How to index Clobber positions?

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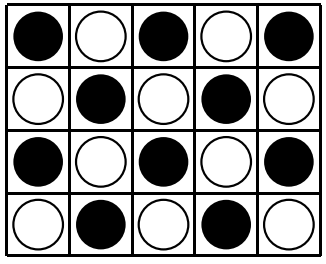
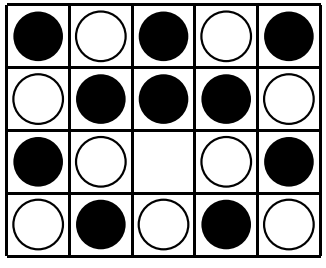
The game of Clobber

- Played by black & white on $m \times n$ board:



- Move is “clobbering” an opposing neighbour:



- Who can’t move, loses

Some properties

- The game is finite, loopless and has no draws
- If two groups of stones become disconnected, they stay that way. Hence, positions tend to fall into small pieces quite fast
- In each position, the players have exactly the same number of possible moves and almost the same number of stones $\Rightarrow$ reasonable position estimation functions are hard to find
- Clobber makes sense in higher dimensions, too

Clobber programming

- Due to property 2, we will face many small subpositions, many quite likely repeated
- It would take a lot of time if we would try to analyze equivalent subpositions many times
- Instead we could try to index the subpositions and their values
- How to do this efficiently?

Zobrist hashing

cell	black	white
A1	1010010100110101	1100101101010010
A2	0010110001101010	0101011000101010
. . .	. . .	. . .
B1	1110010110010101	0010110100101001
. . .	. . .	. . .

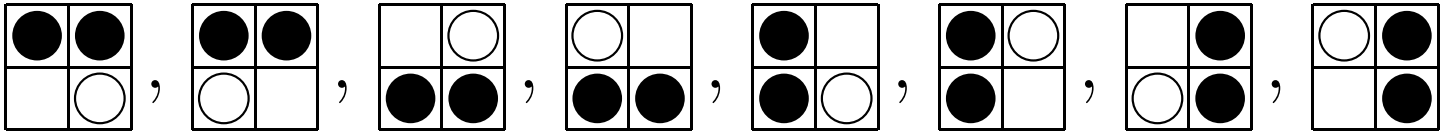
The values describing the position are bitwise XORed and the result is used as the hash key.

Zobrist: pros and cons

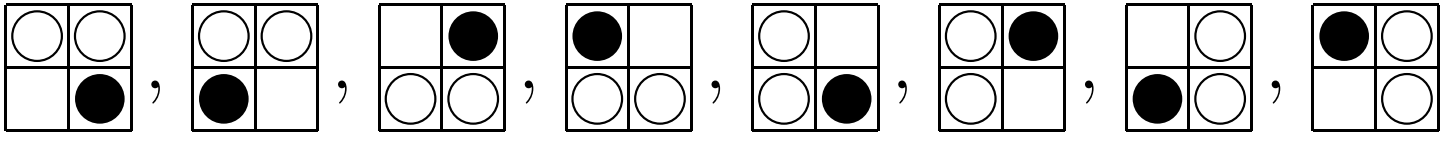
- Zobrist hash function is fast and its value can be easily updated for move-based games
- It is efficient if we want to determine repetitions of the whole positions (e.g. for chess)
- However, for games that tend to be divided to smaller subgames (Go, Amazons, Clobber), it is not very immediate how to generalize Zobrist hashing to subgames of unknown size and shape

Position symmetries

- Each position can have up to 8 reincarnations:



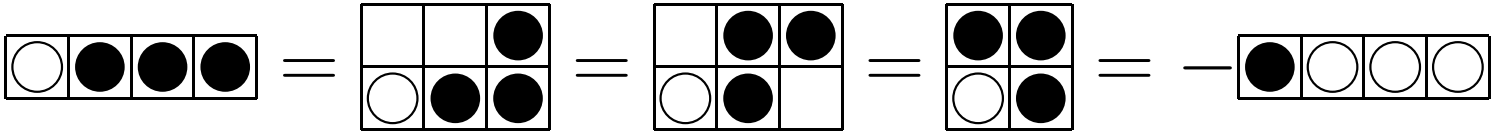
- . . . and 8 more from color exchange:



- For 3D Clobber, the number of symmetries increases to 96

It gets worse

- Note that



- We could do better identifying such positions as well

The Problem

- How to index Clobber subpositions so that
  - we could identify positions of different shapes and sizes,
  - we could recognize equivalent positions easily,
  - we could cope with the symmetries efficiently
- Have fun!