# Predictive Thrust Vectoring

With the use of Bluetooth, latency at any given point has to be compensated for. This latency is calculated then used by the PTV process to estimate the state and position of the rocket in the next (x) milliseconds. Where (x) is the latency. Gimbal position is then calculated for the predicted position and sent to the boost stage controller

Blue Circle – Vehicle
Blue Line – Current Rocket Heading/Direction
**Green Line – Intended Direction of Movement**
Black Line – Thrust Direction
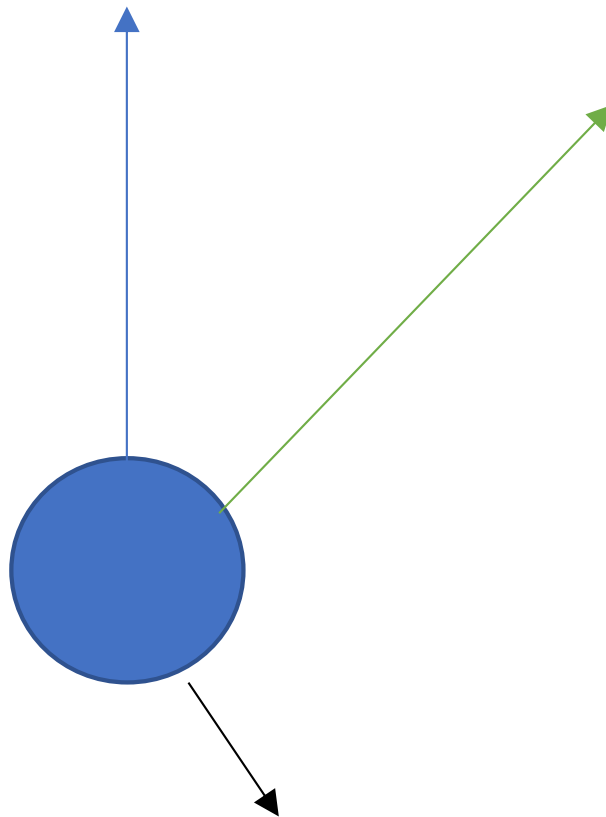
As a result of delay time(latency) , when TVC values from the Navigation and Guidance Functions transmitted through Bluetooth reach the Boost Stage TVC mount, the rocket orientation varies off margin so the rocket will correct for a past state instead of the current state.

Dark Red line – Forecast Error direction when TVC reaches Boost Stage
Bright Red line – Error resulting direction as a result of delay
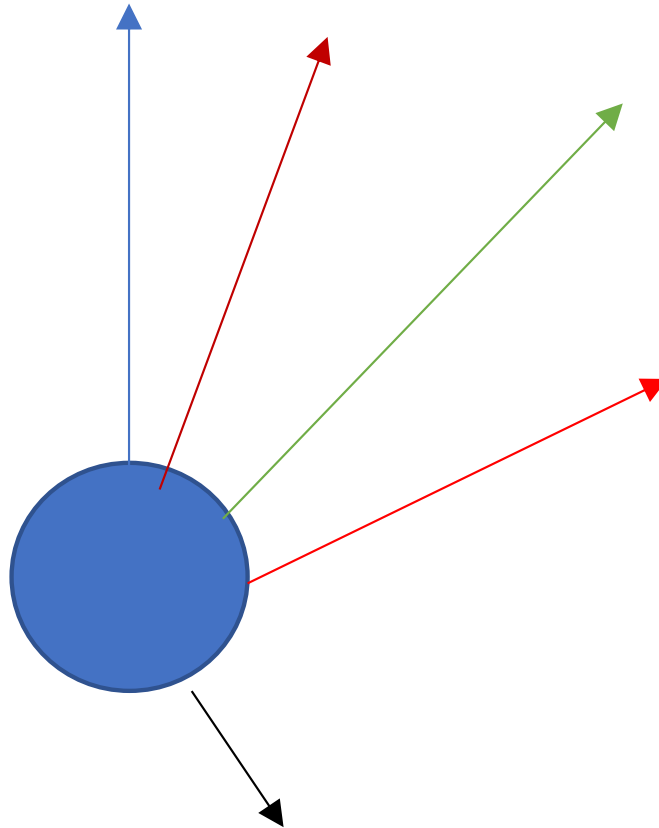
To accurately implement PTV:
- Save current state -> (Current Direction)
- Estimate Guidance and Nav intended rocket direction from TVC mount values. Use this as anchor
- Estimate vehicle current state after delay time
- Find resulting direction from TVC mount values for the estimated delay time state
- Compute the distance between the estimated vehicle state after delay time and the Guidance and Nav intended rocket direction (Minus intended direction from estimated vehicle state after delay time)
- Calculate TVC mount motor values for the distance from Guidance and Nav intended rocket direction and estimated delay time state.