solving  $6 \times 6$  hex



search space?

- $\bullet$  assume hex game ends with board .5 full
- $6 \times 6$ : about 4 e 14 such states
- proof tree, 8 black moves, 7 white moves, how many leaves?
  35 \* 34 \* 32 \* 30 \* 28 \* 26 \* 24
  20530298880 ≈ 2 e 11
- how to solve quickly?
- weak joins, strong joins, mustplay regions (blocksets)

- winning black 1st-player strategy: top-btm weak join (connection)
- winning black 2nd-player strategy: top-btm safe join
- **carrier** of a join is its cell set
- weak join: move, optionally with winning safe join(s)
- safe join:  $\geq 2$  weak joins s.t. interaction of carriers is empty
- each winning strategy: and-or expression (and-or tree)

solving  $6 \times 6$  hex



- run join-search algorithm to find small safe joins (bridge, 4-3-2, etc)
- play centremost main diagonal
- blockset size small (depends on join-search alg'm)
- e.g. with bridge, 4-3-2, and 5 other patterns, blockset size 1: see following slides
- resulting search tree small









white mustplay region (blockset)formed from intersection of3 previous black threatsets











white mustplay region (blockset) formed from 7 previous black threatsets











try move d3



![](_page_18_Picture_0.jpeg)

![](_page_19_Picture_0.jpeg)

![](_page_20_Picture_0.jpeg)

![](_page_21_Picture_0.jpeg)

![](_page_22_Picture_0.jpeg)

![](_page_23_Picture_0.jpeg)

## white mustplay region (blockset) formed from 6 previous black threatsets

![](_page_24_Picture_0.jpeg)

![](_page_25_Picture_0.jpeg)

![](_page_26_Picture_0.jpeg)

![](_page_27_Picture_0.jpeg)

![](_page_28_Picture_0.jpeg)

quickest win