The basics of a sweepline alg
(eg, line segment intersection)

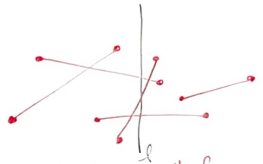
Two Pieces:

① Events

DS: usually a priority queue
- $\Theta(\log i)$ next / pop
- $\Theta(\log i)$ add new event, when there are $i$ events already

② Sweepline Status
→ what the sweepline stores

DS: usually ordered dictionary
- $\Theta(i)$ items stored,
- $\Theta(\log i)$ search/update




LSI: what are all of the intersection points?

⑦ Events are:
- start vertex } a priori known
- end vertex }
- intersections } added/removed on the fly.

② Stores line segment in order along $\ell$ (bot to top)

## INVARIANTS:

- p begins "below"/to right of all lines in $\mathcal{L}$ — $P_0$
- p ends "above"/to left of all lines in $\mathcal{L}$ — $P_1$

| CLAIM | Example |
|---|---|
| If $\exists$ vertex $v \in \mathcal{A}(\mathcal{L})$ to right of p, | there does! $x_0$ |
| then $\exists$ a rightward-facing $\Delta$ in UHT and p | $[y_1, y_2, x_4]$. $[y_4, y_3, x_6]$ right |

# Decrementing Fcns.

$f : SS \to \mathbb{N}$ (or any well-ordered set)

SS = state space

sidenote:
a well-ordered set is one such that every subset has a min. elt.
i.o.w. $X$ is well-ordered iff

$\forall U \subset 2^X, \quad \inf_{x \in U} x \in U$

example: $\mathbb{N} = \{0,1,2,\ldots\}$
$\mathbb{Z}_+ = \{1,2,\ldots\}$

non-example: $\mathbb{R}$
$\inf(0,1) = 0 \notin (0,1)$

such that
if $X_i$ is my state at the entering the loop for the $i$th time (or attempting to),
+ $X_{i+1}$ the state at $(i+1)$-st time

$f(i+1) \leq f(i)$

now, decrements each time through the loop.

try:
$f(SS)$ = max length of increasing path from $X_i$ to $X_f$ (the value being processed)