AWS DeepRacer-Advanced

陳昀(Ingrid)

GitHub LinkedIn

aws certified Cloud Practitioner

aws certified Solutions Architect Associate

Advanced Example- Waypoints Template

Lab

- **Find the lab content here: Link**
- **Create a car**
- **Start training your time-trial model**
- **Submit your model to the Virtual Race**

Training configuration

Environment simulation

re:Invent 2018

Reward function

Show

Sensor(s)

Camera

Action space type

Discrete

Action space

No.	Steering angle (°)	Speed (m/s)
0	-20.0	1.00
1	-20.0	2.00
2	0.0	1.00
3	0.0	2.00
4	20.0	1.00
5	20.0	2.00

Framework

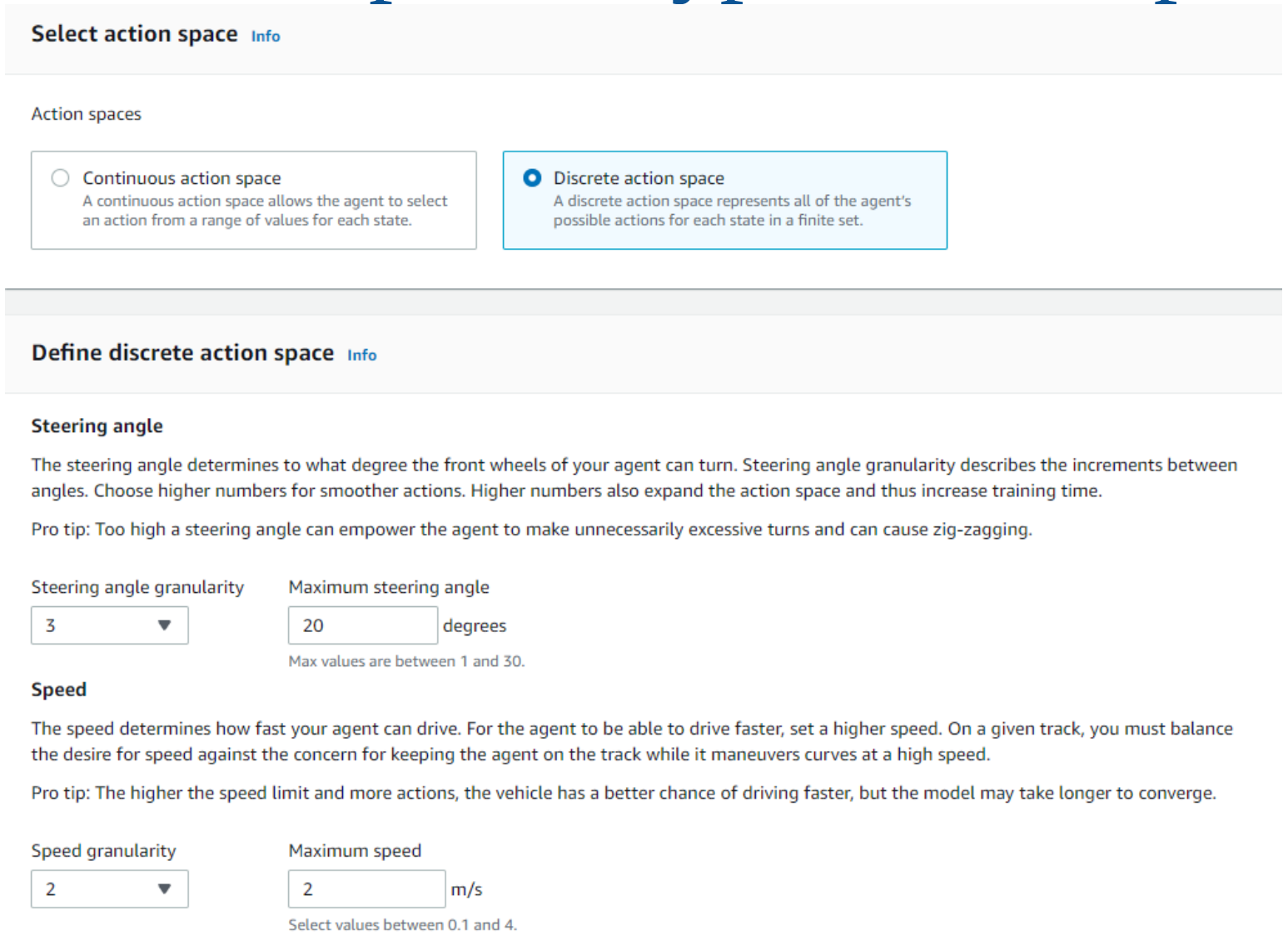
Tensorflow

Reinforcement learning algorithm

PPO

Hyperparameter	Value
Gradient descent batch size	64
Entropy	0.01
Discount factor	0.999
Loss type	Huber
Learning rate	0.00003
Number of experience episodes between each policy-updating iteration	20
Number of epochs	10

Advanced Example- Waypoints Template



Advanced Example- Waypoints Template

```python
def reward_function(params):

    center_variance = params["distance_from_center"] / params["track_width"]
    #racing line
    left_lane = []#Fill in the waypoints

    center_lane = []#Fill in the waypoints

    right_lane = []#Fill in the waypoints

    #Speed
    fast = []#Fill in the waypoints, 2m/s
    slow = []#Fill in the waypoints, 1m/s

    reward = 21

```

Advanced Example- Waypoints Template

```
if params["all_wheels_on_track"]:
    reward += 10
else:
    reward -= 10

if params["closest_waypoints"][1] in left_lane and params["is_left_of_center"]:
    reward += 10
elif params["closest_waypoints"][1] in right_lane and not params["is_left_of_center"]:
    reward += 10
elif params["closest_waypoints"][1] in center_lane and center_variance < 0.4:
    reward += 10
else:
    reward -= 10
if params["closest_waypoints"][1] in fast:
    if params["speed"] == 2 :
        reward += 10
    else:
        reward -= 10
elif params["closest_waypoints"][1] in slow:
    if params["speed"] == 1 :
        reward += 10
    else:
        reward -= 10



return float(reward)
```

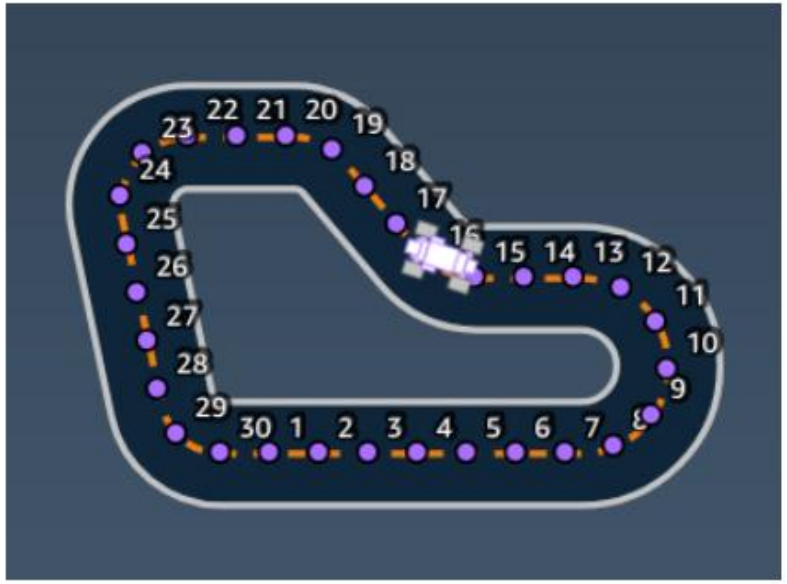
Advanced Example- Waypoints Template

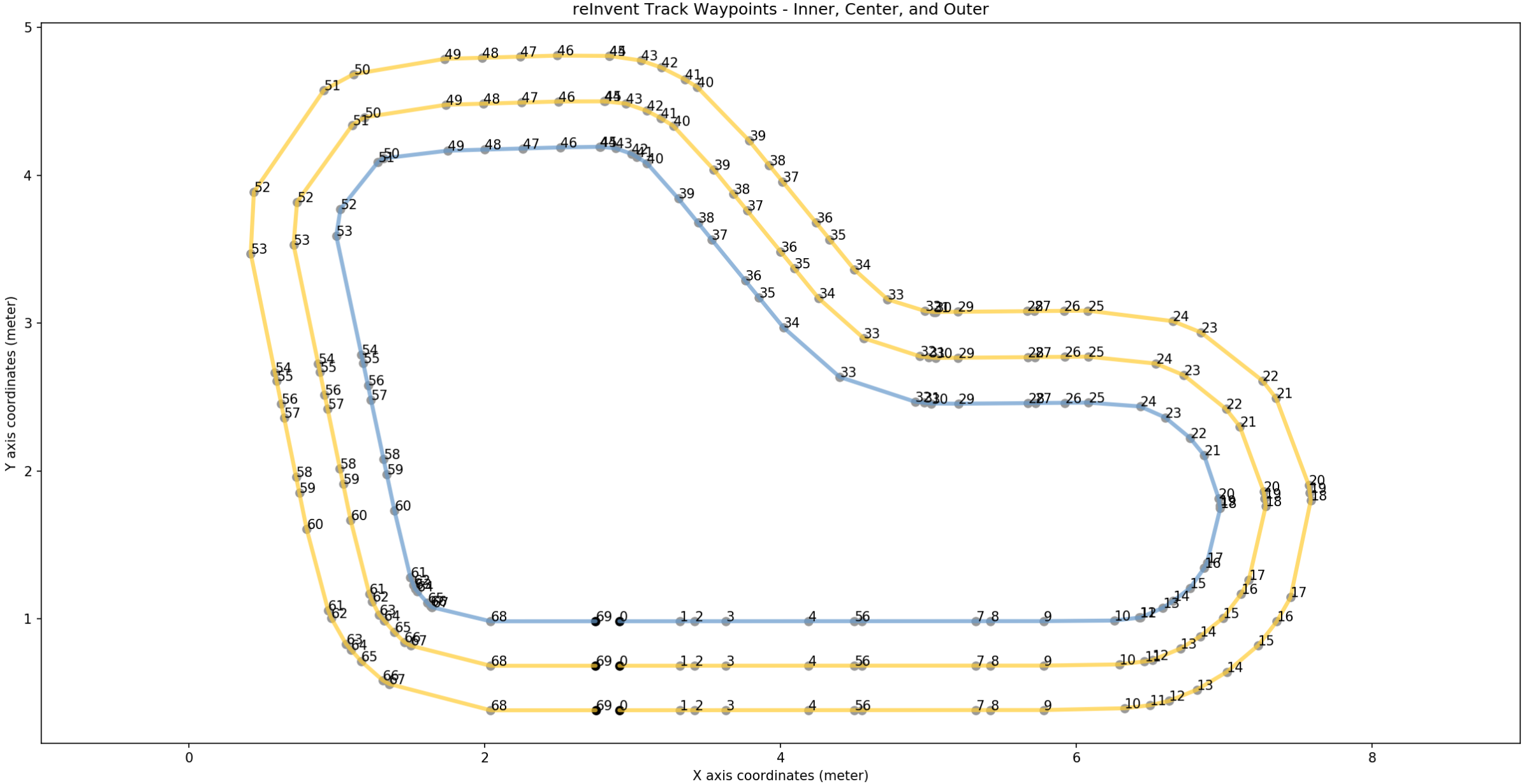
waypoints

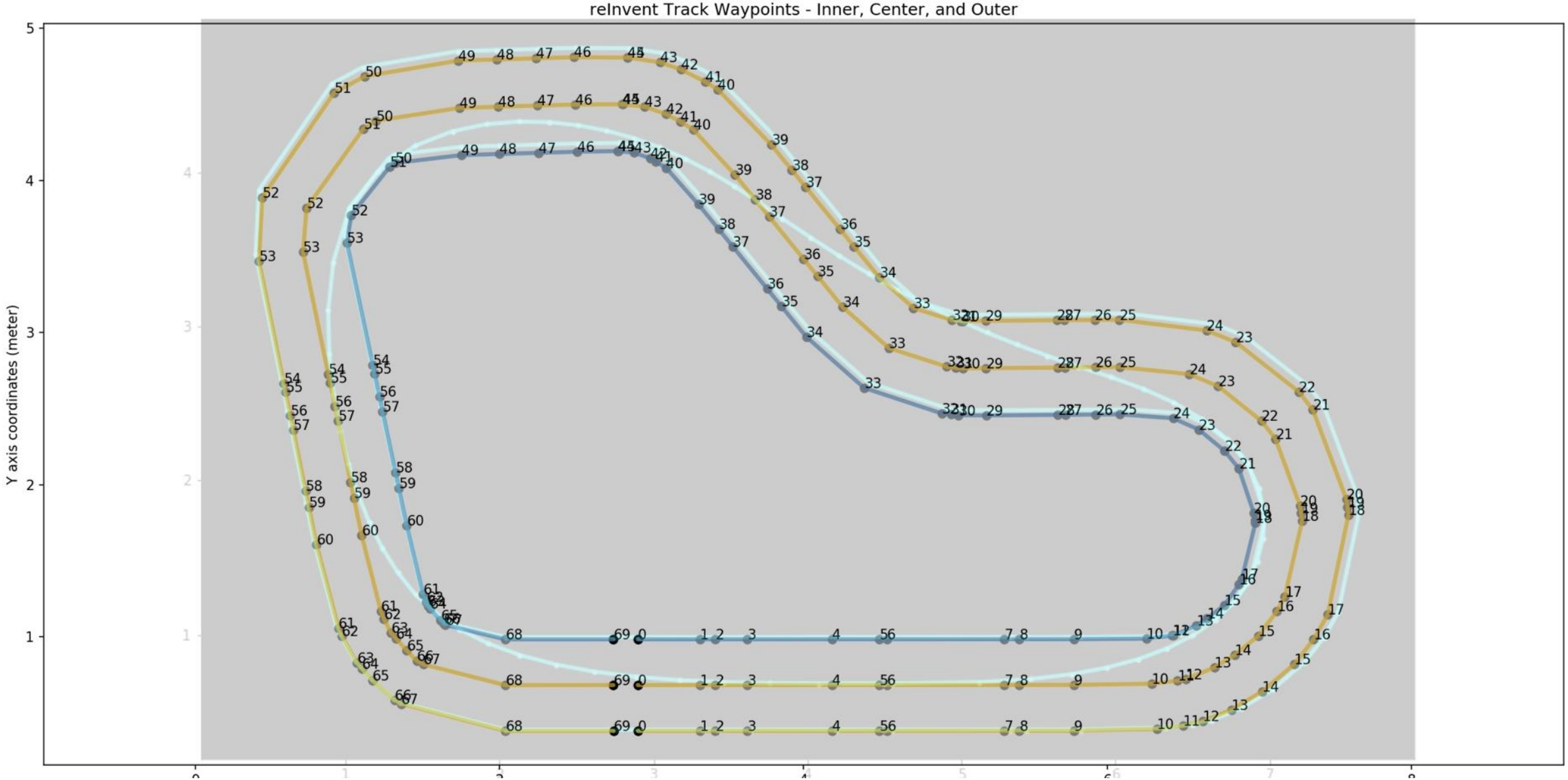
Type: `list` of `[float, float]`

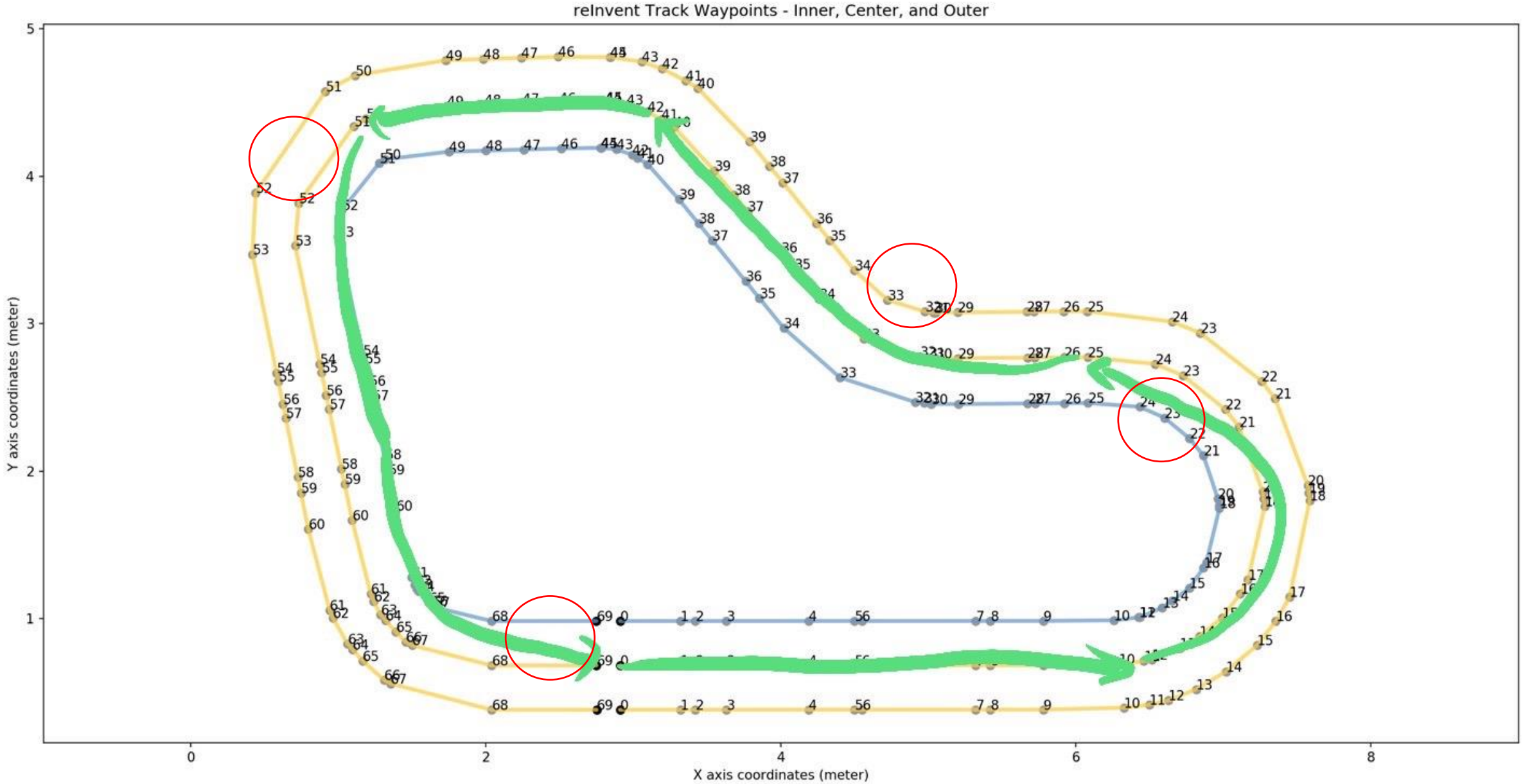
Range: $[[x_{w,0}, y_{w,0}] \ldots [x_{w,Max-1}, y_{w,Max-1}]]$

An ordered list of track-dependent `Max` milestones along the track center. Each milestone is described by a coordinate of ($x_{w,i}$, $y_{w,i}$). For a looped track, the first and last waypoints are the same. For a straight or other non-looped track, the first and last waypoints are different.




reInvent Track Waypoints - Inner, Center, and Outer
Y axis coordinates (meter)
X axis coordinates (meter)
0
1
2
3
4
5
6
8


reInvent Track Waypoints - Inner, Center, and Outer
Y axis coordinates (meter)


reInvent Track Waypoints - Inner, Center, and Outer
Y axis coordinates (meter)
X axis coordinates (meter)
0
1
2
3
4
5
6
8

Advanced Example- Waypoints Template

```
left_lane = [23, 24, 50, 51, 52, 53, 61, 62, 63, 64, 65, 66, 67, 68]  # Fill in the waypoints

center_lane = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 25, 26, 27, 28, 35, 36,
               37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 54, 55, 56, 57, 58, 59, 60, 69,
               70]  # Fill in the waypoints

right_lane = [29, 30, 31, 32, 33, 34]  # Fill in the waypoints

# Speed
fast = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44,
        45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69,
        70]  # Fill in the waypoints, 2m/s
slow = [10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24]  # Fill in the waypoints, 1m/s
```

Advanced Example- Waypoints Template

Advanced Example- Result & Clone model