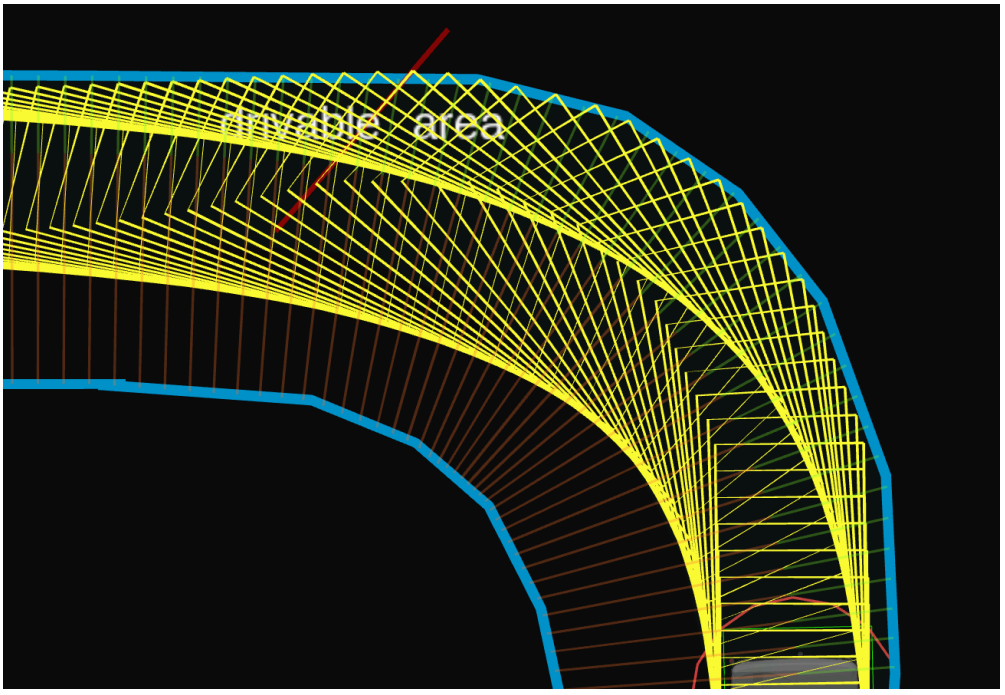
Related to mpt road clearance parameters #3206

Answered by mitsudome-r **mehmetdogru** asked this question in **Q&A**

mehmetdogru on Jan 16, 2023 Maintainer

Currently only `soft_clearance_from_road` and `soft_second_clearance_from_road` are used in the code to give clearance from road boundary during mpt calculations. However I could not observe that if they are functional. No matter what I do mpt doesn't plan a trajectory with some clearance from road boundary. I get this:



However if I add `extra_desired_clearance_from_road` during bound calculation I can observe that we certainly get clearance from road boundary

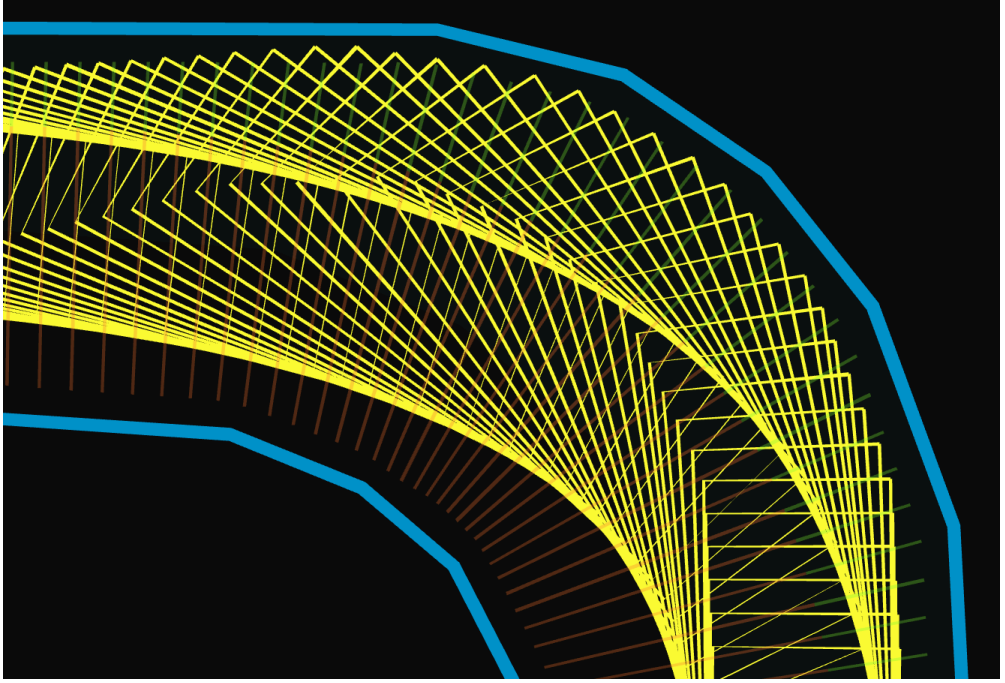
Category

Q&A

Labels

None yet

4 participants



So my questions are that:

1. Do soft_clearance params from road boundary work as intended and if so how can I tune them?
2. Isn't it a proper approach to shrink bounds so we would get clearance from road boundary? (That is why it is commented out ?)

Thanks in advance!

cc: **@takayuki5168**

↑ 1

Answered by **mitsudome-r** on Jan 17, 2023

There seems to be some other parameters that might affect `soft_clearance_from_road`. It might help TIER IV engineers to answer your questions if you can provide values for the parameters listed here. (posting your yaml file would be even better.)

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mitsudome-r on Jan 17, 2023 Maintainer

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Marked as answer ↑ 1 2 replies

mehmetdogru on Jan 17, 2023 Maintainer Author

I actually use the default parameters for `obstacle_avoidance_planner`, so **no changes/customization/tuning here**:

```yaml
/**:
  ros__parameters:
    option:
      # publish
      is_publishing_debug_visualization_marker: true
      is_publishing_clearance_map: false # publish clearance r
      is_publishing_object_clearance_map: false # publish clea
      is_publishing_area_with_objects: false # publish occupar

      is_stopping_if_outside_drivable_area: true # stop if the

      # show
      is_showing_debug_info: false
      is_showing_calculation_time: false

      # other
      enable_avoidance: false # enable avoidance function
      enable_pre_smoothing: true # enable EB
      skip_optimization: false # skip MPT and EB
      reset_prev_optimization: false

    common:
      # sampling
      num_sampling_points: 100 # number of optimizing points

      # trajectory total/fixing length
      trajectory_length: 300.0 # total trajectory length[m]

      forward_fixing_min_distance: 1.0 # number of fixing poir
      forward_fixing_min_time: 0.5 # forward fixing time with

      backward_fixing_distance: 5.0 # backward fixing length f
      delta_arc_length_for_trajectory: 0.1 # delta arc length

      delta_dist_threshold_for_closest_point: 3.0 # delta dist
      delta_yaw_threshold_for_closest_point: 1.046 #M_PI/3.0,
      delta_yaw_threshold_for_straight: 0.02 # delta dist thre

      num_fix_points_for_extending: 50 # number of fixing poir
      max_dist_for_extending_end_point: 0.0001 # minimum delta

      enable_clipping_fixed_traj: false
      non_fixed_trajectory_length: 5.0 # length of the trajec

    object:  # avoiding object
      max_avoiding_objects_velocity_ms: 0.5 # maximum velocity
      max_avoiding_ego_velocity_ms: 6.0 # maximum ego velocity

      avoiding_object_type:
        unknown: true
        car: true
        truck: true
        bus: true
        bicycle: true
        motorbike: true
```

```yaml
    pedestrian: true
    animal: true

# mpt param
mpt:
  option:
    steer_limit_constraint: true
    fix_points_around_ego: true
    plan_from_ego: true
    max_plan_from_ego_length: 10.0
    visualize_sampling_num: 1
    enable_manual_warm_start: true
    enable_warm_start: true # false
    is_fixed_point_single: false

  common:
    num_curvature_sampling_points: 5 # number of sampling
    delta_arc_length_for_mpt_points: 0.5 # delta arc lengt

  # kinematics:
    # If this parameter is commented out, the parameter is
    # The logic could be `optimization_center_offset = veh
    # The 0.8 scale is adopted as it performed the best.
    # optimization_center_offset: 2.3 # optimization cente

# replanning & trimming trajectory param outside algorithm
replan:
  max_path_shape_change_dist: 0.3 # threshold of path shap
  max_ego_moving_dist_for_replan: 3.0 # threshold of ego's
  max_delta_time_sec_for_replan: 1.0 # threshold of delta

# advanced parameters to improve performance as much as po
advanced:
  eb:
    common:
      num_joint_buffer_points: 3 # number of joint buffer
      num_offset_for_begin_idx: 2 # number of shifting poi
      delta_arc_length_for_eb: 0.6 # 1.0 # delta arc lengt
      num_sampling_points_for_eb: 95 # number of optimizin

    clearance:
      clearance_for_straight_line: 0.05 # minimum optimizi
      clearance_for_joint: 0.1 # minimum optimizing range
      clearance_for_only_smoothing: 0.1 # minimum optimizi

    qp:
      max_iteration: 10000 # max iteration when solving QP
      eps_abs: 1.0e-8 # eps abs when solving OSQP
      eps_rel: 1.0e-10 # eps rel when solving OSQP

  mpt:
    bounds_search_widths: [0.45, 0.15, 0.05, 0.01]

    clearance:  # clearance(distance) between vehicle and
      hard_clearance_from_road: 0.0 # clearance from road
      soft_clearance_from_road: 0.1 # clearance from road
      soft_second_clearance_from_road: 1.0 # clearance fro
      clearance_from_object: 1.0 # clearance from object[m
      extra_desired_clearance_from_road: 0.0 # extra desir

    weight:
      soft_avoidance_weight: 1000.0 # slack weight for lat
      soft_second_avoidance_weight: 100.0 # slack weight f

      lat_error_weight: 100.0 # weight for lateral error
```

```
          yaw_error_weight: 0.0 # weight for yaw error
          yaw_error_rate_weight: 0.0 # weight for yaw error ra
          steer_input_weight: 10.0 # weight for steering input
          steer_rate_weight: 10.0 # weight for steering rate

          obstacle_avoid_lat_error_weight: 3.0 # weight for la
          obstacle_avoid_yaw_error_weight: 0.0 # weight for ya
          obstacle_avoid_steer_input_weight: 1000.0 # weight f
          near_objects_length: 30.0 # weight for yaw error

          terminal_lat_error_weight: 100.0 # weight for latera
          terminal_yaw_error_weight: 100.0 # weight for yaw er
          terminal_path_lat_error_weight: 1000.0 # weight for
          terminal_path_yaw_error_weight: 1000.0 # weight for

        # check if planned trajectory is outside drivable area
        collision_free_constraints:
          option:
            l_inf_norm: true
            soft_constraint: true
            hard_constraint: false
            # two_step_soft_constraint: false

          vehicle_circles:
            method: "rear_drive"

            uniform_circle:
              num: 3
              radius_ratio: 0.8

            rear_drive:
              num_for_calculation: 3
              front_radius_ratio: 1.0
              rear_radius_ratio: 1.0

            bicycle_model:
              num_for_calculation: 3
              front_radius_ratio: 1.0
              rear_radius_ratio: 1.0
```

Actually only thing I change is expansion of drivable_area parameters:

```
/**:
  ros__parameters:
    avoidance:
      drivable_area_right_bound_offset: 0.0
      drivable_area_left_bound_offset: 0.0
      drivable_area_types_to_skip: [road_border]
    lane_change:
      drivable_area_right_bound_offset: 0.0
      drivable_area_left_bound_offset: 0.0
      drivable_area_types_to_skip: [road_border]
    lane_following:
      drivable_area_right_bound_offset: 2.8
      drivable_area_left_bound_offset: 2.8
      drivable_area_types_to_skip: [road_border]
    pull_out:
      drivable_area_right_bound_offset: 0.0
      drivable_area_left_bound_offset: 0.0
      drivable_area_types_to_skip: [road_border]
    pull_over:
```

```
      drivable_area_right_bound_offset: 0.0
      drivable_area_left_bound_offset: 0.0
      drivable_area_types_to_skip: [road_border]
    side_shift:
      drivable_area_right_bound_offset: 0.0
      drivable_area_left_bound_offset: 0.0
      drivable_area_types_to_skip: [road_border]
```

takayuki5168 on Feb 7, 2023 Collaborator

@mehmetdogru Sorry to be late. When do you want this problem solved?
The refactored obstacle_avoidance_planner will be merged in a few weeks, and with this refactored one, the problem was solved, if you can wait for a while.
autowarefoundation/autoware.universe#2796

👍 1

Answer selected by **mehmetdogru**

yukkysaito on Jan 28, 2023 Maintainer

@takayuki5168 can you answer?

↑ 1 👍 1 0 replies