speed t_green t_yellow car_len space thresh acc

if space ≥ thresh:

$i \cdot d\_hood\_to\_hood = d\_total$

$i = \frac{d\_total}{d\_hood...}$

ret $\lceil i \rceil$

else:

$d\_to\_go\_th = \cancel{thresh} - space$

if $d\_to\_go... < d\_acc$:

$t\_delay = i\sqrt{\frac{2\, d\_to\_go..}{acc}}$

t_to_plane =

$\hookrightarrow i(d\_hood...) = \frac{1}{2} acc\, t_c^2$

$\sqrt{\frac{2i(d\_hood...)}{acc}} = t$

$t\_total = t\_green + t\_yellow$

$t\_to\_limit = speed / acc$

$t\_acc = \min(t\_total, t\_to\_limit)$

$t\_limit = t\_total - t\_acc$

$d\_hood\_to\_hood = space + car\_len$

$d\_acc = \frac{1}{2} acc\, t_{acc}^2$

$d\_limit = speed\, t_{limit}$

$(i\, react + react)^2$

$i^2 react^2 + 2i\, react + rea$

to plane $t(i) = i\sqrt{\frac{2d\_to\_go}{acc}} + \sqrt{\frac{2i(d\_hood...)}{acc}} + (i^{+1}) react$

$\max_i\ t\_total^2 \geq \frac{2i^2(d\_to\_go)}{acc} + \frac{2i(d\_hood...)}{acc} + (i+1)^2 react^2$

$\frac{acc(t\_total)^2}{2} \geq i^2(d\_to\_go) + i(\cancel{d\_hood...})$

(thresh - space) (space + car_len)

space = car_len

$\sqrt{\frac{acc(t\_total)^2}{2\, thresh}}$

$i^2 thresh - i\, space + i\, car\_len$

$i(i\, thresh - space + car\_len)$

$$\frac{2\,\cancel{\ }\,(i^2 T + iD)}{\cancel{a}\ 2} = t\_total^2$$

$0 \quad t(th-sp) \quad 2\cdot t(th-sp)$

$sp \geq th$: go all

else:

1 go

2 wait for th-sp

$$\frac{a\cdot(t\_total^2)}{2} = i^2 T + i D$$

$$A := \frac{a\, tot^2}{2}$$

$$0 = T i^2 + D i + A$$

ith car till go

$i \cdot t(th-sp)$

$\cancel{t_0}\ t(dist(i\cdot(c\_len + sp)))$

time for ith to cross plane

$i \cdot till\_go() + to\_plane()$

till_go():

$\Delta = th - sp$

time to ~~accel~~ acc Δ

$i =$

to_plane():

$D = c\_len + sp$

time to acc $\cancel{D}\cdot i$

$$i\cdot\sqrt{\frac{2\,th}{a}} + \sqrt{\frac{2Di}{a}}$$

$$0 = t\_total - (i\cdot delay + t(Di))$$

$$i^2\sqrt{\frac{2T}{a}} + \sqrt{\frac{2Di}{a}} = t\_total^2$$

$$\sqrt{\frac{2Di}{a}} = \cancel{\ }\,t^2$$

$c = -t\_total^2$

$a = \frac{2\, d\_to\_go}{acc}$ $\quad b = \frac{2\, d\_car}{acc}$

$i\sqrt{\frac{2 d\_to\_go}{acc}} + t\_acc + \frac{i\, d\_car}{limit} - \frac{d\_acc}{limit}$

$y = mx + b$

$$\frac{t\_acc \quad t\_total^2}{} = i^2\, d\_to\_go + i\, d\_lead$$

$t\_total =$

$$\begin{cases} \text{if } d\_acc > d\_to\_go: & i\sqrt{\frac{2 d\_to\_go}{acc}} \\ \text{else}: & i\left(t\_acc + \frac{(d\_to\_go - d\_acc)}{speed\ limit}\right) \end{cases}$$

$$\begin{cases} \text{if } i(d\_car) < d\_acc: & \sqrt{\frac{2 i\, d\_car}{acc}} \\ \text{else}: & t\_acc + \frac{(i\, d\_car) - d\_acc}{speed\ limit} \end{cases}$$

$$t\_total^2 = \left[i^2 \frac{2\, d\_to\_go}{acc}\right] \text{ or } i^2\left(\cancel{t\_acc} + \frac{d\_to\_go - d\_acc}{speed\ limit}\right)^2$$

$$+ \left[i\, \frac{2\, d\_car}{acc}\right] \text{ or } \left(t\_acc + \frac{(i\, d\_car) - d\_acc}{speed\ limit}\right)^2$$

$$t\_acc^2 + 2\, t\_acc\left(\frac{(i\, d\_car) - d\_acc}{sp}\right) + \left(\frac{(i\, d\_car) - d\_acc}{sp}\right)^2$$

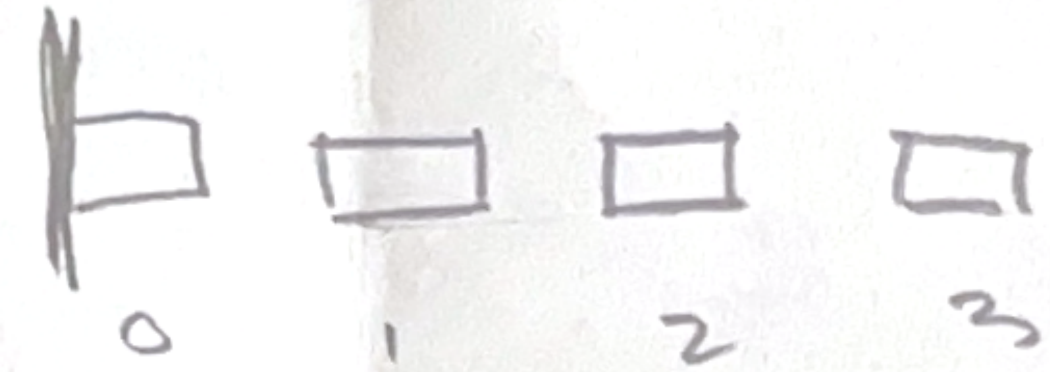
$$\cancel{t\_acc^2 + 2} \quad \left(sp\,(t\_acc) + (i\, d\_car) - d\_acc\right)^2$$

time

now

$\sqrt{\frac{2\,d\_to\_go}{acc}}$

$\sqrt{\frac{2(1)(d\_hood)}{acc}}$



0

acc (0) till go_thresh
acc (1) till plane

acc (1) till go
acc (2) till plane

0	instant
1	$(1)\sqrt{\frac{2\,d\_to\_go}{acc}} + \sqrt{\frac{2(1)(d\_hood)}{acc}}$
2	$(2)\sqrt{\frac{2\,d\_to\_go}{acc}} + \sqrt{\frac{2(2)(d\_hood)}{acc}}$

0 . . .

$time(i) = i\sqrt{\frac{2\,d\_to\_go}{acc}} + \sqrt{\frac{2i\,d\_hood}{acc}}$

total_time =

$[i]$

$0 = \frac{2i^2(d\_to\_go)}{acc} + \frac{2i(d\_hood)}{acc} - t\_total^2$

$a = \frac{2\,d\_to\_go}{acc}$ $\quad b = \frac{2\,d\_hood}{acc}$ $\quad c = -t\_total^2$

$$
t\_total = \begin{cases}
\geq, \; < & i\sqrt{\dfrac{2\,d\_to\_go}{acc}} + \sqrt{\dfrac{2\,i\,d\_car}{acc}} \\[2ex]
\geq, \; > & i\sqrt{\dfrac{2\,d\_to\_go}{acc}} + \left(t\_acc + \dfrac{(i\,d\_car) - d\_acc}{limit}\right) \\[2ex]
<, \; < & i\left(t\_acc + \dfrac{d\_to\_go - d\_acc}{limit}\right) + \sqrt{\dfrac{2\,i\,d\_car}{acc}} \\[2ex]
<, \; > & i\left(t\_acc + \dfrac{d\_to\_go - d\_acc}{limit}\right) + \left(t\_acc + \dfrac{i\,d\_car - d\_acc}{limit}\right)
\end{cases}
$$

d_acc — d_to_go

d_acc — i(d_car)

$$i A + t\_acc + \frac{i\,d\_car - d\_acc}{limit}$$

$$A + \frac{d\_car}{limit}$$

$$i\left(\min\left(\sqrt{\frac{2\,d\_to\_go}{acc}},\ t\_acc\right) + \max\left(0,\ \frac{d\_to\_go - d\_acc}{limit}\right)\right)$$

$$\min\left(\sqrt{\frac{2i\,d\_car}{acc}},\ t\_acc\right) + \max\left(0,\ \frac{i(d\_car) - d\_acc}{limit}\right)$$

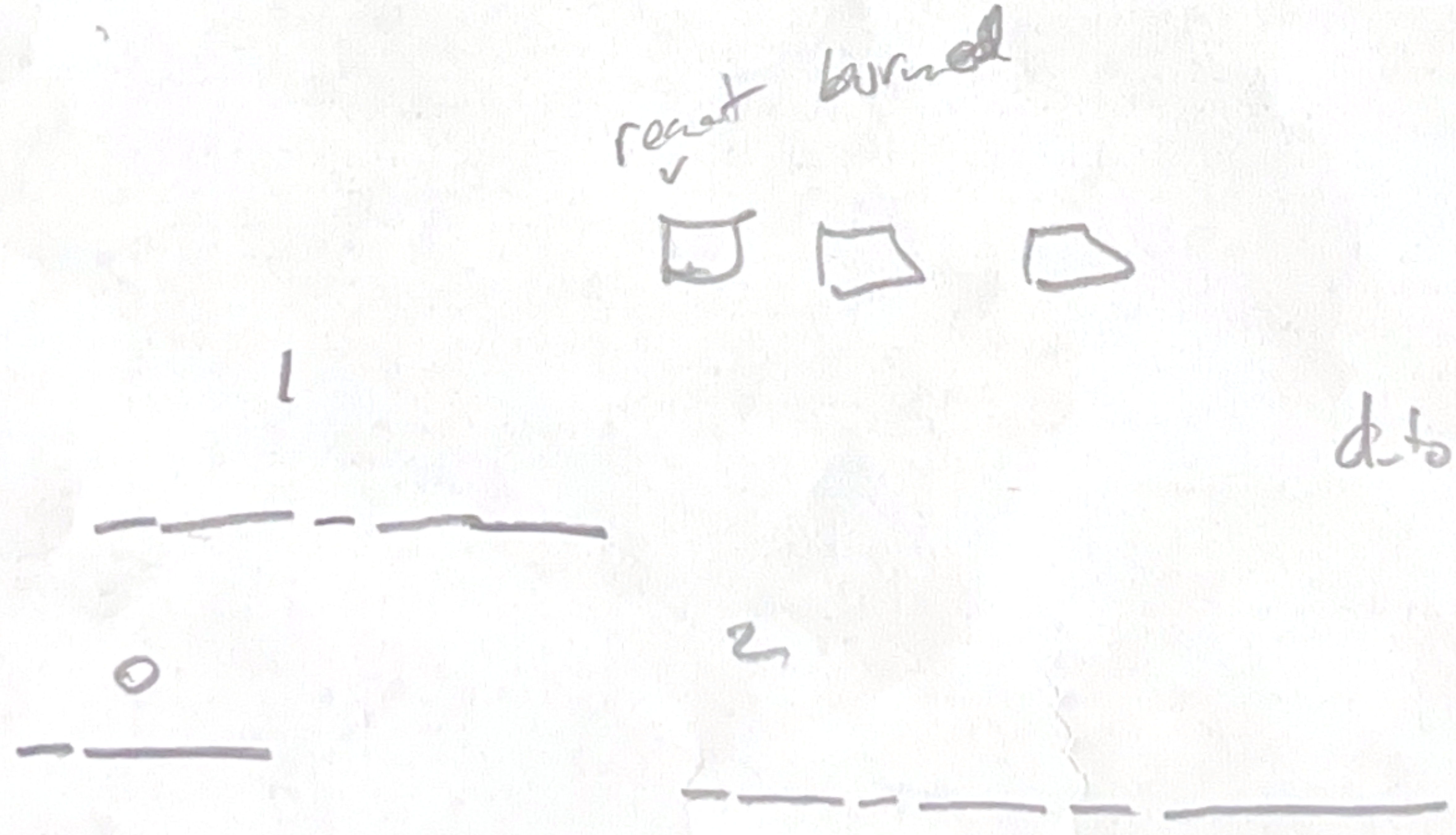
x starts 0 $t(x) = x\sqrt{\frac{2\,d\_to\_go}{acc}} + \sqrt{\frac{2 \times d\_car}{acc}}$

$t(x) = x\sqrt{\frac{2\,d\_to\_go}{acc}} + \sqrt{\frac{2 + d\_car}{acc}} + react$

$x \max\left(\sqrt{\frac{2\,d\_to\_go}{acc}},\ react\right)$

d_to_go	acc	d_car	t_total	limit
	t_acc		d_acc	
2	2	10	30	12
	6		36	

given i, what is time & cmp to total time



d_to_go - (

$>$ $<$ $a = \frac{2\,d\_to\_go}{acc}$ $b = \frac{2\,d\_car}{acc}$ $c = -t\_total^2$

$>$ $>$ $m = \sqrt{\frac{2\,d\_to\_go}{acc}} + \frac{d\_car}{limit}$ $b = -t\_total + t\_acc - \frac{d\_acc}{limit}$

$<$ $<$ $a = \left(t\_acc + \frac{d\_to\_go - d\_acc}{limit}\right)^2$ $b = \frac{2\,d\_car}{acc}$ $c = -t\_total^2$

$<$ $>$ $m = \left(t\_acc + \frac{d\_to\_go - d\_acc}{limit}\right) + d\_car$ $b = -t\_total + t\_acc - \frac{d\_acc}{limit}$

$0 = mx + b$ $x = \frac{-b}{m}$

$0 = ax^2 + bx + c$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$d\_acc \ \square \ d\_to\_go$

$d\_acc \ \square \ i * d\_car \Rightarrow i \ \square \ \frac{d\_acc}{d\_car}$

$$\frac{\frac{1}{2}\, acc\ t\_acc^2}{space + car\_len}$$