



Pure Pursuit vs. Stanley – Comparing Controllers

Ecurie Aix.

Me, Myself and AIX



© FSG Andrae



Ecurie Aix – Driverless

Who that?

- CS @ [RWTH](#)
- Joined EcurieAix in 2024/25 season
 - Utility & QoL in DV
 - Control in DV
- Inexperienced Noob

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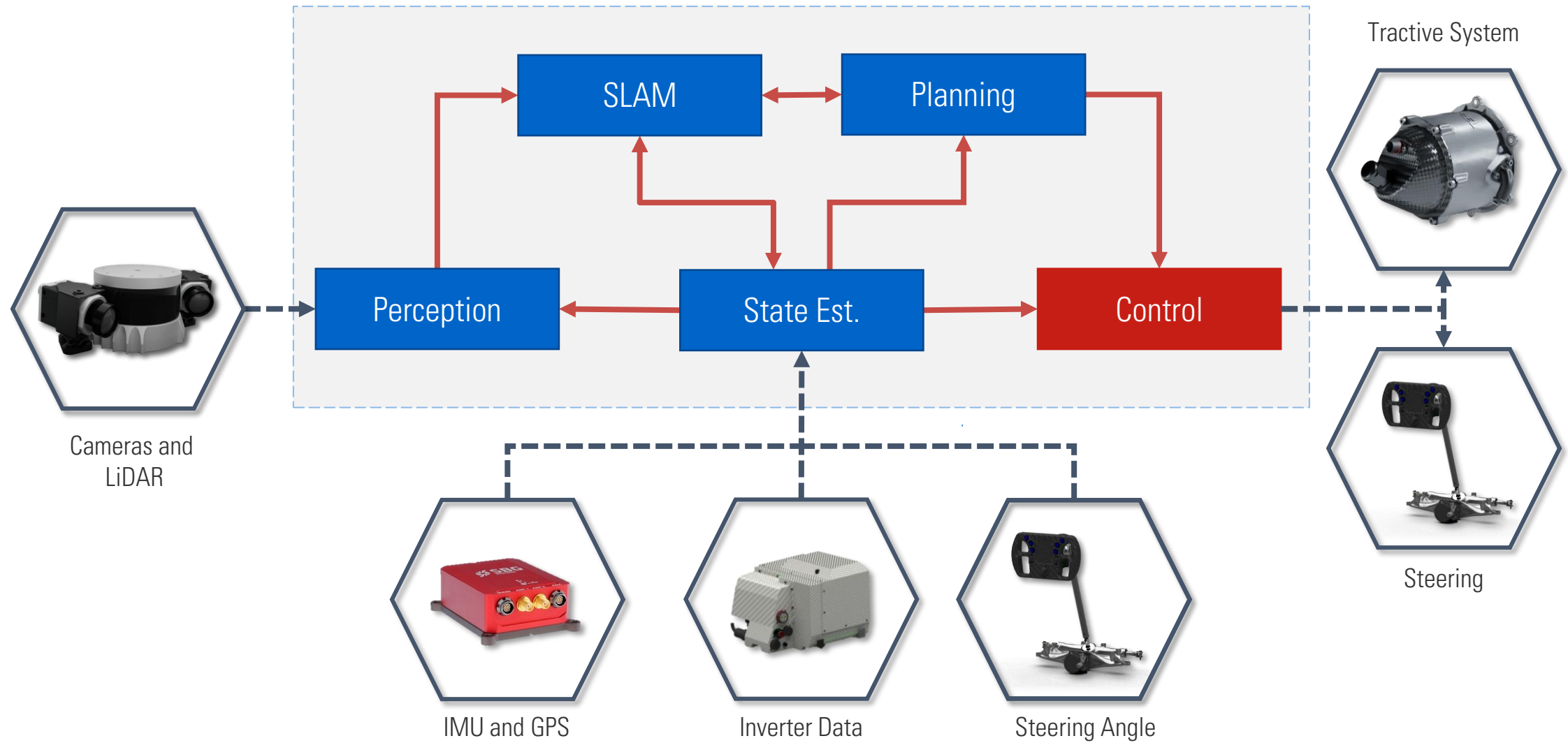


What Control?

Press 'W' to move forward

© FSG Mosch





How Control?

More than WASD?



© FSG Wintermantel

Longitudinal



PID, MPC

Lateral

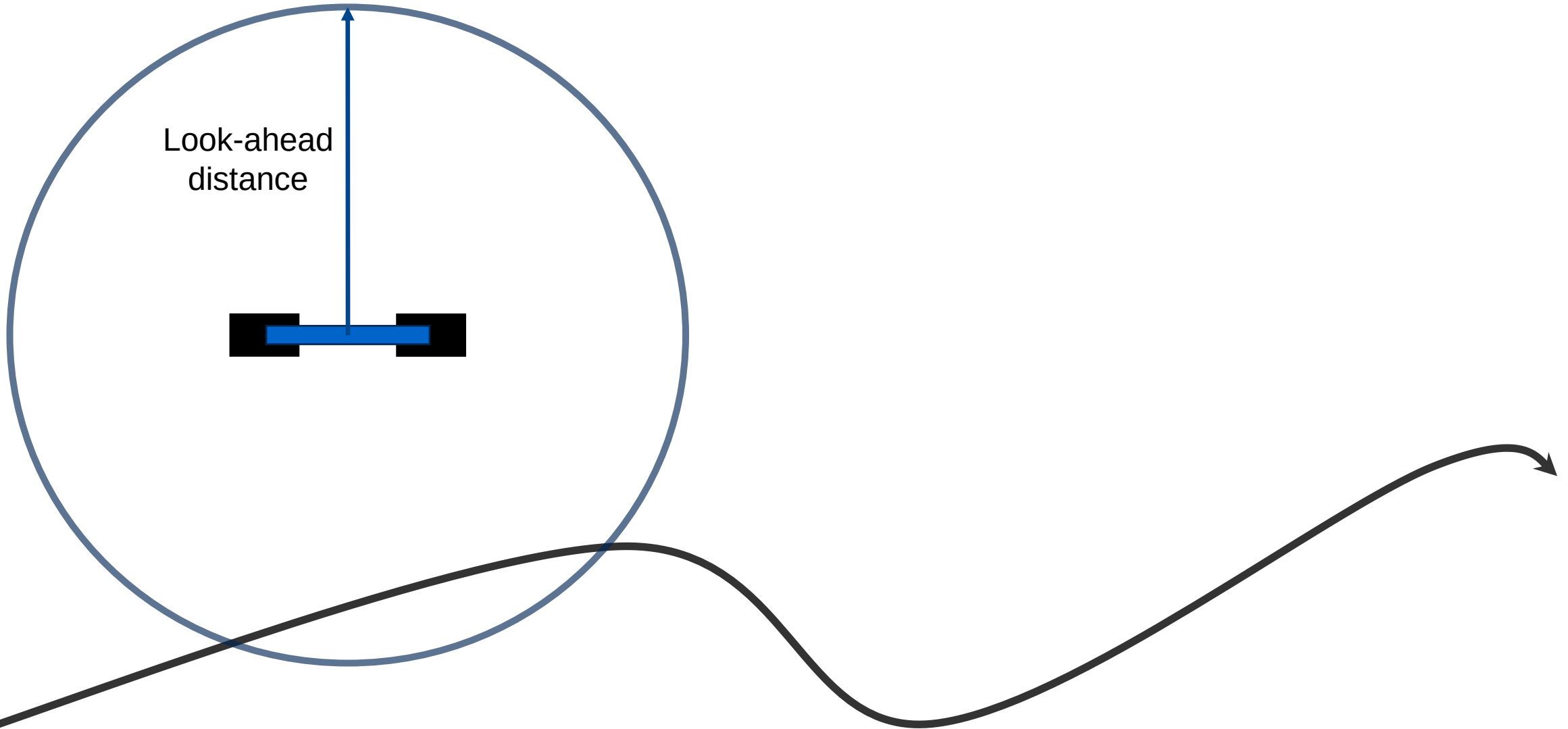


Pure Pursuit, Stanley, MPC

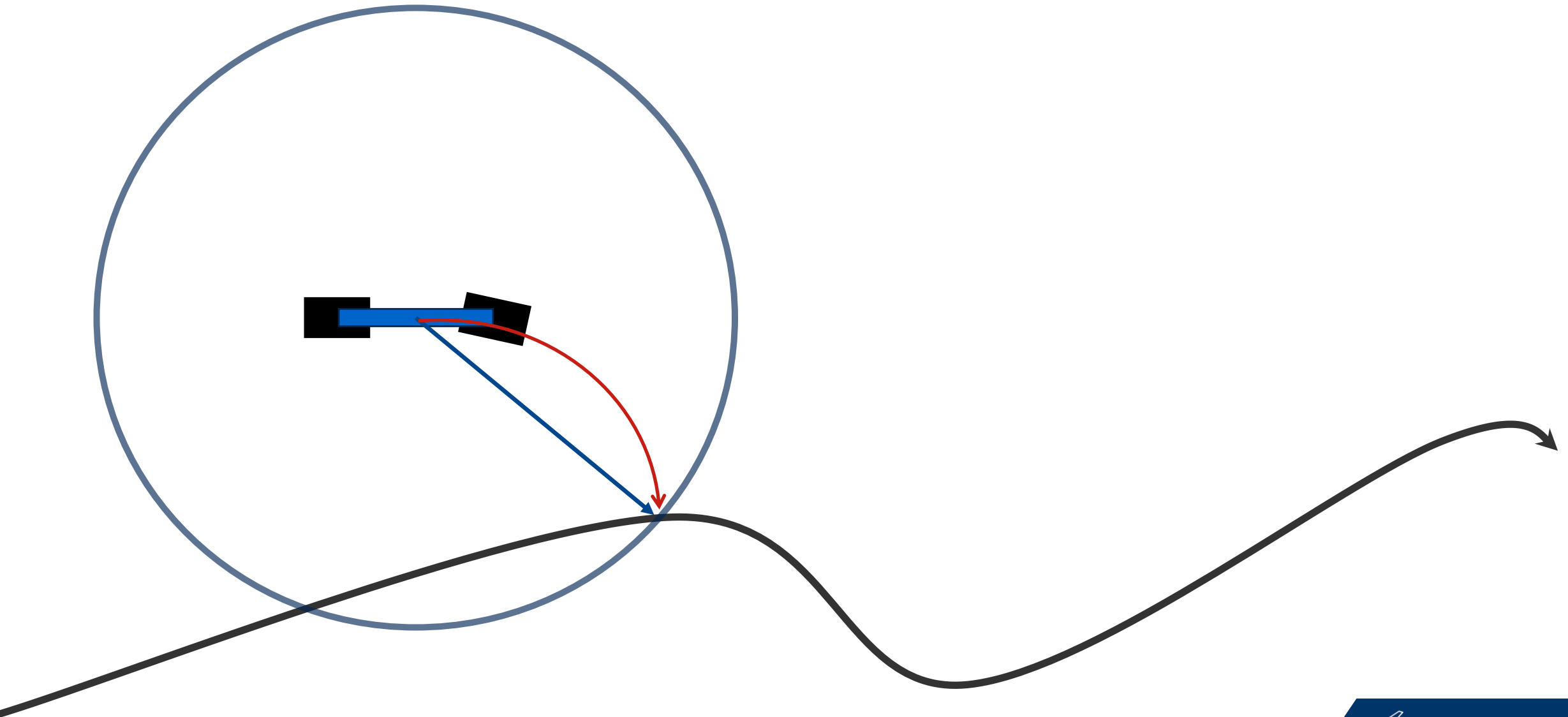
Pure Pursuit



Pure Pursuit



Pure Pursuit



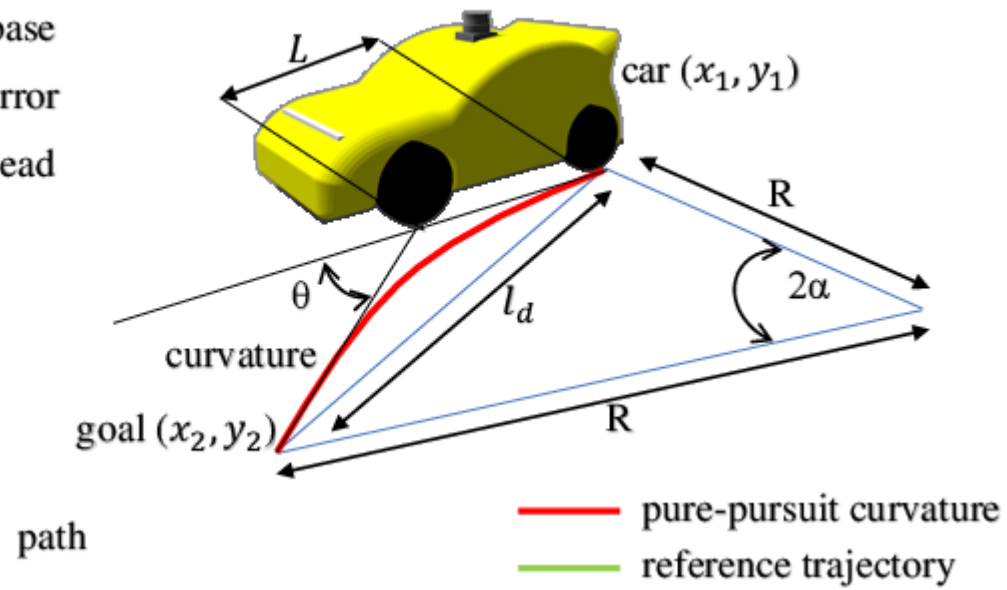
Pure Pursuit

Legend

L : wheelbase

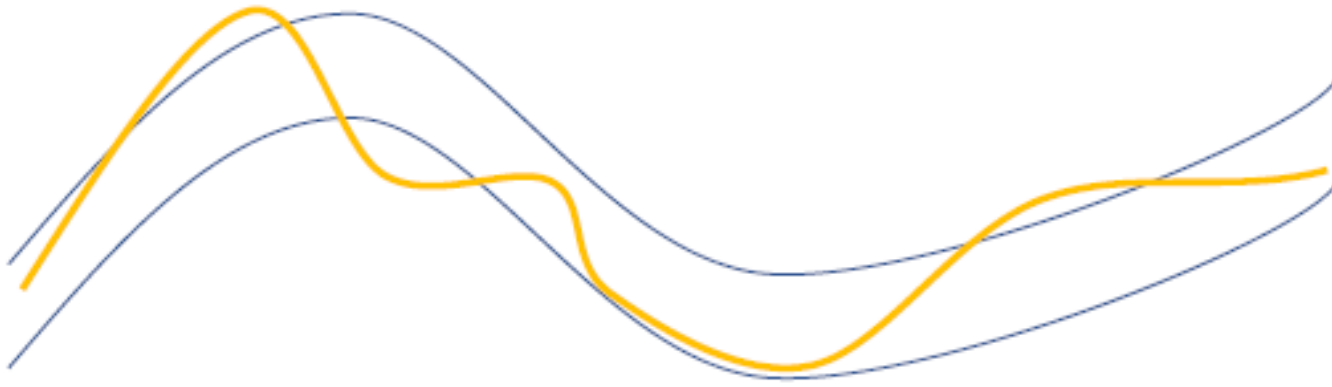
θ : angle error

l_d : lookahead

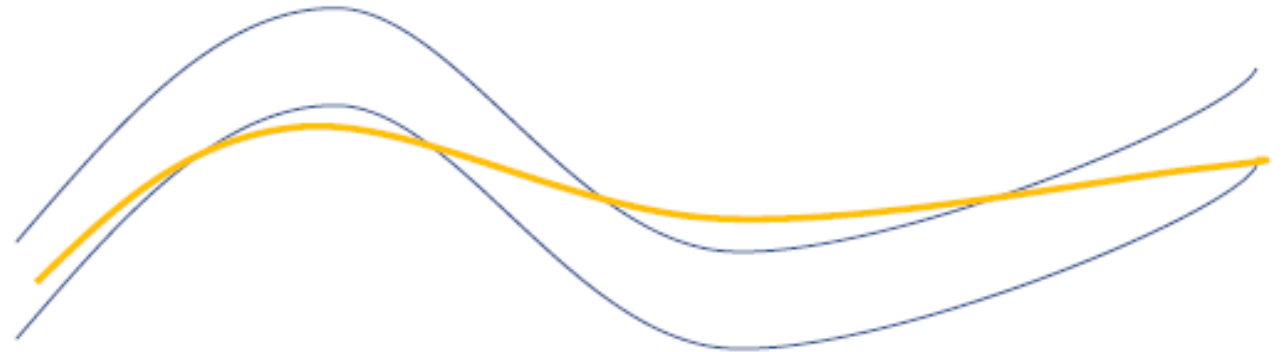


Pure Pursuit

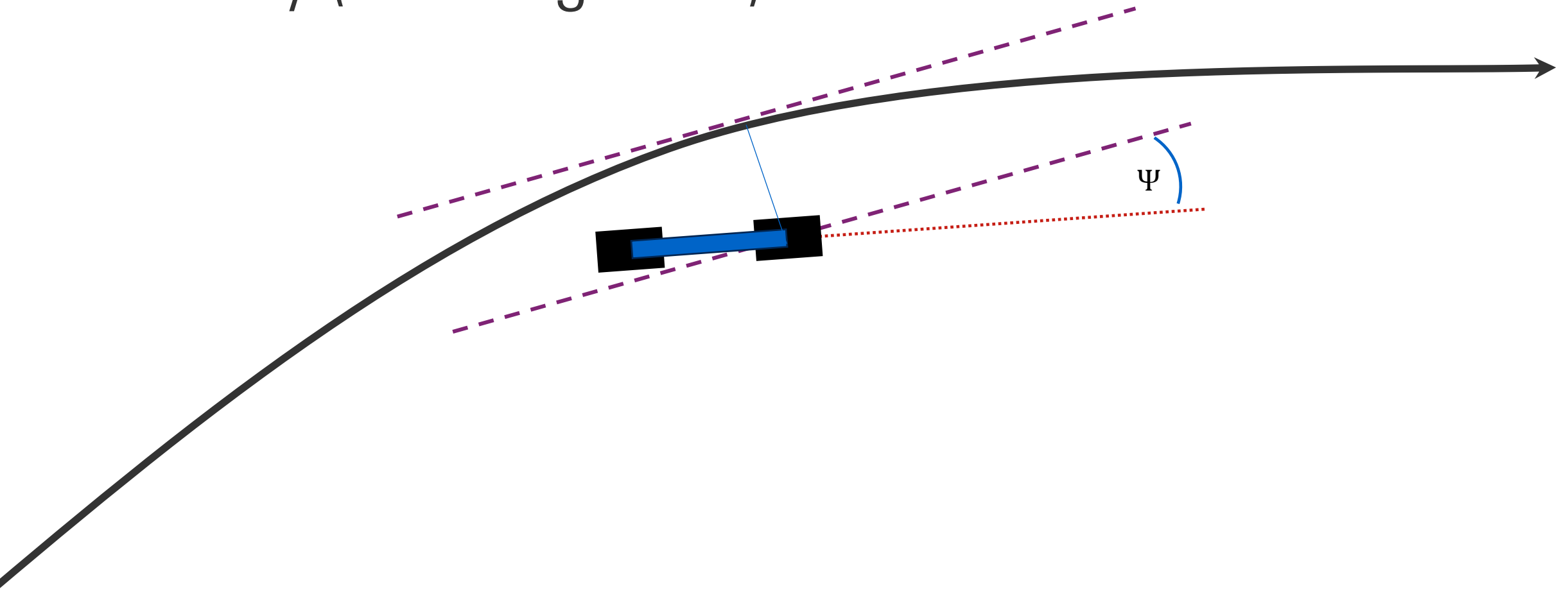
Lookahead too low



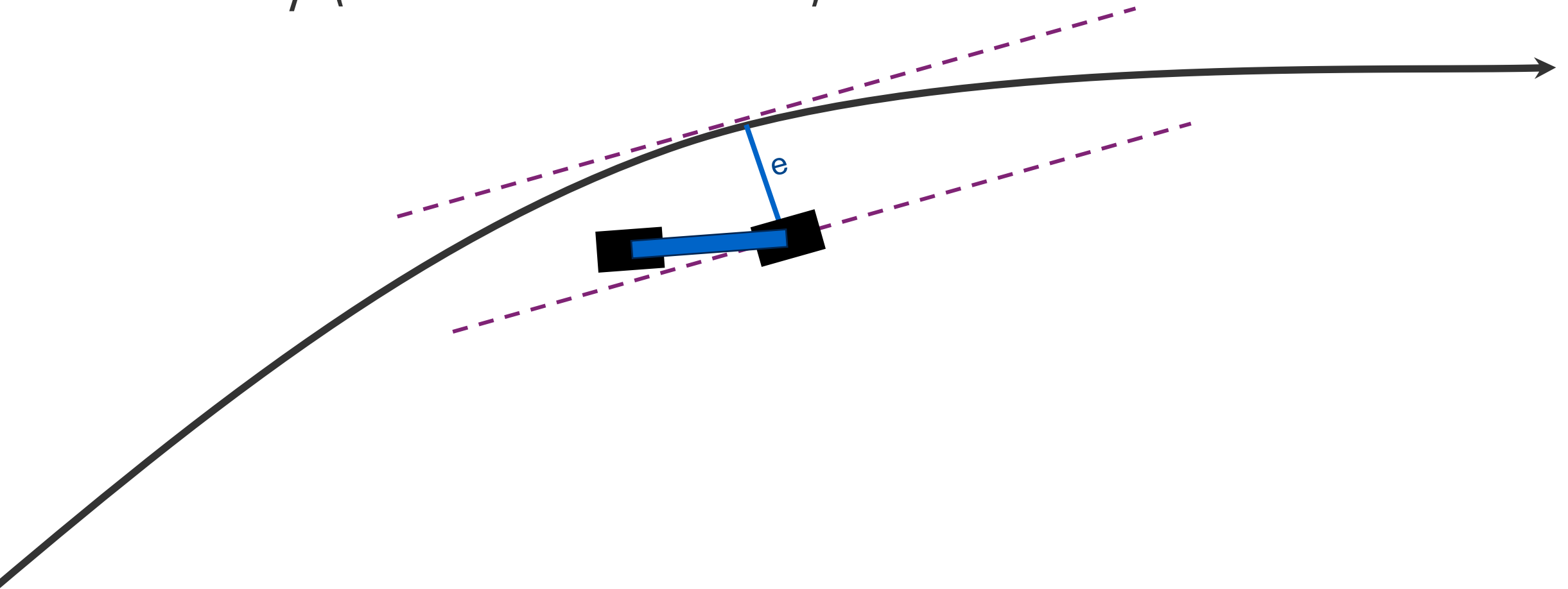
Lookahead too high



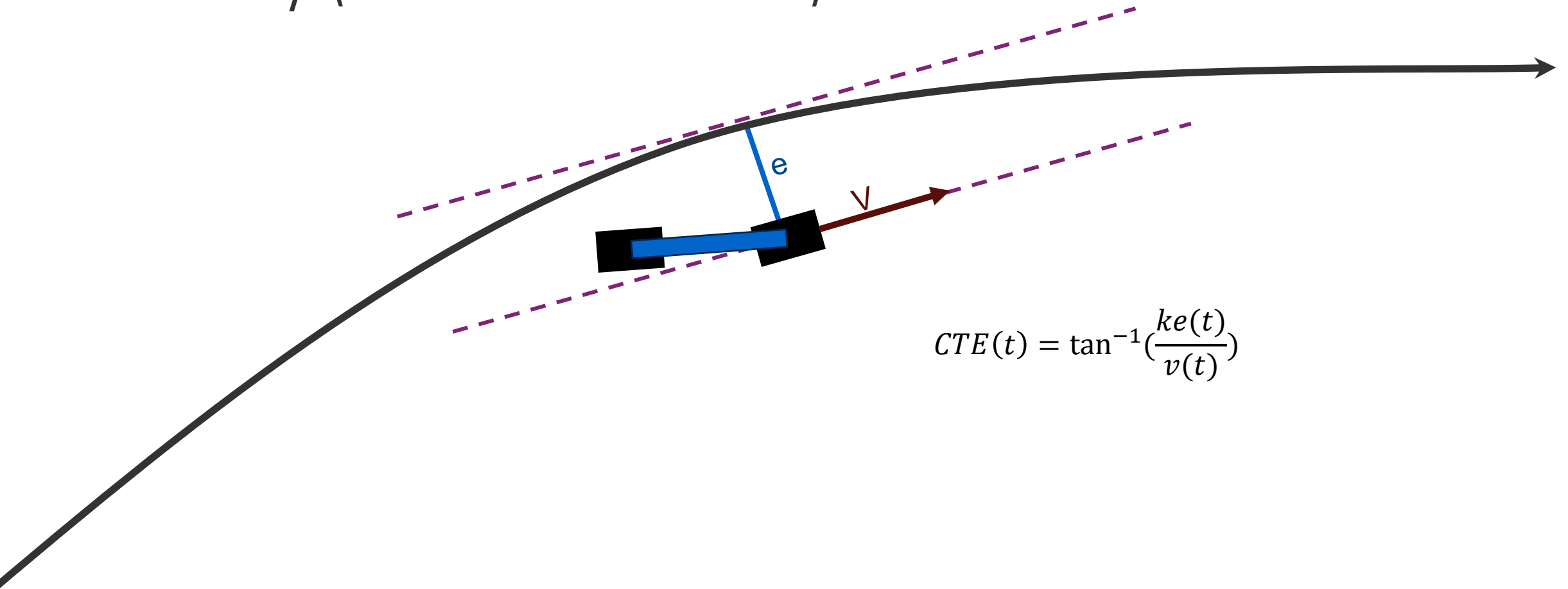
Stanley (Heading Error)



Stanley (Crosstrack Error)

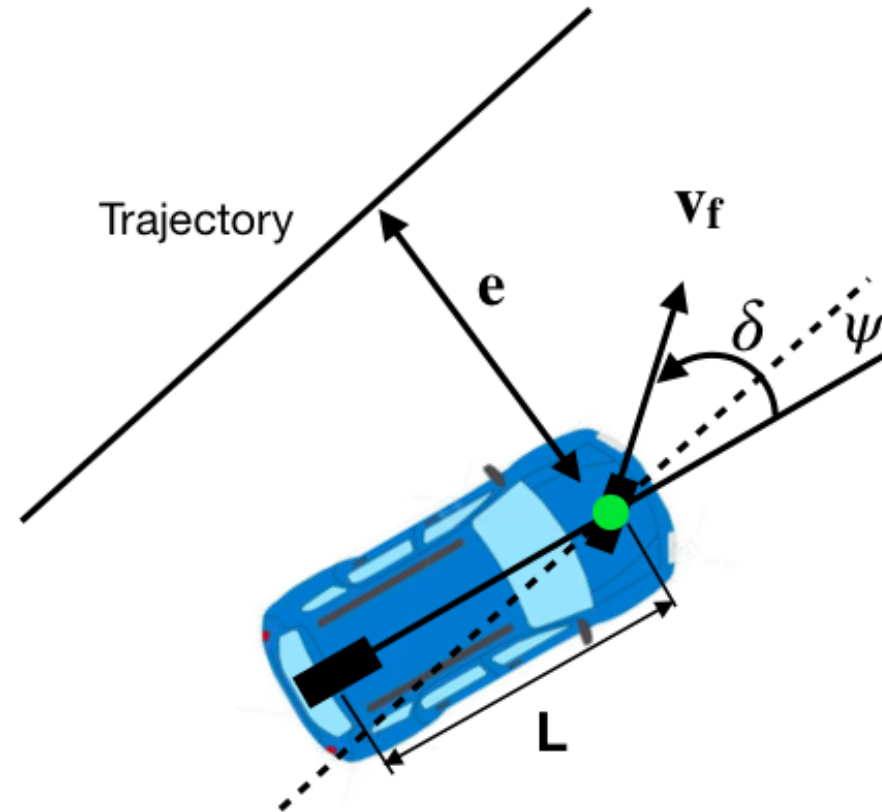


Stanley (Crosstrack Error)

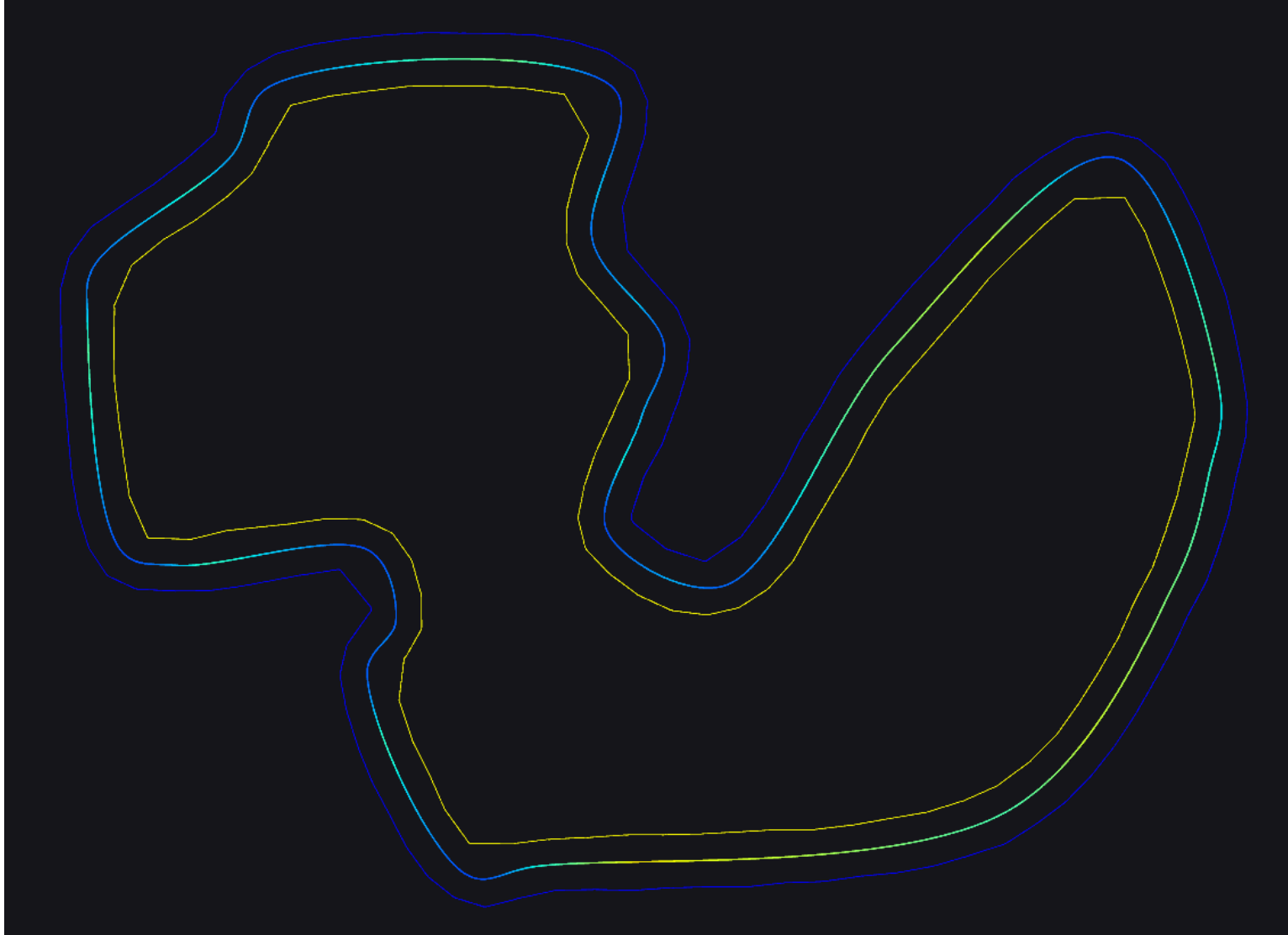


$$CTE(t) = \tan^{-1}\left(\frac{ke(t)}{v(t)}\right)$$

Stanley



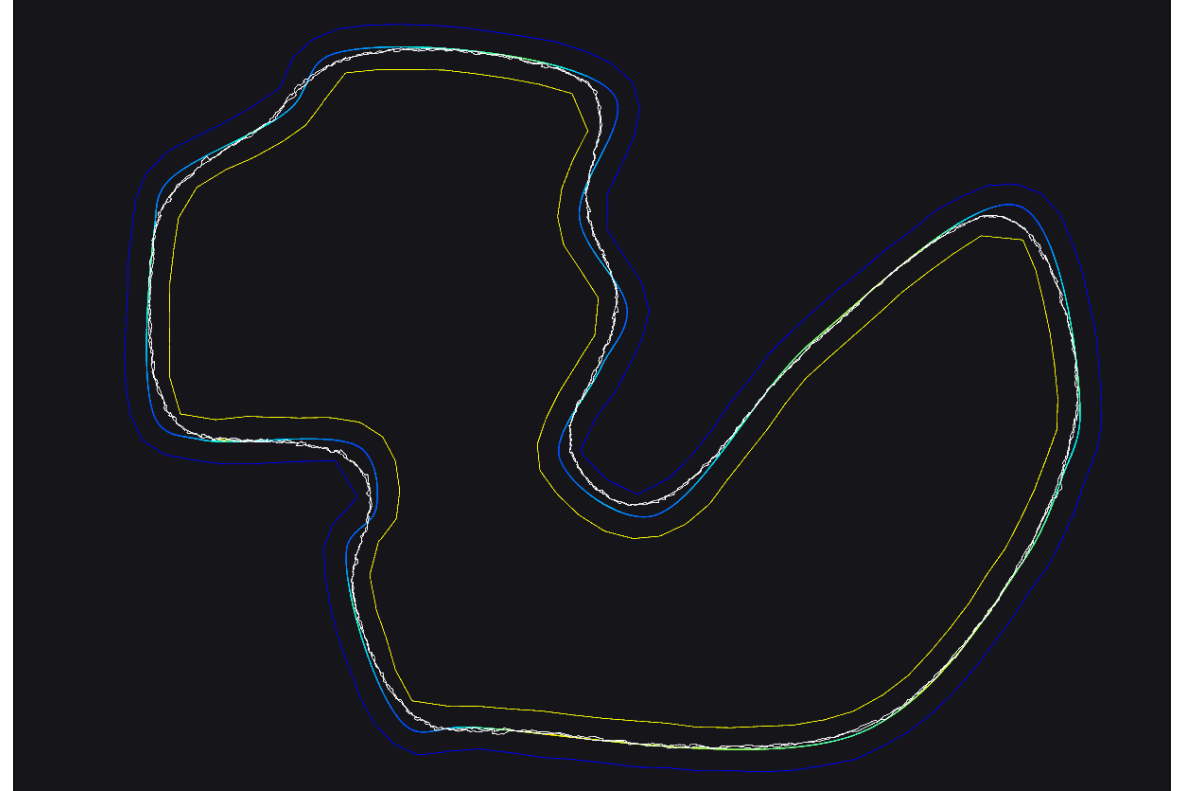
Evaluation



Evaluation

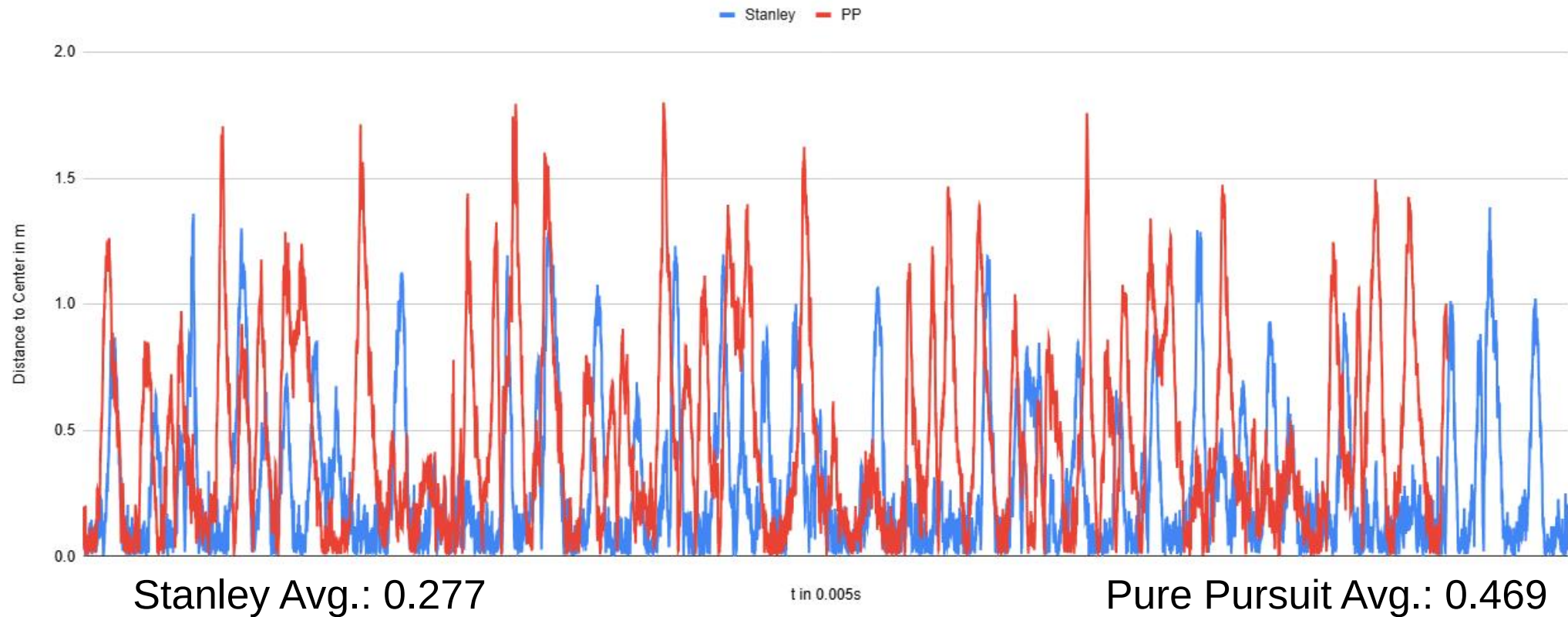


Stanley

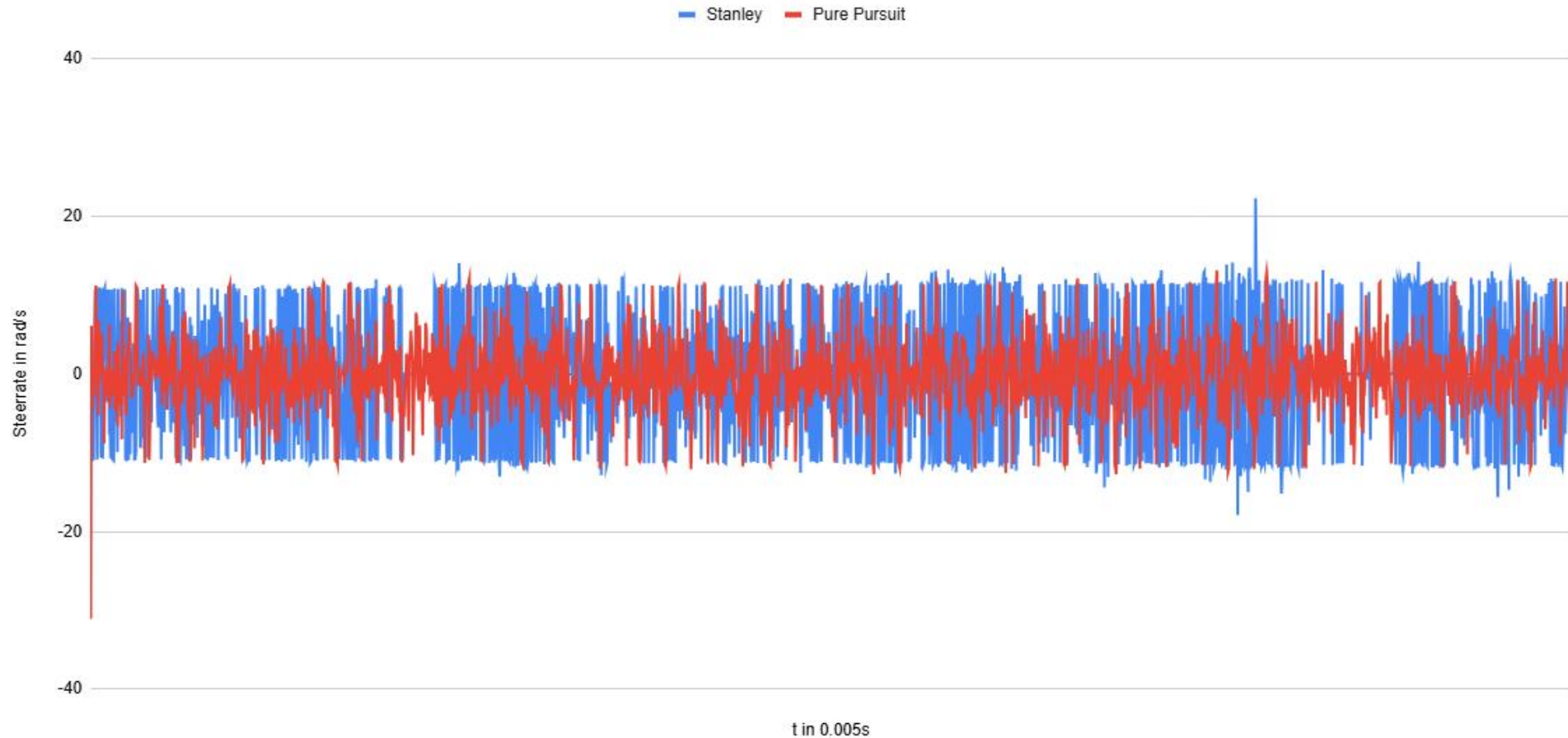


Pure Pursuit

Evaluation (Trajectory Deviation)



Evaluation (Steerrate)



Stanley AAD.: 7.1

Pure Pursuit AAD.: 3.96

Pros & Cons

Stanley	Pure Pursuit
+ Precise + High speed + Bit less finetuning	+ Smooth + Low speed + Robust against noise
– Understeering – Heavily reliant on other modules – Large Steering rate	– Oversteering – Lookahead tuning – High speed

Thank you.

Questions?

Feedback QR:

