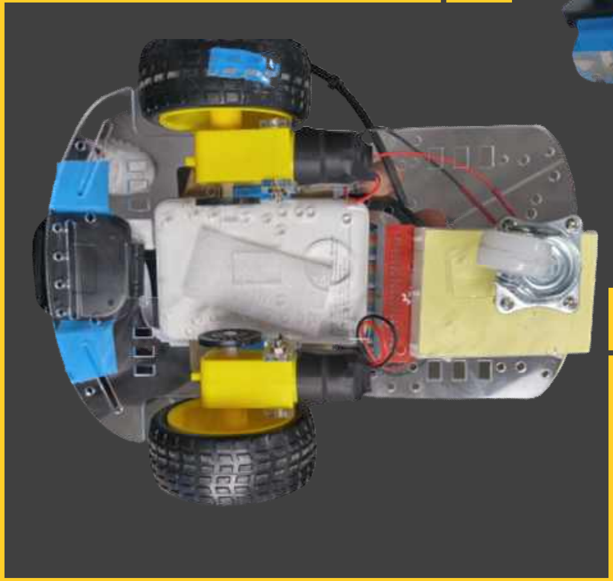
ii) 무게중심

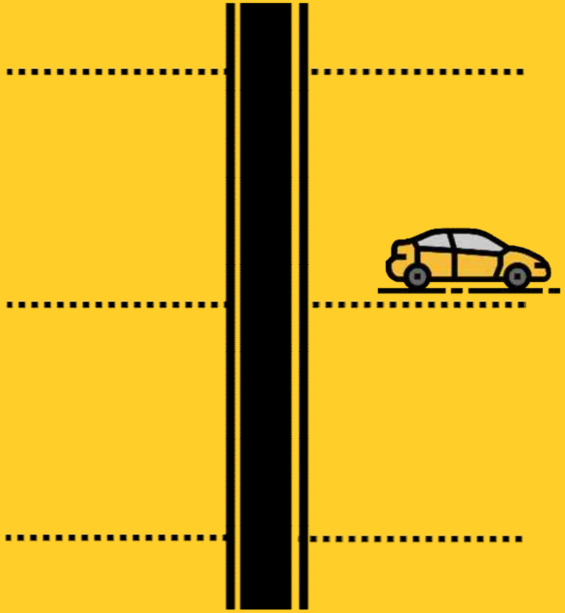
- 뒷 바퀴 제어

iii) 카메라 영상 처리

- 카운트

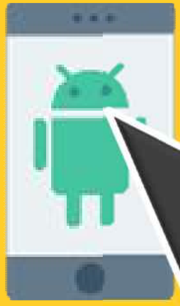




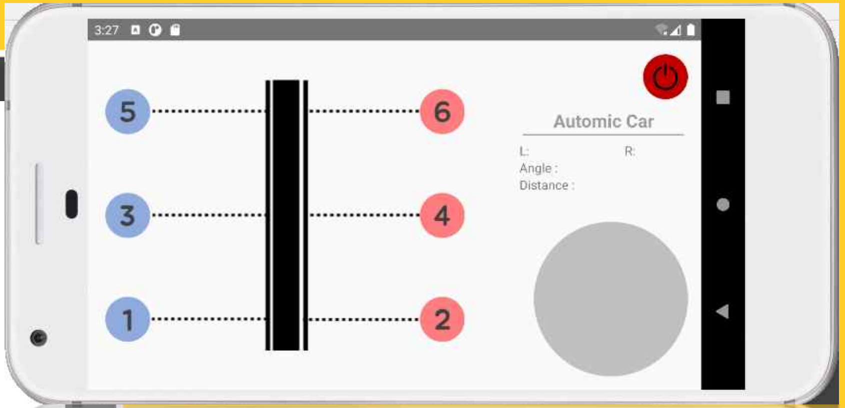


Line Tracking

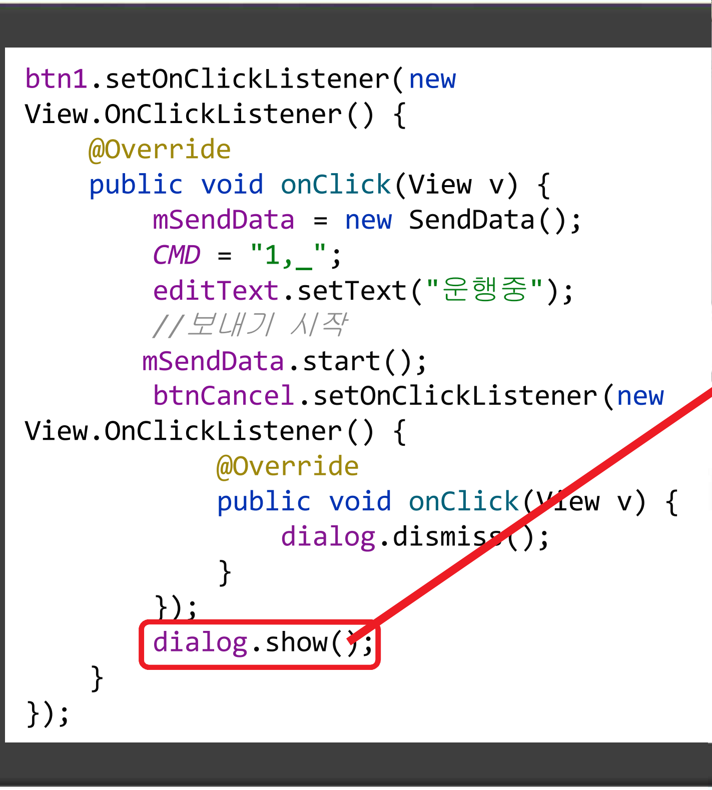
Line Tracking



```
btn1.setOnClickListener(new
View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("운행중");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```



Line Tracking



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View.OnClickListener() {
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    public void onClick(View v) {
        mSendData = new SendData();
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        btnCancel.setOnClickListener(new
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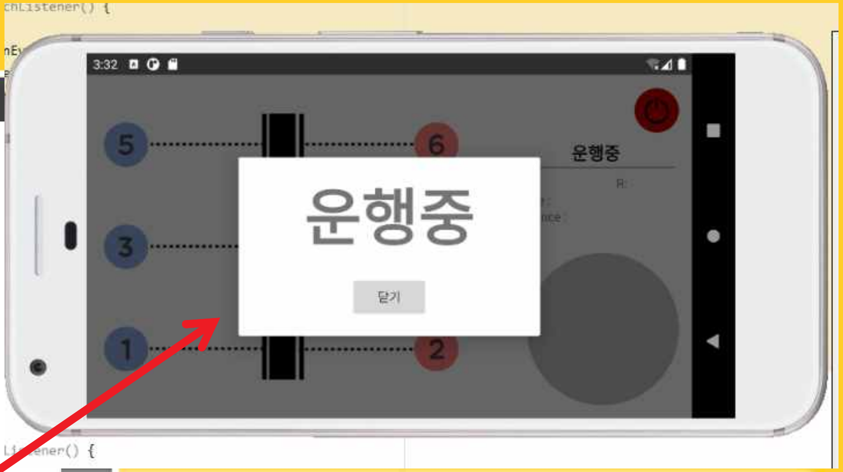
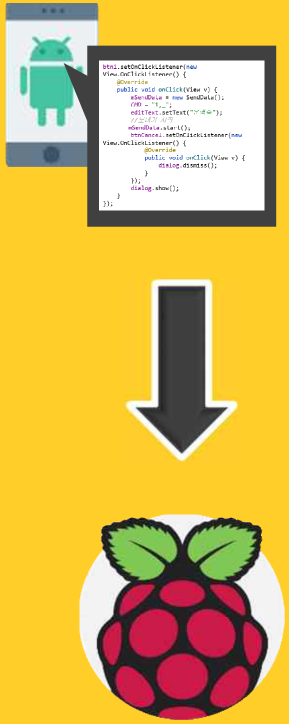
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```



Line Tracking



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View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("운행중");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```
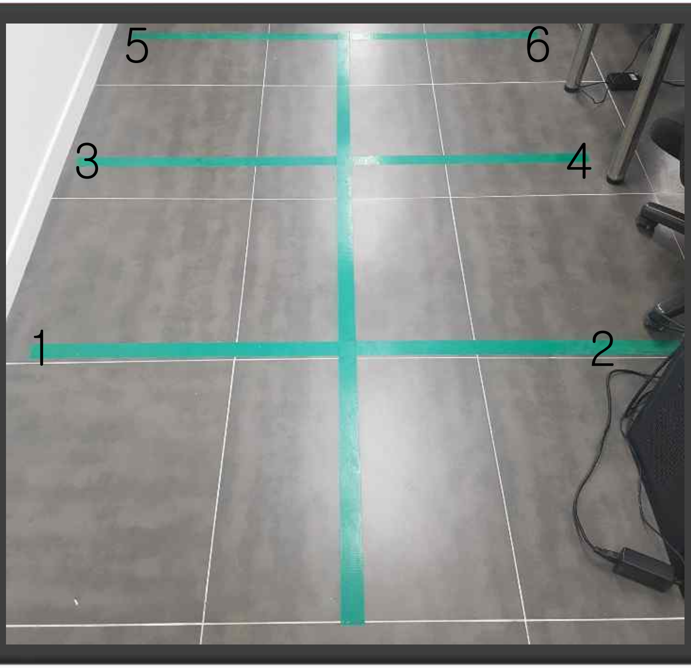
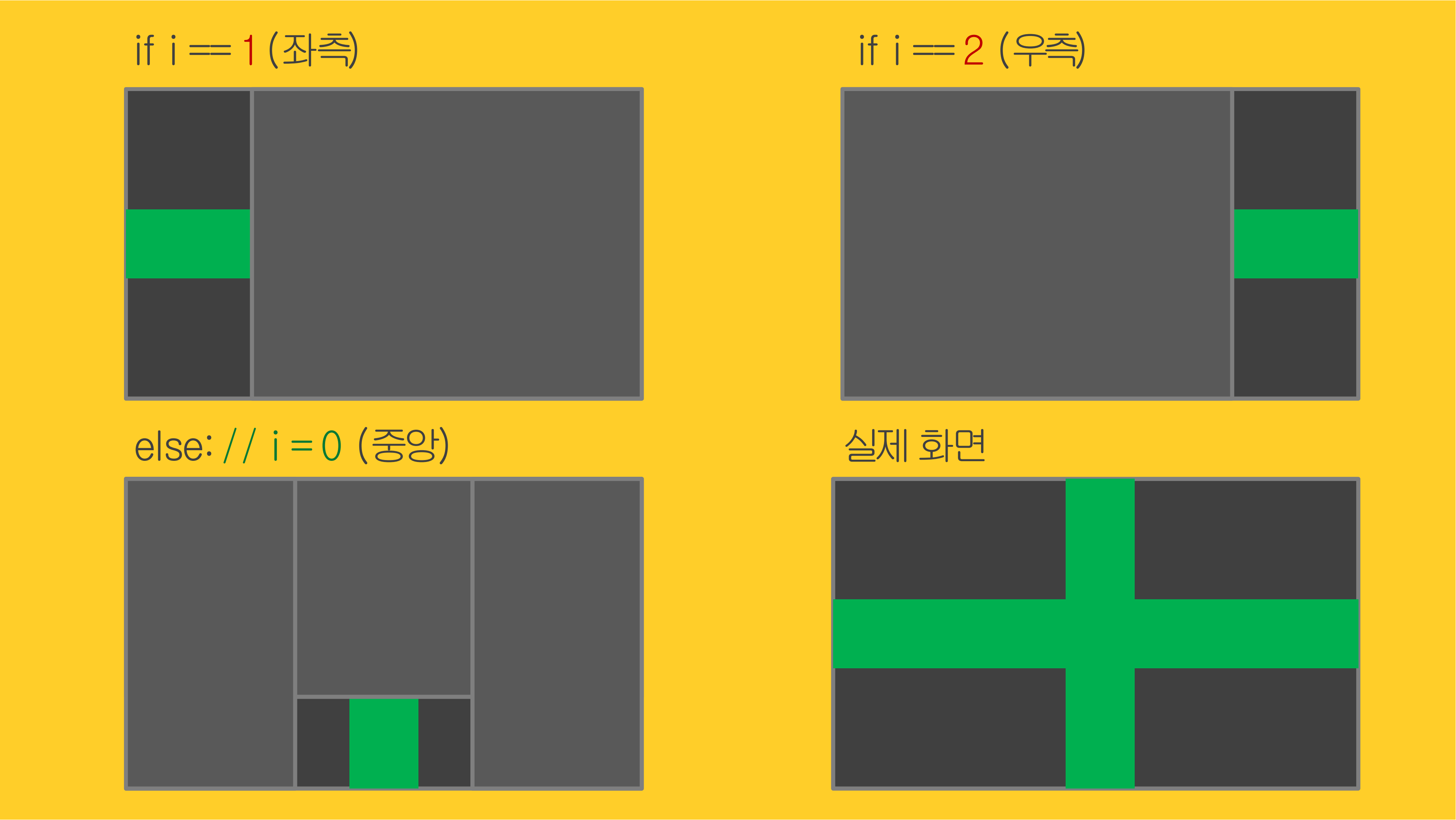





if i == 1 (좌측)

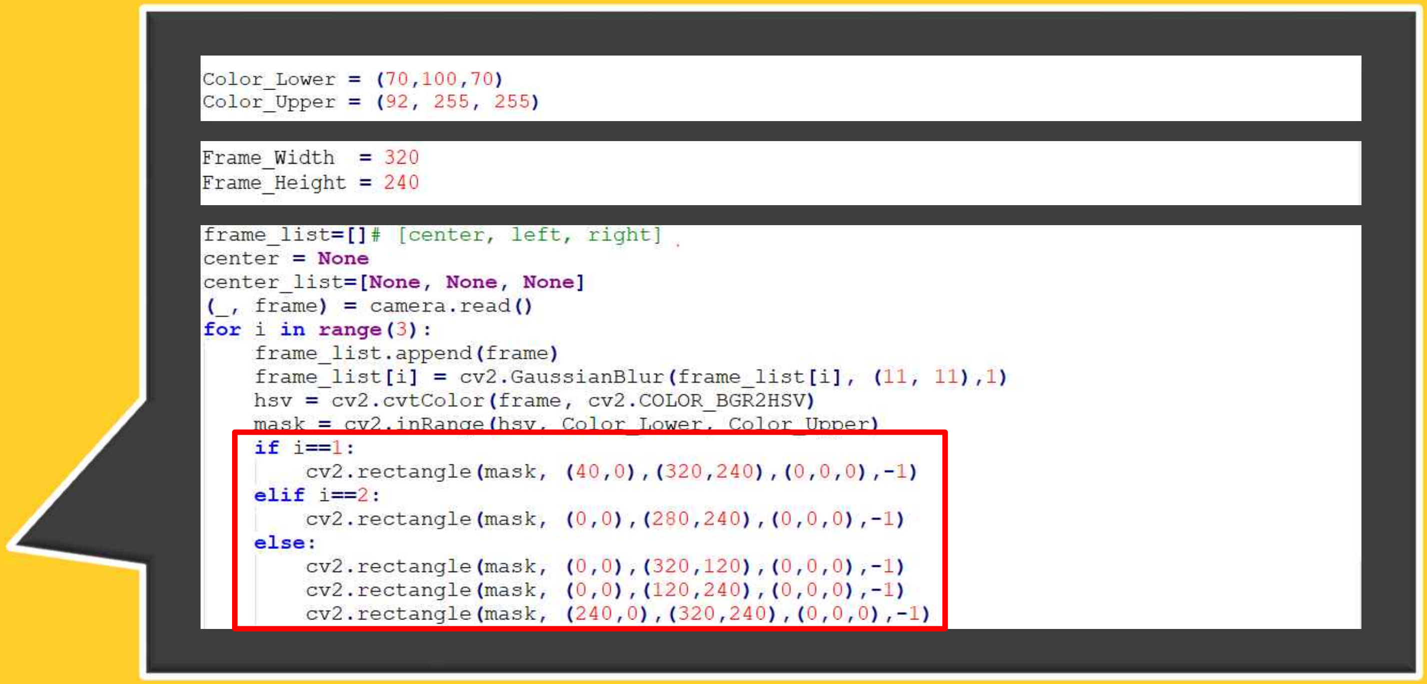
if i == 2 (우측)

else: // i = 0 (중앙)

실제 화면

Line Tracking

```
btn1.setOnClickListener(new
View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("[illegible]");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```

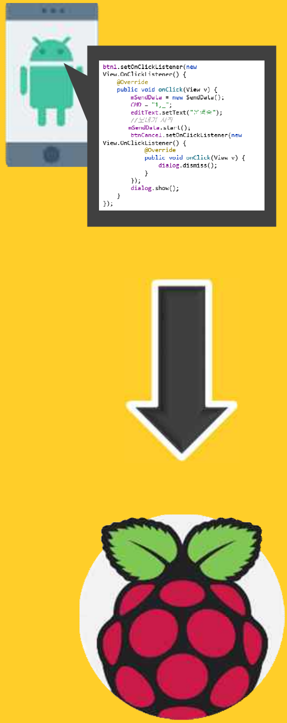


```
Color_Lower = (70,100,70)
Color_Upper = (92, 255, 255)
```

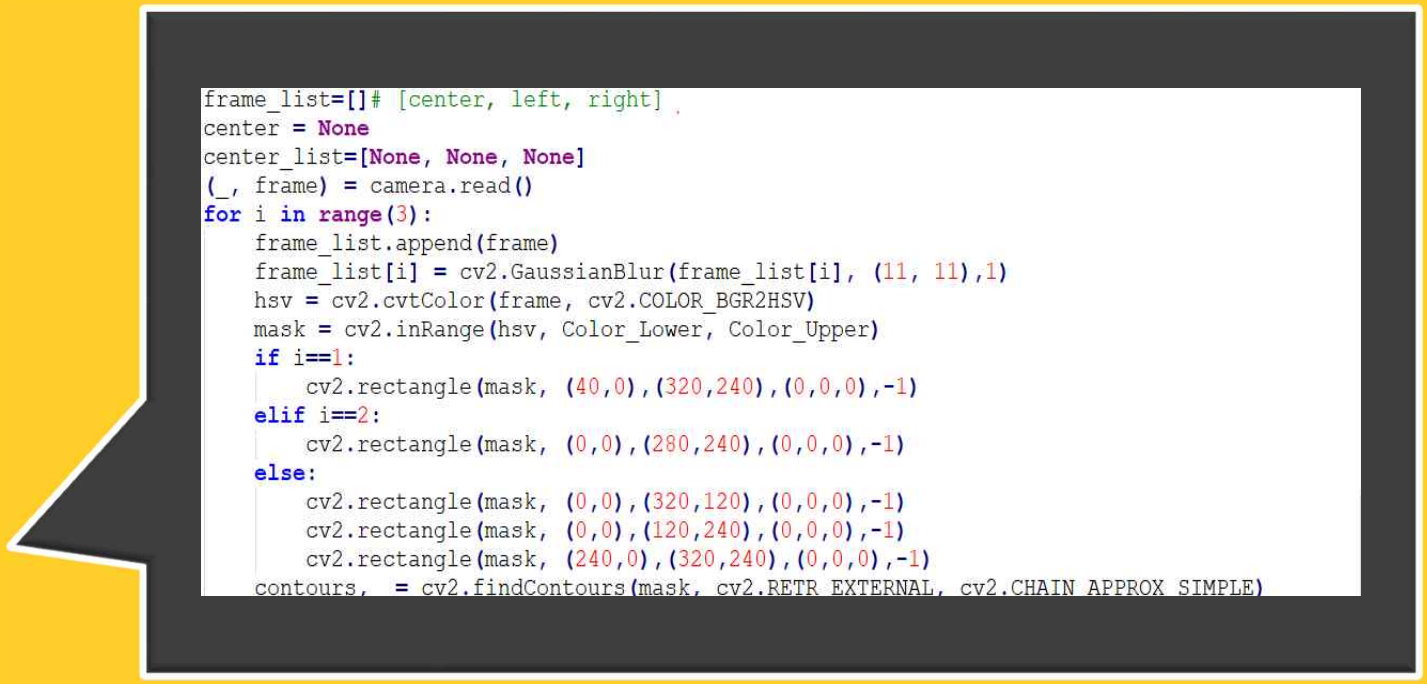
```
Frame_Width  = 320
Frame_Height = 240
```

```
frame_list=[]# [center, left, right]
center = None
center_list=[None, None, None]
(_, frame) = camera.read()
for i in range(3):
    frame_list.append(frame)
    frame_list[i] = cv2.GaussianBlur(frame_list[i], (11, 11),1)
    hsv = cv2.cvtColor(frame, cv2.COLOR_BGR2HSV)
    mask = cv2.inRange(hsv, Color_Lower, Color_Upper)
    if i==1:
        cv2.rectangle(mask, (40,0),(320,240),(0,0,0),-1)
    elif i==2:
        cv2.rectangle(mask, (0,0),(280,240),(0,0,0),-1)
    else:
        cv2.rectangle(mask, (0,0),(320,120),(0,0,0),-1)
        cv2.rectangle(mask, (0,0),(120,240),(0,0,0),-1)
        cv2.rectangle(mask, (240,0),(320,240),(0,0,0),-1)
```

Line Tracking

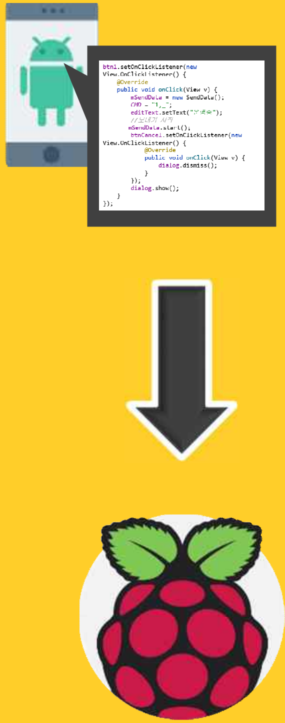


```
btn1.setOnClickListener(new
View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("운행중");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```



```
frame_list=[]# [center, left, right]
center = None
center_list=[None, None, None]
(_, frame) = camera.read()
for i in range(3):
    frame_list.append(frame)
    frame_list[i] = cv2.GaussianBlur(frame_list[i], (11, 11),1)
    hsv = cv2.cvtColor(frame, cv2.COLOR_BGR2HSV)
    mask = cv2.inRange(hsv, Color_Lower, Color_Upper)
    if i==1:
        cv2.rectangle(mask, (40,0),(320,240),(0,0,0),-1)
    elif i==2:
        cv2.rectangle(mask, (0,0),(280,240),(0,0,0),-1)
    else:
        cv2.rectangle(mask, (0,0),(320,120),(0,0,0),-1)
        cv2.rectangle(mask, (0,0),(120,240),(0,0,0),-1)
        cv2.rectangle(mask, (240,0),(320,240),(0,0,0),-1)
    contours, _ = cv2.findContours(mask, cv2.RETR_EXTERNAL, cv2.CHAIN_APPROX_SIMPLE)
```

Line Tracking



```
btn1.setOnClickListener(new
View.OnClickListener() {
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    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("운행중");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```
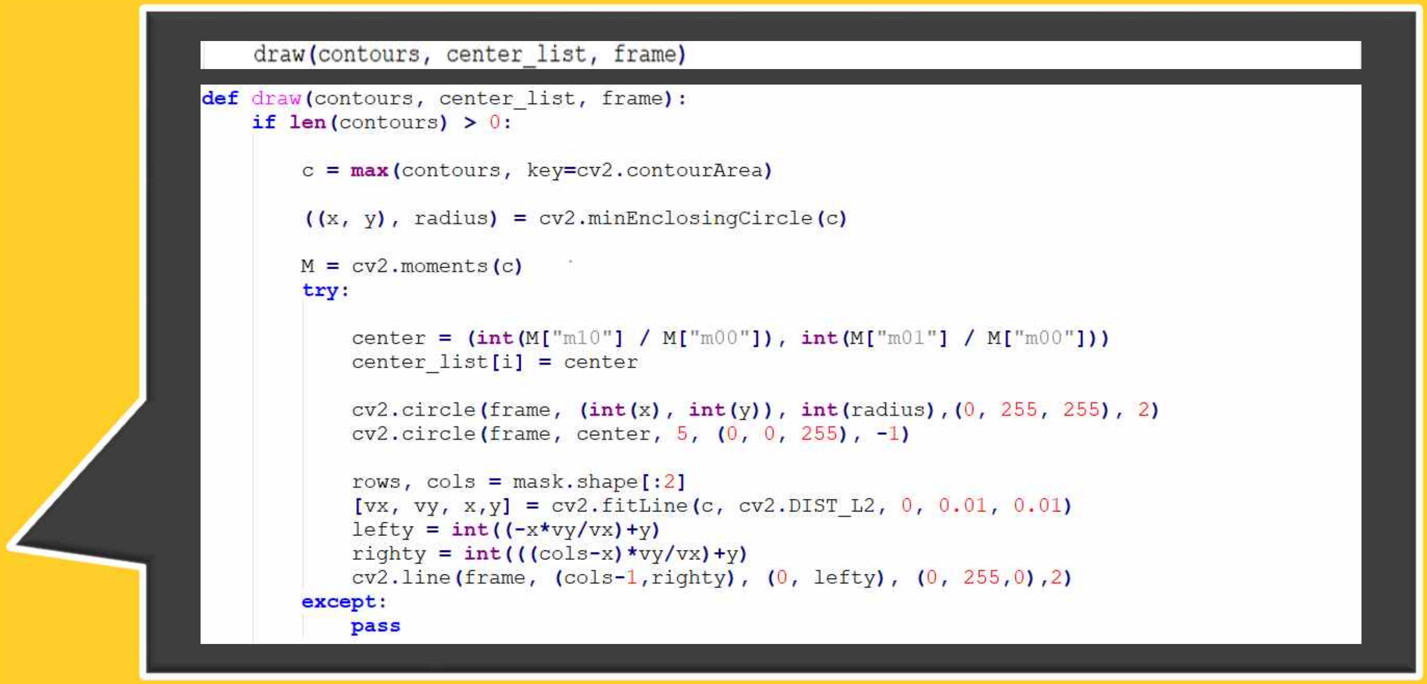
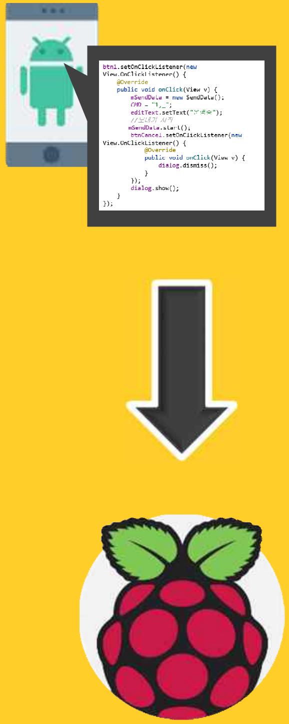



```
    draw(contours, center_list, frame)
```

```
def draw(contours, center_list, frame):
    if len(contours) > 0:

        c = max(contours, key=cv2.contourArea)

        ((x, y), radius) = cv2.minEnclosingCircle(c)

        M = cv2.moments(c)
        try:

            center = (int(M["m10"] / M["m00"]), int(M["m01"] / M["m00"]))
            center_list[i] = center

            cv2.circle(frame, (int(x), int(y)), int(radius),(0, 255, 255), 2)
            cv2.circle(frame, center, 5, (0, 0, 255), -1)

            rows, cols = mask.shape[:2]
            [vx, vy, x,y] = cv2.fitLine(c, cv2.DIST_L2, 0, 0.01, 0.01)
            lefty = int((-x*vy/vx)+y)
            righty = int(((cols-x)*vy/vx)+y)
            cv2.line(frame, (cols-1,righty), (0, lefty), (0, 255,0),2)
        except:
            pass
```

Line Tracking



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btn1.setOnClickListener(new
View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("운행중");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
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});
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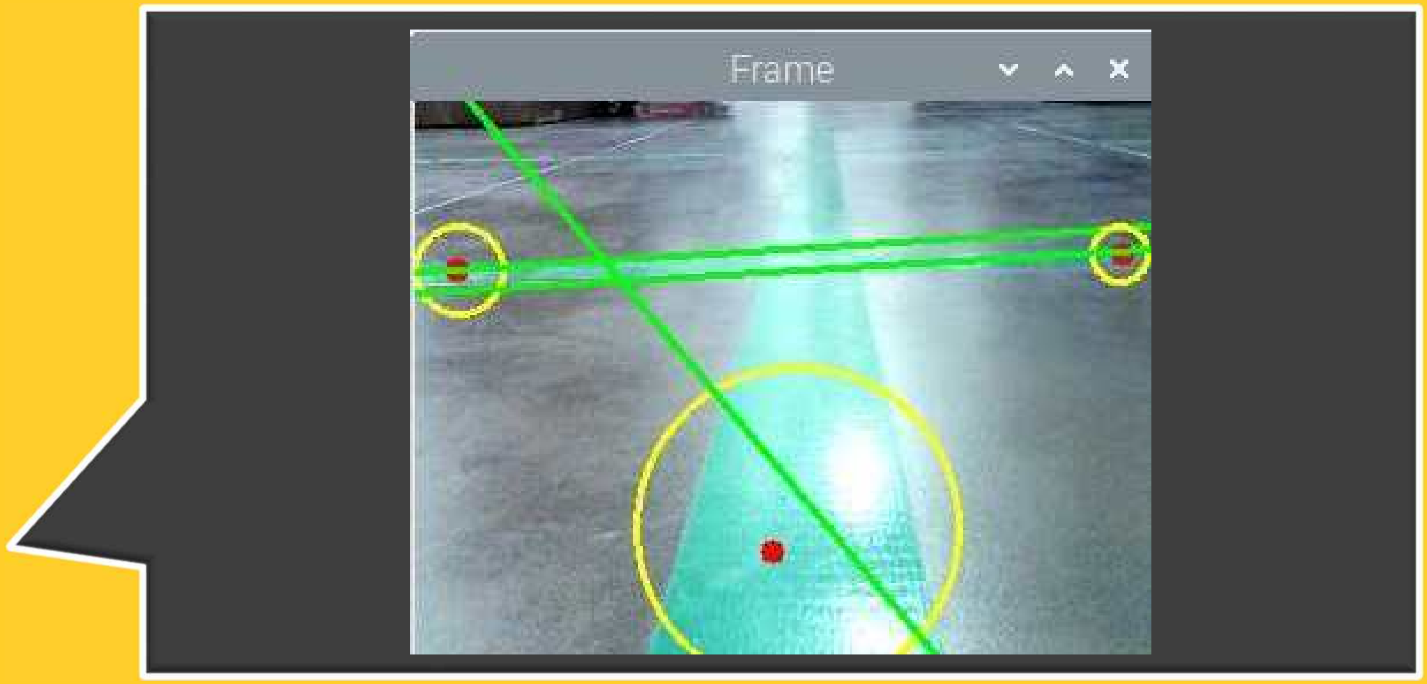
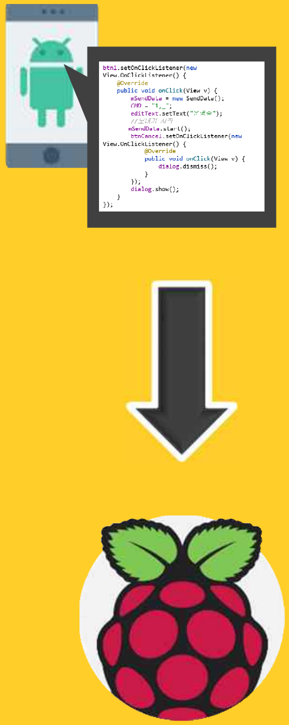


Line Tracking



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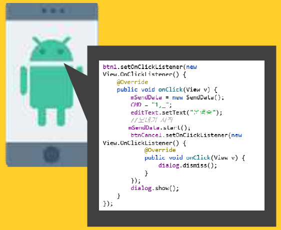
View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("운행중");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```

center_list [0]	center_list [1]	center_list [2]
중앙	좌측	우측
(x,y)	(x,y)	(x,y)

Line Tracking



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View.OnClickListener() {
    @Override
    public void onClick(View v) {
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        CMD = "1,_";
        editText.setText("운행중");
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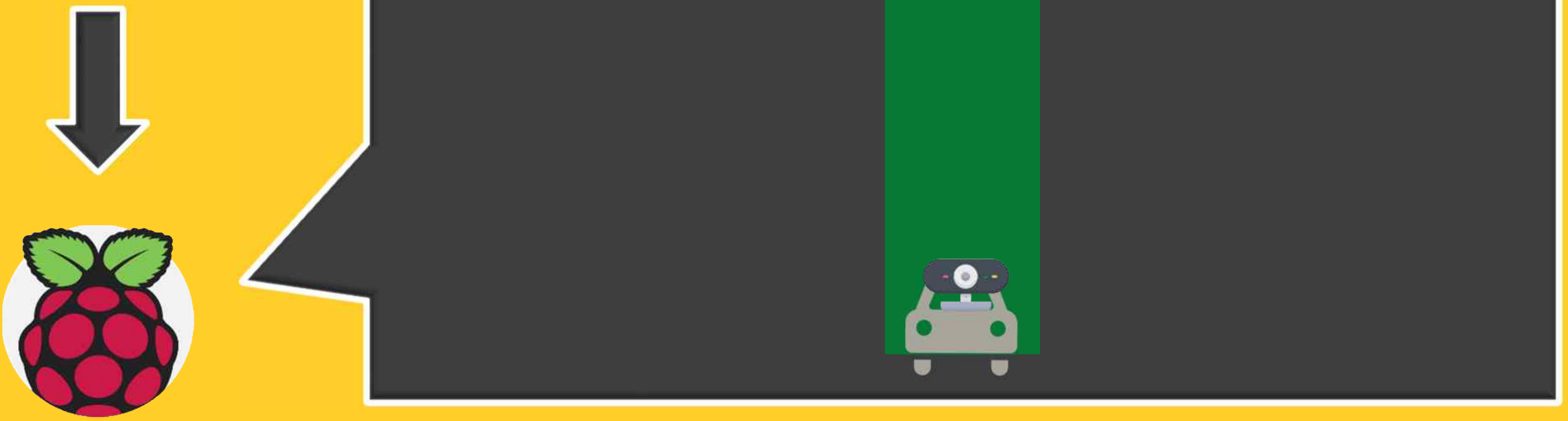
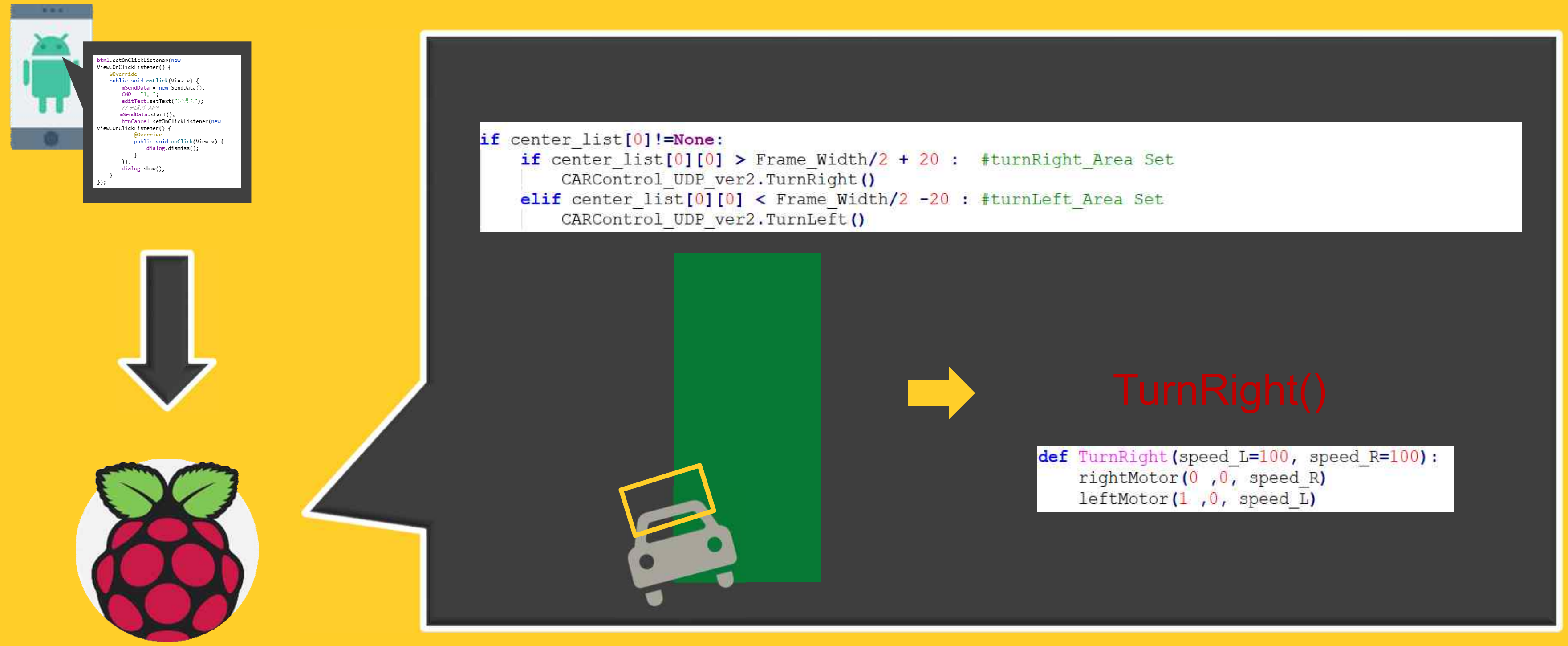


Line Tracking



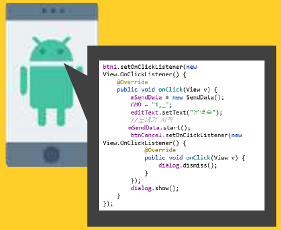
```
btn1.setOnClickListener(new
View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("우회전");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```

```
if center_list[0]!=None:
    if center_list[0][0] > Frame_Width/2 + 20 :  #turnRight_Area Set
        CARControl_UDP_ver2.TurnRight()
    elif center_list[0][0] < Frame_Width/2 -20 : #turnLeft_Area Set
        CARControl_UDP_ver2.TurnLeft()
```

TurnRight()

```
def TurnRight(speed_L=100, speed_R=100):
    rightMotor(0 ,0, speed_R)
    leftMotor(1 ,0, speed_L)
```

Line Tracking



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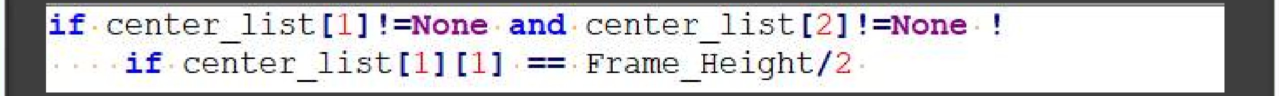
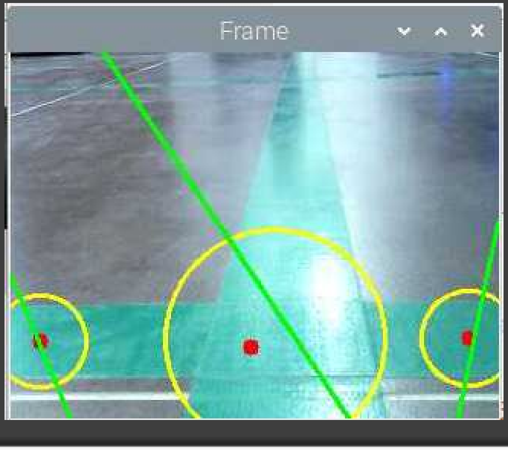
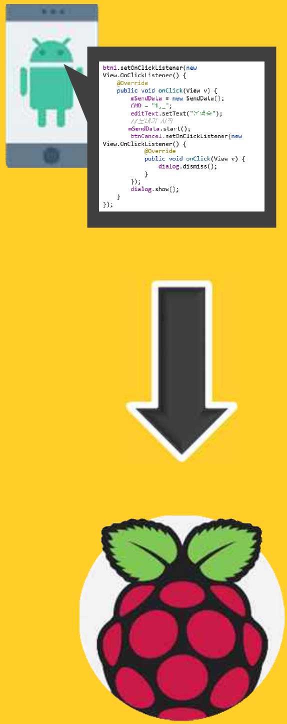


```
if center_list[1]!=None and center_list[2]!=None !
    if center_list[1][1] == Frame_Height/2
```



Line Tracking



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View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("운행중");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```
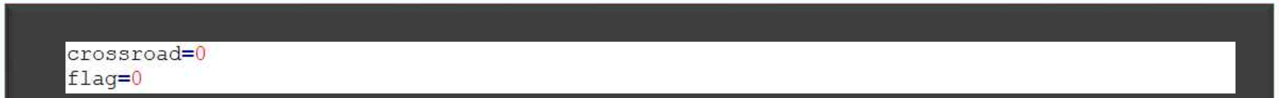
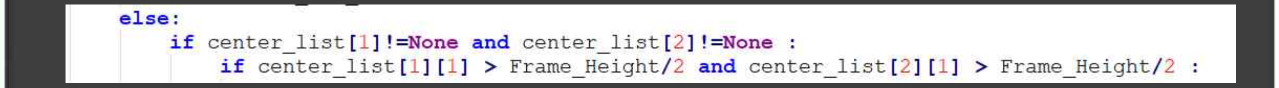
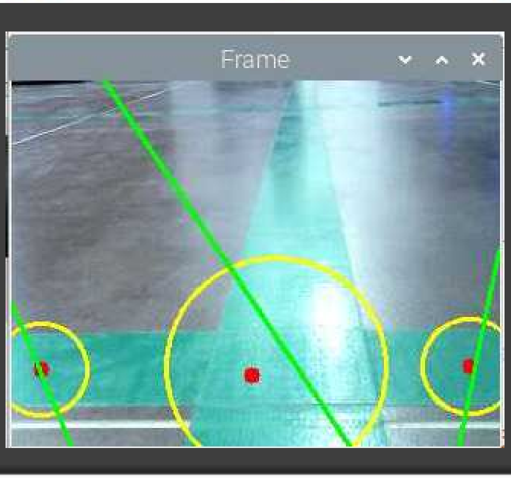



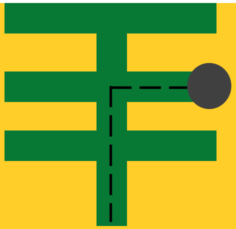
```
crossroad=0
flag=0
```

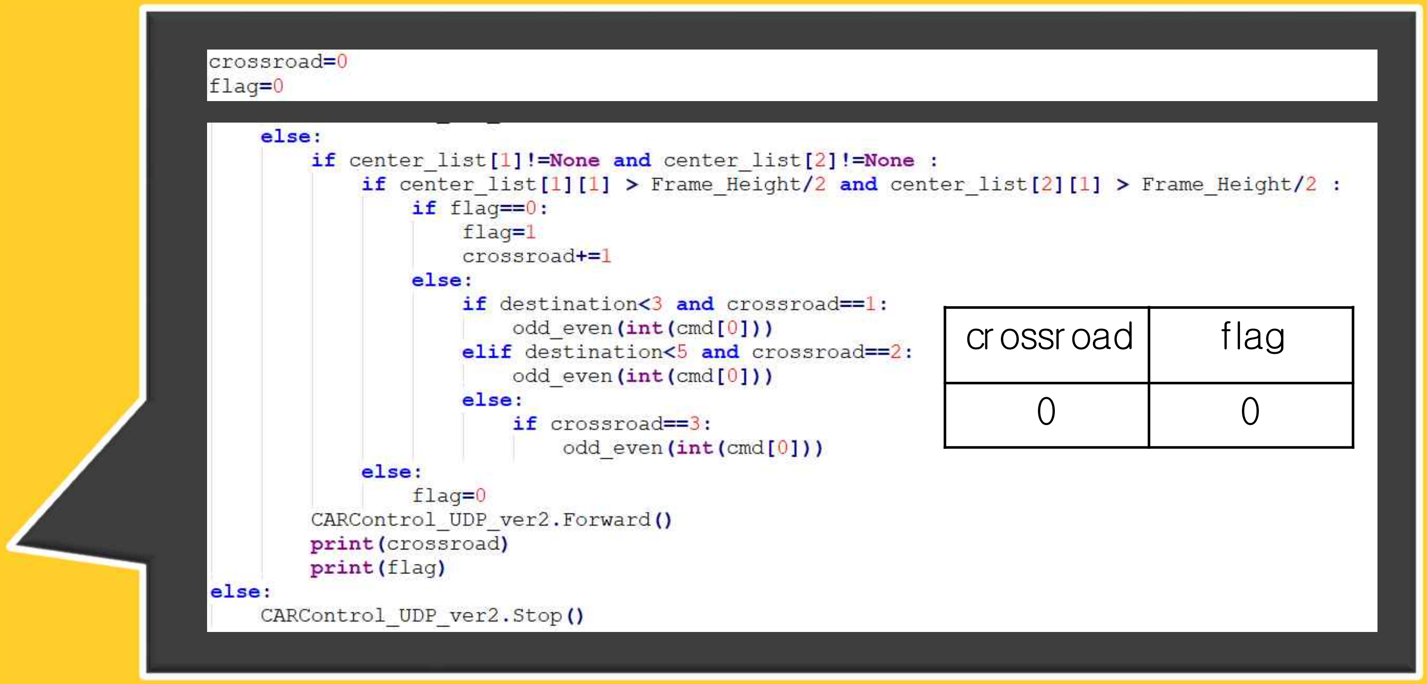


```
    else:
        if center_list[1]!=None and center_list[2]!=None :
            if center_list[1][1] > Frame_Height/2 and center_list[2][1] > Frame_Height/2 :
```



Line Tracking



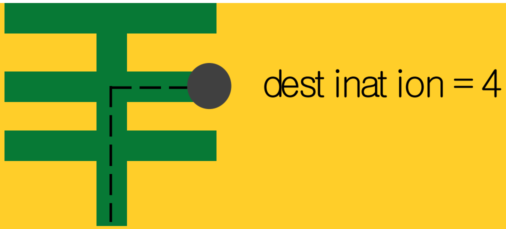


```
crossroad=0
flag=0
```

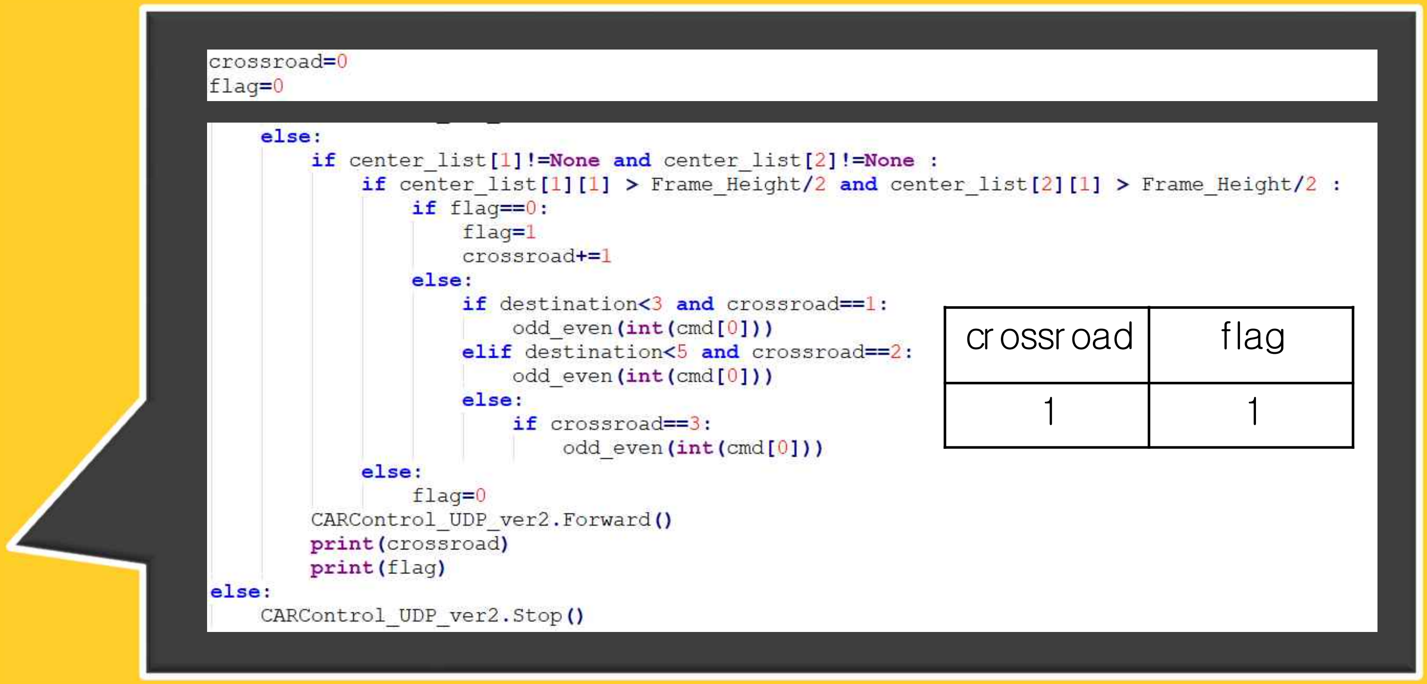
```
    else:
        if center_list[1]!=None and center_list[2]!=None :
            if center_list[1][1] > Frame_Height/2 and center_list[2][1] > Frame_Height/2 :
                if flag==0:
                    flag=1
                    crossroad+=1
                else:
                    if destination<3 and crossroad==1:
                        odd_even(int(cmd[0]))
                    elif destination<5 and crossroad==2:
                        odd_even(int(cmd[0]))
                    else:
                        if crossroad==3:
                            odd_even(int(cmd[0]))
            else:
                flag=0
        CARControl_UDP_ver2.Forward()
        print(crossroad)
        print(flag)
else:
    CARControl_UDP_ver2.Stop()
```

crossroad	flag
0	0

Line Tracking



```java
btn1.setOnClickListener(new
View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("우회전");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```

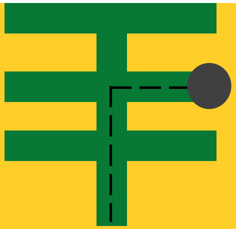


```python
crossroad=0
flag=0
```

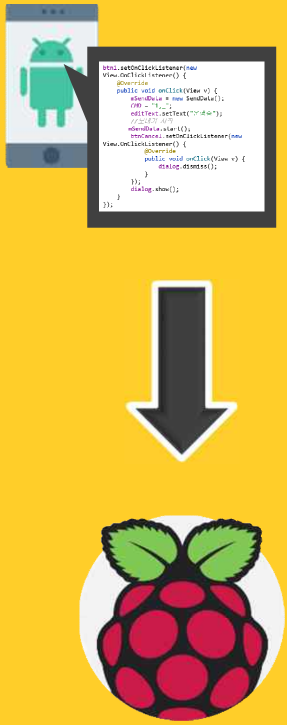
```python
    else:
        if center_list[1]!=None and center_list[2]!=None :
            if center_list[1][1] > Frame_Height/2 and center_list[2][1] > Frame_Height/2 :
                if flag==0:
                    flag=1
                    crossroad+=1
                else:
                    if destination<3 and crossroad==1:
                        odd_even(int(cmd[0]))
                    elif destination<5 and crossroad==2:
                        odd_even(int(cmd[0]))
                    else:
                        if crossroad==3:
                            odd_even(int(cmd[0]))
            else:
                flag=0
        CARControl_UDP_ver2.Forward()
        print(crossroad)
        print(flag)
else:
    CARControl_UDP_ver2.Stop()
```

crossroad	flag
1	1

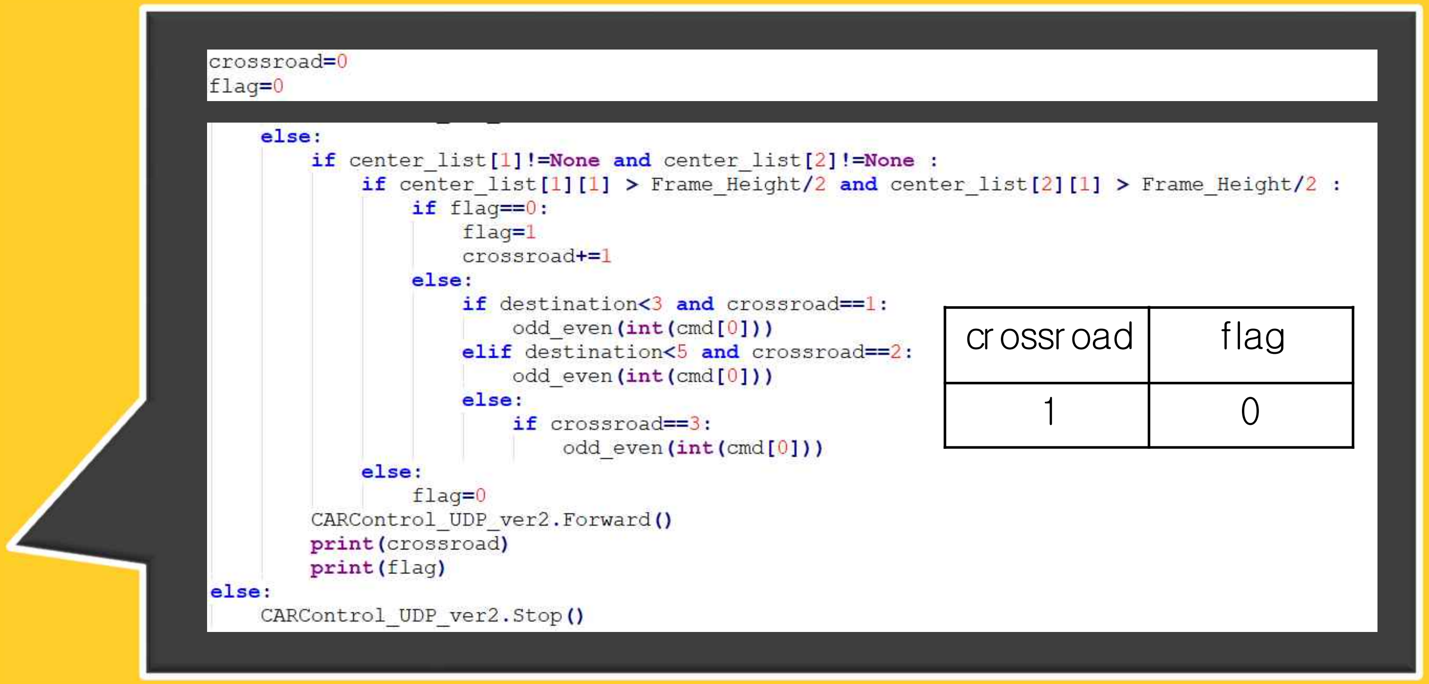
Line Tracking



destination = 4



```
btn1.setOnClickListener(new
View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("운행중");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```

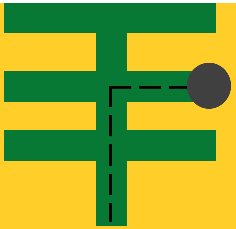


```
crossroad=0
flag=0
```

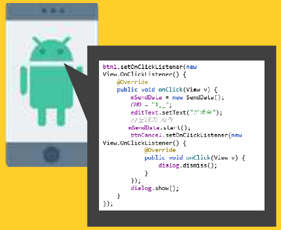
```
    else:
        if center_list[1]!=None and center_list[2]!=None :
            if center_list[1][1] > Frame_Height/2 and center_list[2][1] > Frame_Height/2 :
                if flag==0:
                    flag=1
                    crossroad+=1
                else:
                    if destination<3 and crossroad==1:
                        odd_even(int(cmd[0]))
                    elif destination<5 and crossroad==2:
                        odd_even(int(cmd[0]))
                    else:
                        if crossroad==3:
                            odd_even(int(cmd[0]))
            else:
                flag=0
        CARControl_UDP_ver2.Forward()
        print(crossroad)
        print(flag)
else:
    CARControl_UDP_ver2.Stop()
```

crossroad	flag
1	0

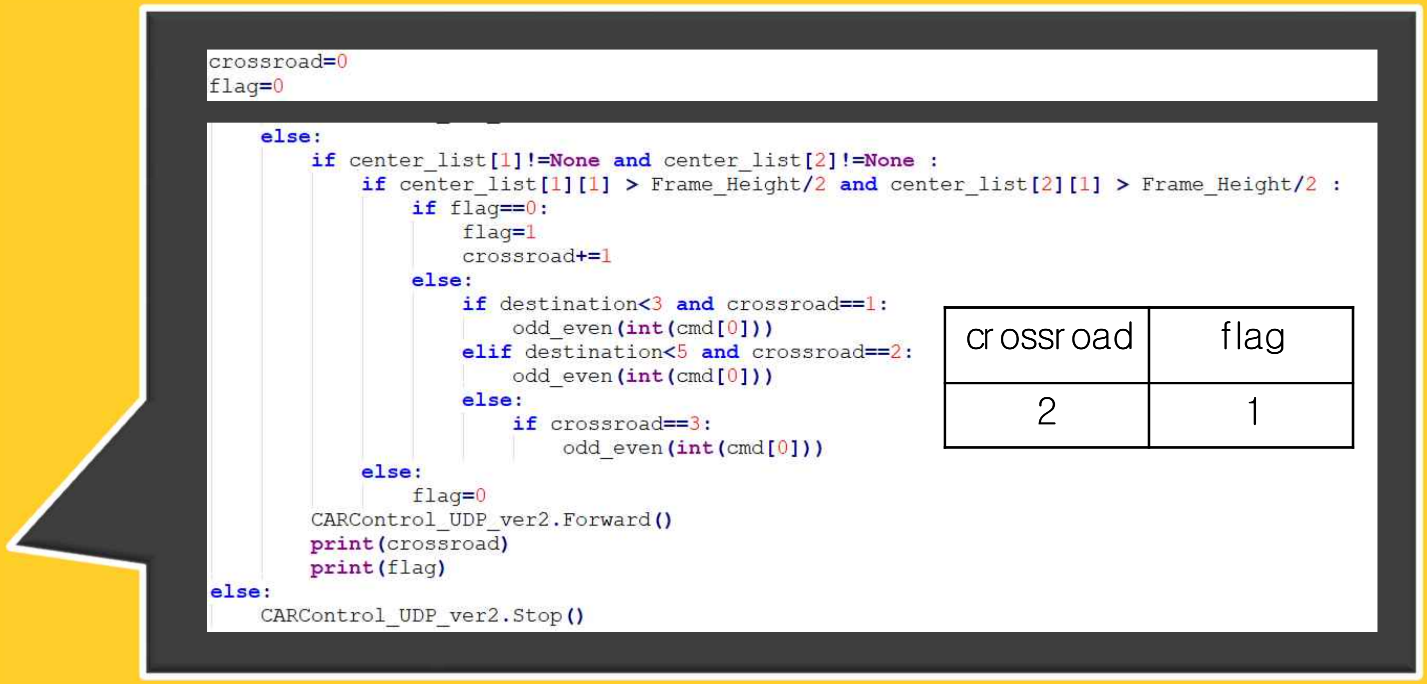
Line Tracking



destination = 4



```
btn1.setOnClickListener(new
View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("운행중");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```

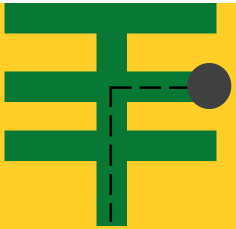


```
crossroad=0
flag=0
```

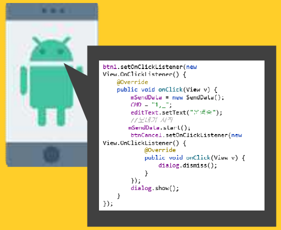
```
    else:
        if center_list[1]!=None and center_list[2]!=None :
            if center_list[1][1] > Frame_Height/2 and center_list[2][1] > Frame_Height/2 :
                if flag==0:
                    flag=1
                    crossroad+=1
                else:
                    if destination<3 and crossroad==1:
                        odd_even(int(cmd[0]))
                    elif destination<5 and crossroad==2:
                        odd_even(int(cmd[0]))
                    else:
                        if crossroad==3:
                            odd_even(int(cmd[0]))
            else:
                flag=0
        CARControl_UDP_ver2.Forward()
        print(crossroad)
        print(flag)
else:
    CARControl_UDP_ver2.Stop()
```

crossroad	flag
2	1

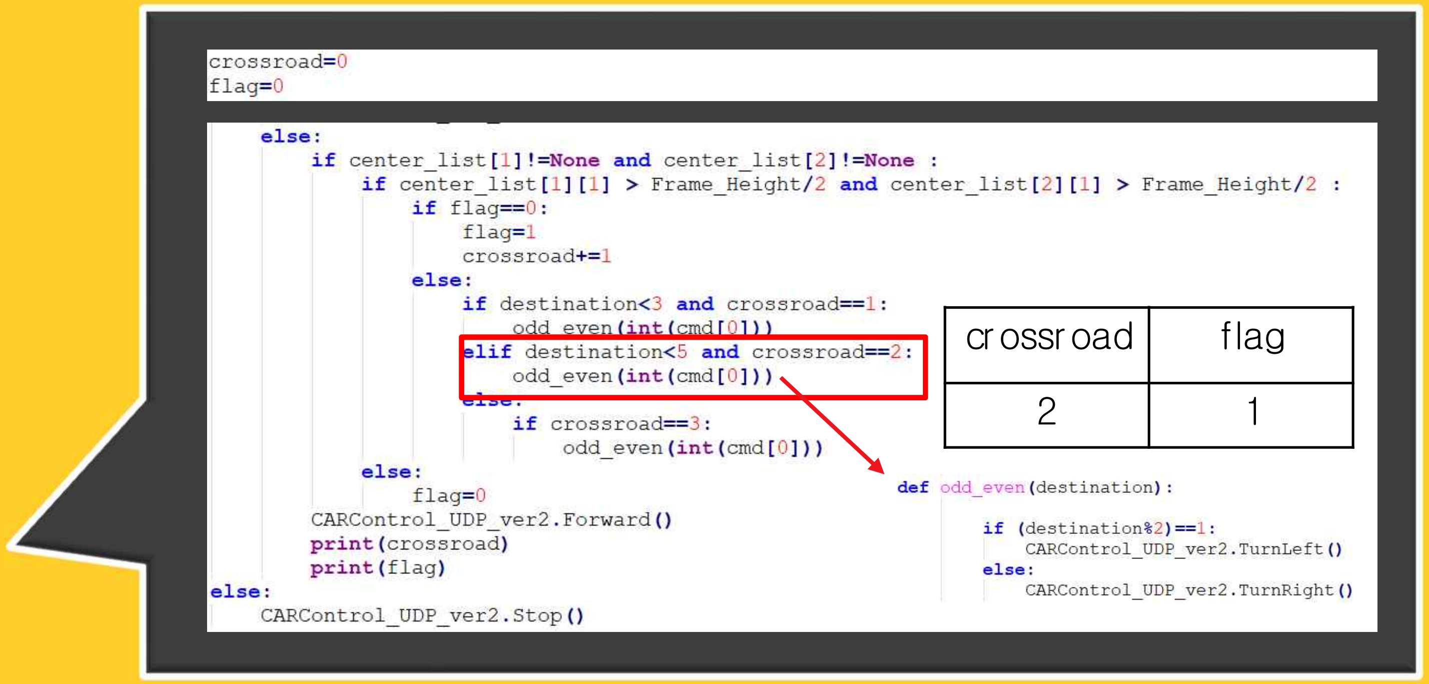
Line Tracking



destination = 4



```
btn1.setOnClickListener(new
View.OnClickListener() {
    @Override
    public void onClick(View v) {
        mSendData = new SendData();
        CMD = "1,_";
        editText.setText("운행중");
        //보내기 시작
       mSendData.start();
        btnCancel.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                dialog.dismiss();
            }
        });
        dialog.show();
    }
});
```



```
crossroad=0
flag=0
```

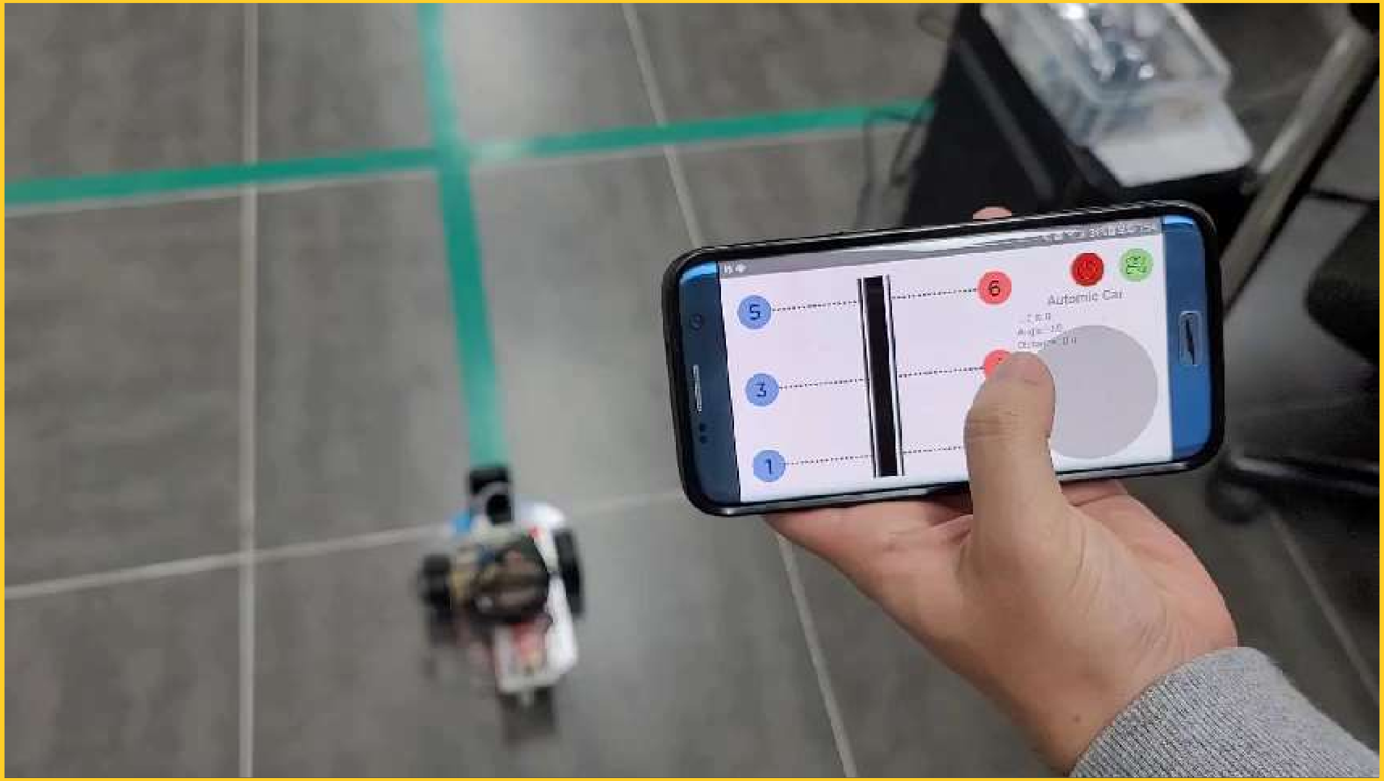
```
    else:
        if center_list[1]!=None and center_list[2]!=None :
            if center_list[1][1] > Frame_Height/2 and center_list[2][1] > Frame_Height/2 :
                if flag==0:
                    flag=1
                    crossroad+=1
                else:
                    if destination<3 and crossroad==1:
                        odd_even(int(cmd[0]))
                    elif destination<5 and crossroad==2:
                        odd_even(int(cmd[0]))
                    else:
                        if crossroad==3:
                            odd_even(int(cmd[0]))
            else:
                flag=0
        CARControl_UDP_ver2.Forward()
        print(crossroad)
        print(flag)
else:
    CARControl_UDP_ver2.Stop()
```

crossroad	flag
2	1

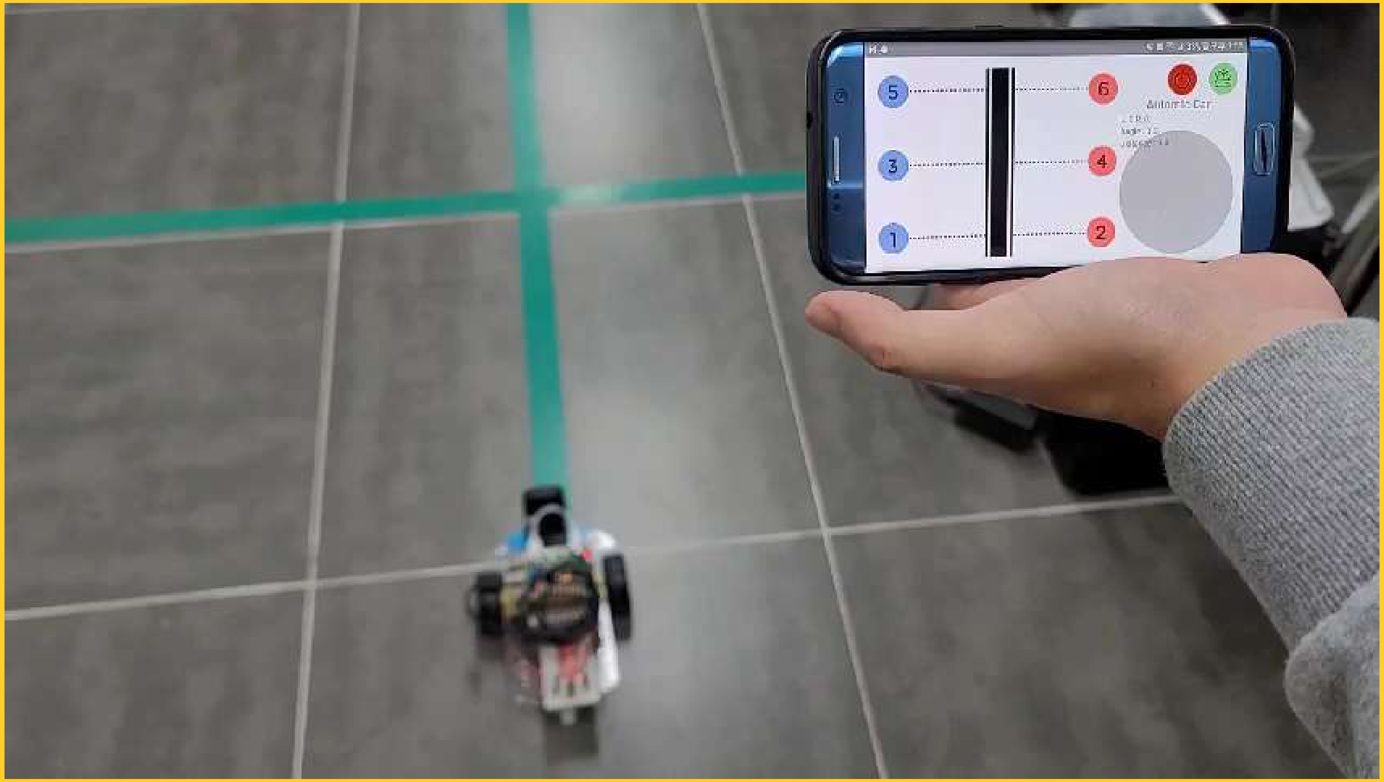
```
def odd_even(destination):

    if (destination%2)==1:
        CARControl_UDP_ver2.TurnLeft()
    else:
        CARControl_UDP_ver2.TurnRight()
```

촬영 영상(1번)

촬영 영상(4 번)



촬영 영상(5번)



Thank you