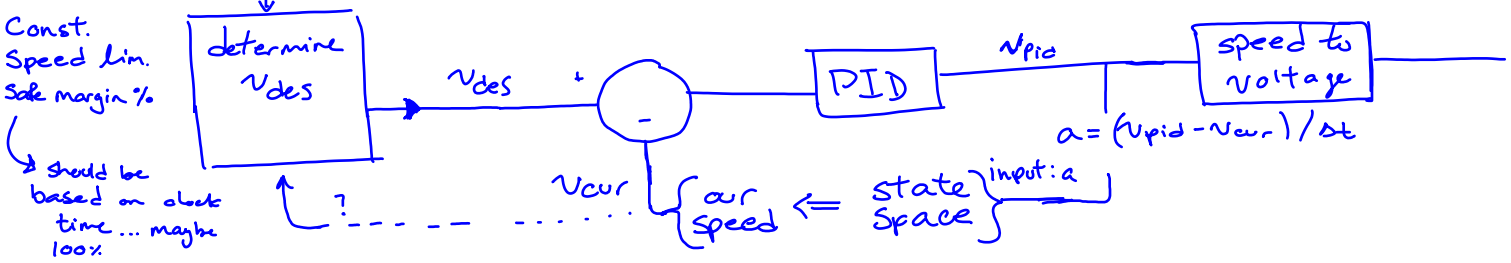
From Sensor: Rel. Distance, Rel. Speed.

Assuming $v_{el\ lead}$ is Const between $\Delta T$. Need Intrupt for break.




determine $v_{des}$:

Let $d$ be the abs. value of the max deceleration of the host vehical. $v_{lead} = v_{cur} + v_{rel}$

goal: to follow at a speed and distance, such that if the lead car were to instantaously stop, we would not collide.

Ideally host and lead car should have the same vel

$\Rightarrow v_{rel} = 0$, and $d_{rel} > \frac{v_{lead}^2}{2d}$

$\cancel{v_f^2}^{0} - v_i^2 = 2ad$

$\not\Rightarrow v_{lead}^2 = +2d_{rel}$

$\Delta t \ll \Delta T$

to let PID run multiple times per desired velocity.

* Possible interupt to engage break when really close.

Case 1: "Ideal", $d_{rel}$ is in safe region

$\Rightarrow v_{des} = v_{lead}$

Case 2: "Not safe", $d_{rel}$ is too small


Want to set a vel such that next time step has Rel. dis = Safe(1+m) assuming linear dec. over entire time step. (PID should be much faster)

Case 3:

...

$\text{Safe}(1+m) = \underset{\text{travel in } \Delta T}{\text{lead car distance}} - \underset{\text{traveled in } \Delta T}{\text{host car distance}} + \underset{\text{curr dis.}}{x}$

$\text{Safe}(1+m) - x = \frac{v_{cur} + v_{des}}{2}\Delta T - v_{lead}\Delta T$

$2\left(\frac{\text{Safe}(1+m) - x}{\Delta T} + v_{lead}\right) - v_{cur} = v_{des}.$

$\text{Safe} = \frac{v_{lead}^2}{2d} = s$