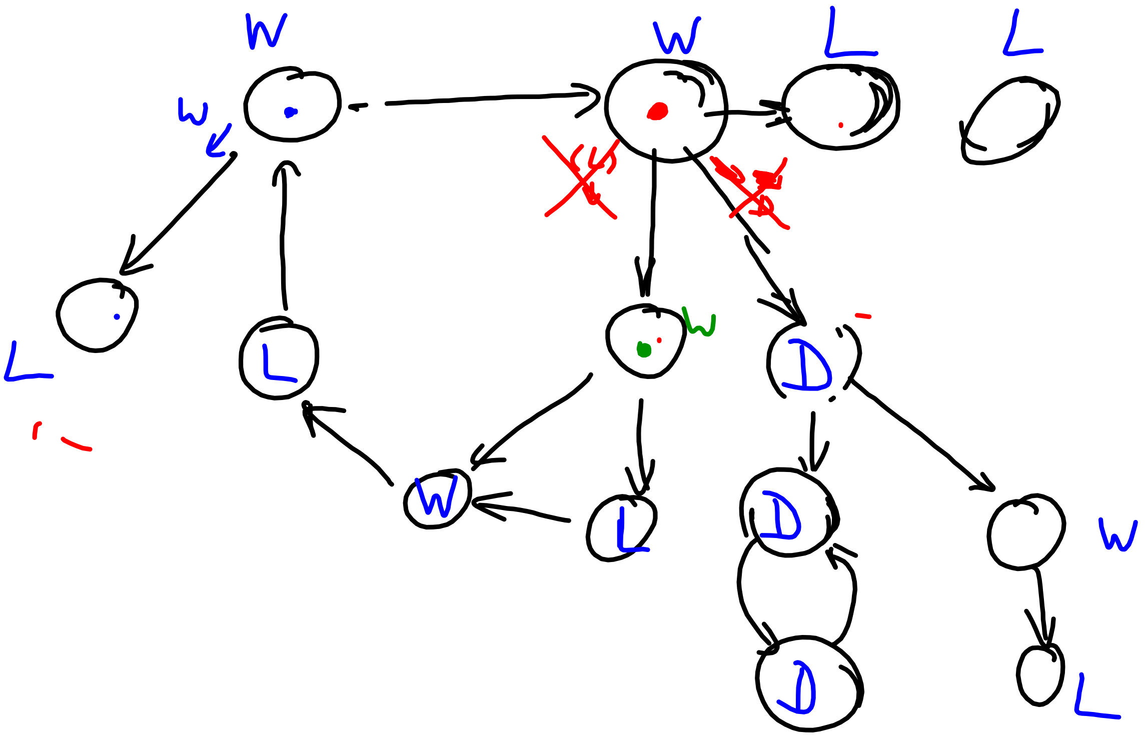
§.595

- Win-move games
- Ehrenfeucht-Fraïssé-games
  - mathematical logic
  - model theory, database theory

~ research of others 1970–200x

- pebble games

Jun 19-14:06



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- for each move
  - zero, one, or **more** possibilities where to go

Win(x)? ~ $\exists y$: move(x,y) $\wedge$ the other loses at y

lose(y)? ~ $\forall z$: move(y,z) → the other will win at z

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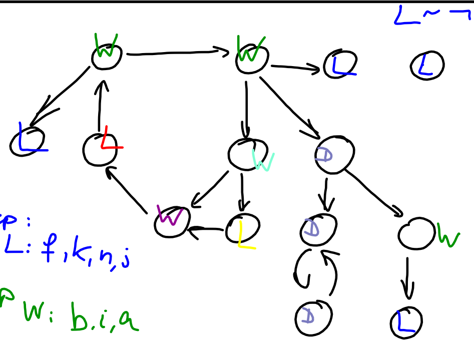
L ~ ¬W



1. step: L: f, k, n, j
2. step W: b, i, a
3. step L: e
4. step W: d
5. step: L: l
6. step: W: c
7. step: cannot derive anything

there are still some positions "open" "undefined": g, h, m

→ interpret the result:

- we know which positions are won
- " " " " lost
- the others are drawn

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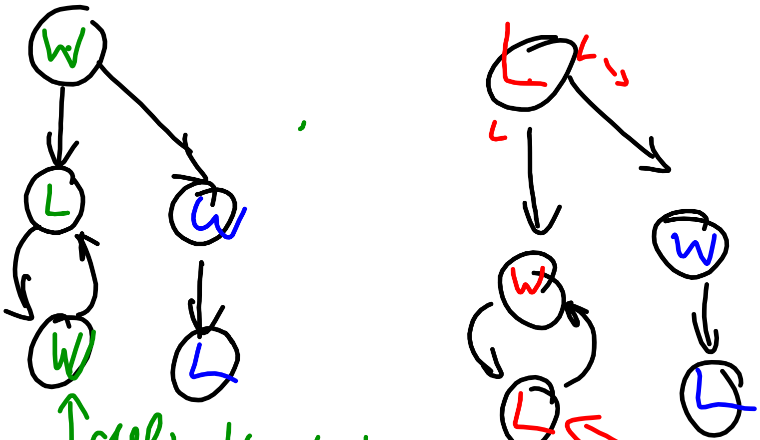
look on the right lower part locally:



↑ define this to be won, and the others are forced L/W

define this to be L then the others follow

$\Rightarrow$ 2 stable "models"

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FOL:

$$\forall x: \ win(x) \leftrightarrow \exists y: move(x,y) \wedge \neg win(y).$$

$\leftrightarrow \Rightarrow$ CWA

$$\forall x: \ win(x) \leftrightarrow \neg lose(x)$$

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after first step: $L(f)$
$L(k)$
$L(n)$
$L(j)$ known

means: $\mathcal{H}^-$ $\begin{cases} \neg win(f) \\ \neg win(k) \\ \neg win(n) \\ \neg win(j) \end{cases}$ are known

recall: Herbrand setting where $\mathcal{H}$ is a set of positive atoms

define $T_P^\omega(\mathcal{H}, \mathcal{H}^-)$ ......

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(*) f, k, n, j are known to be in $\neg win$

→ ground the program:

rule $win(X) :- move(X,Y), \neg win(Y).$

Consider all pairs of X, Y

X	Y
a	f
a	b
a	c
⋮	⋮
k	d

* $win(a) \leftarrow (move(a,f)$ ✓$)$, ~~not win(f)~~ ✓

~~win(a) ← move(a,b) ✓, not win(b)?~~

~~win(a) ← move(a,c), not win(c).~~

~~win(k) ← move(k,d) ✓, not win(d)~~

⇒ reduced ground program? P'
positive

↳ $T_{P'}^\omega$

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Current, non-recursive case:

Start with $\mathcal{H}_0 := \emptyset$

$\downarrow$

reduced $P'_{\mathcal{H}_0} \longrightarrow$ run $T_{P'_{\mathcal{H}_0}}(\emptyset)$ once

$\mathcal{H}_1 :=$

reduced $P'_{\mathcal{H}_1}$

$\downarrow$

$\vdots$

$\mathcal{H}_6$ stops.

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