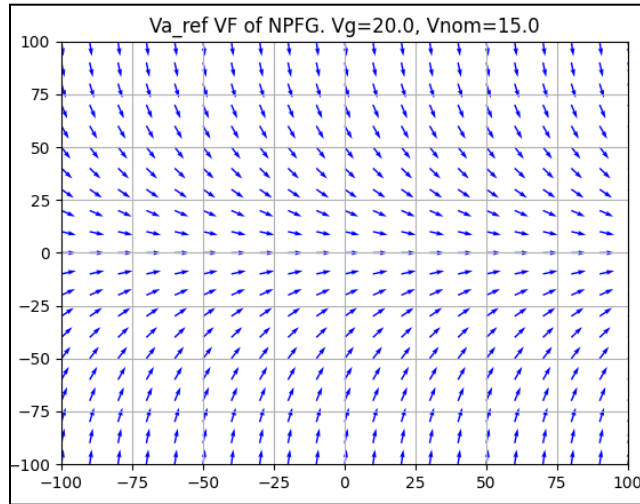


Week 7 Report - Jan 2, 2023 ~ Jan 8, 2023

Vector Field Drawing

To get an intuitive sense on the NPGF's Air-velocity reference vector around a path, a small script was made to visualize the VF. With this, the coupling between track error boundary (grows linearly with ground speed of the vehicle), look-ahead angle (course of Vectors), and a reference speed (magnitude of the vector).



More info can be found in [7 NPFG VectorField Visualization](#) document.

Timeline Setting

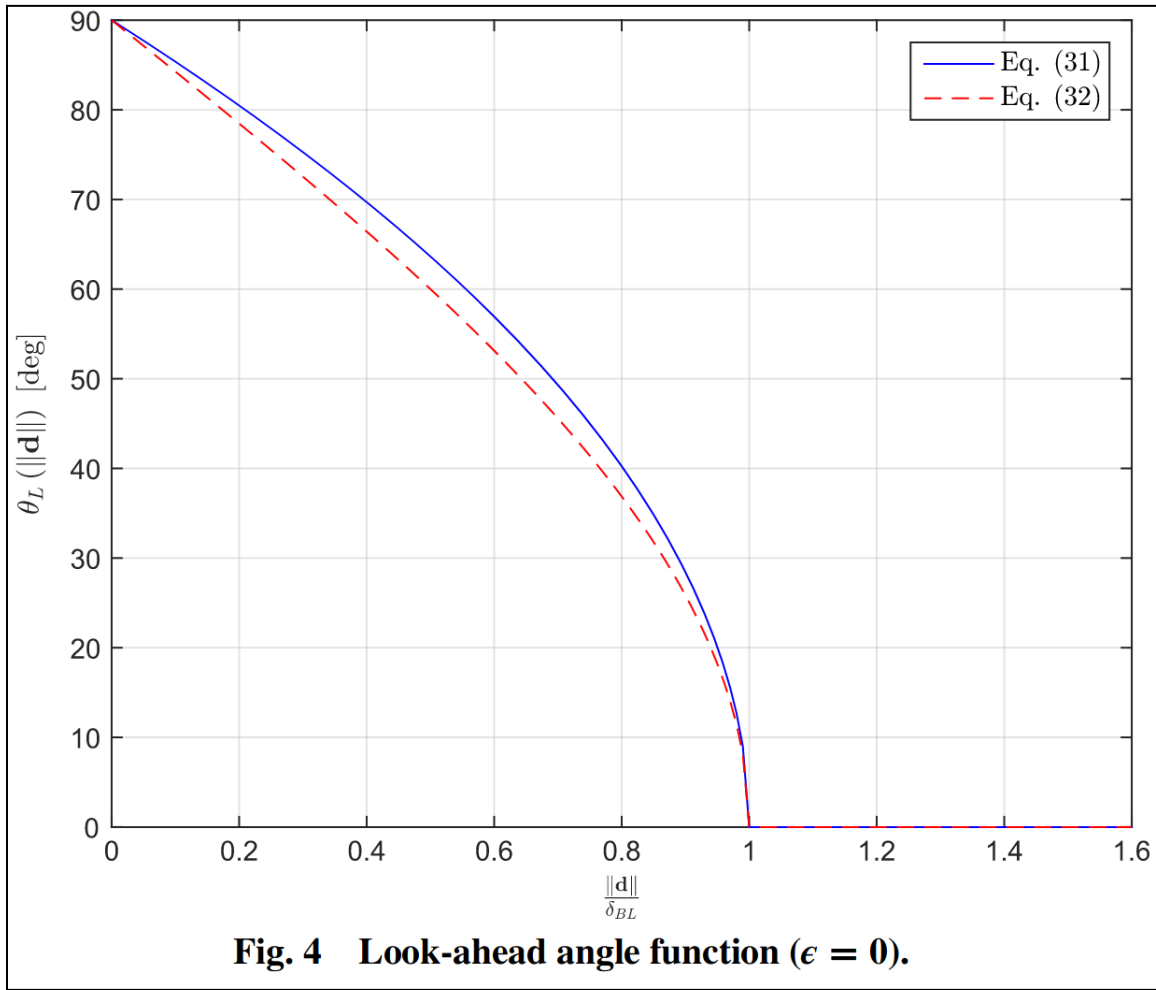
As part of the preparation for the [8 Intermediate Presentation](#) which was held on Jan 9, 2023 , the timeline for the project & goals were updated.

[illegible]

In summary, the new jerk-limited air-velocity reference vector formulation & considering wind into guidance were incorporated.

The document can be accessed [here](#) as well.

Revisiting 3D-NPFG paper & look-ahead angle ramp-in curve



In the [3D NPFG Paper](#), I have revisited this diagram, which gives a good sense on how the vehicle's inertial velocity will *turn relative to the error vector between the closest point on path, in the direction of the unit path tangent vector (should approach $\pi/2$, as vehicle approaches (X-value in the above diagram reaching 0.0)).

And the 'jerk', when assuming a constant vehicle speed & no-wind (airspeed == groundspeed), the jerk is simply a in a form of:

$$\left[\frac{V_g}{\delta_{BL}} \cdot \frac{|d|}{\delta_{BL}} \cdot \sin(\theta_L(|d|))^2 \cdot V_g \right]$$

As it is simply a centrifugal acceleration / jerk, which is a multiplication of vehicle's speed and functions of the look-ahead angle & normalized track error variables. Therefore, this will be used to plot the jerk experienced by the vehicle under different guidance laws each with their unique look-ahead angle function curves. Which will first provide an intuitive sense on jerk experienced by vehicle with constant speed & no-wind.

END