Improve the lateral acceleration filter in motion velocity smoother #2661

Unanswered **brkay54** asked this question in **Ideas**

brkay54 on Jun 10, 2022 Collaborator

Hello everyone,

In current implementation of lateral acceleration filtering in trajectory, we are estimating the curvature by selecting three point. Then, we are calculating the lateral acceleration with this curvature estimation. See here!

I want to suggest a new approach to estimate the curvature in trajectory points. We can estimate the curvature by using the orientation of trajectory points. I think orientation can give more accurate results because it is output of optimization.

We can calculate the desired steering angle with following equation:

$$\dot{\theta} = v * \frac{tan(\varsigma)}{wheelbase}$$

$$\triangle \theta = \triangle s * \frac{tan(\varsigma)}{wheelbase}$$

$$\varsigma = tan^{-1}(\frac{\triangle \theta * wheelbase}{\triangle s})$$

After calculate the desired steering angles, `tan(steering_angle) / wheelbase` will give us the curvature of the trajectory point. We can set the velocities w.r.t. this calculation. What do you think? Please feel free to share your thoughts. Thank you!

↑ 1

Category
Ideas

Labels
component:planning

1 participant

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brkay54 on Jun 10, 2022 Collaborator Author

cc. @mehmetdogru @TakaHoribe

↑ 1 0 replies

brkay54 on Jun 14, 2022 Collaborator Author edited

I tested the both approach with `control_performance_analysis` (in this PR).

Results (Before is current implementation, after is implementation with new approach):

Series
/control_performance/driving_status/lateral_acceleration/data
/control_performance/driving_status/lateral_jerk/data
/control_performance/driving_status/longitudinal_acceleration/data
/control_performance/driving_status/longitudinal_jerk/data
/control_performance/performance_vars/error/control_effort_energy
/control_performance/performance_vars/error/curvature_estimate
/control_performance/performance_vars/error/curvature_estimate_pp
/control_performance/performance_vars/error/error_energy
/control_performance/performance_vars/error/heading_error
/control_performance/performance_vars/error/heading_error_velocity
/control_performance/performance_vars/error/lateral_error
/control_performance/performance_vars/error/lateral_error_acceleration
/control_performance/performance_vars/error/lateral_error_velocity
/control_performance/performance_vars/error/longitudinal_error
/control_performance/performance_vars/error/longitudinal_error_accelerati
/control_performance/performance_vars/error/longitudinal_error_velocity
/control_performance/performance_vars/error/tracking_curvature_discontii
/control_performance/performance_vars/error/value_approximation
/control_performance/performance_vars/error/vehicle_velocity_error
iae_heading_error
iae_heading_velocity_error
iae_lateral_acceleration_error
iae_lateral_error
iae_lateral_velocity_error
iae_longitudina_velocity_error
iae_longitudinal_acceleration_error
iae_longitudinal_error
iae_tracking_curvature_discontinuity_ability

Series
rms_heading_error
rms_heading_velocity_error
rms_lateral_acceleration_error
rms_lateral_error
rms_lateral_velocity_error
rms_longitudinal_acceleration_error
rms_longitudinal_error
rms_longitudinal_velocity_error
rms_tracking_curvature_discontinuity_ability

With new approach, maximum, total, average lateral errors decreased.

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