Home * **Board Representation**

Paul Klee, Überschach, 1937 [1]

A chess program needs an internal **board representation** to maintain chess positions for its search, evaluation and game-play. Beside modelizing the chessboard with its piece-placement, some additional information is required to fully specify a chess position, such as side to move, castling rights, possible en passant target square and the number of reversible moves to keep track on the fifty-move rule.

To begin with, we further elaborate on the pure data structures to represent the board and its piece-placement. There are piece centric and square centric representations as well as hybrid solutions.

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References

Piece Centric

A **piece centric** representation keeps lists, arrays or sets of all pieces still on the board - with the associated information which square they occupy. A popular piece centric representative is the set-wise bitboard-approach. One 64-bit word for each piece type, where one-bits associate their occupancy.

- Piece-Lists
- Piece-Sets
- Bitboards

Square Centric

The **square centric** representation implements the inverse association - is a square empty or is it occupied by a particular piece? The most popular square centric representations, mailbox or it's 0x88-enhancements - are basically arrays of direct piece-codes including the empty square and probably out of board codes. Hybrid solutions may further refer piece-list entries.

- Mailbox
  8x8 Board
  10x12 Board
  0x88
  Vector Attacks

Hybrid Solutions

While different algorithms and tasks inside a chess program might prefer one of these associations, it is quite common to use redundant board representations with elements of both. Bitboard approaches often keep a 8x8 board to determine a piece by square, while square centric board array approaches typically keep piece-lists and/or piece-sets to avoid scanning the board for move generation purposes.

Move Generation

With a board representation, one big consideration is the generation of moves. This is essential to the game playing aspect of a chess program, and it must be completely correct. Writing a good move generator is often the first basic step of creating a chess program.

- Move Generation
- Perft

Make and Unmake

- Incremental Updates
- Copy-Make
- Make Move
- Unmake Move
- Bitboard Update By Move

See Also

- Array of Nibbles
- Attack and Defend Maps
- Chess Position
- Chinese Chess Board Representation
- Graphics Programming
  Extended Position Description (EPD)
  Forsyth-Edwards Notation (FEN)
- Quad-Bitboards

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Up one Level