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Efficient Chess Board Representation: A Space-Efficient Protocol

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Abstract : This paper delves into the intersection of chess and computer science, specifically focusing on the efficient representation of chess game states. We propose two methods: the Static Method and the Dynamic Method, each offering unique advantages in terms of space efficiency and computational complexity. The Static Method aims to represent the game state using a fixedlength encoding, allocating 192 bits to capture the positions of all pieces on the board. This method introduces a protocol for ordering and encoding piece positions, ensuring efficient storage and retrieval. However, it faces challenges in representing pieces no longer in play. In contrast, the Dynamic Method adapts to the evolving game state by dynamically adjusting the encoding length based on the number of pieces in play. By incorporating Alive Bits for each piece kind, this method achieves greater flexibility and space efficiency. Additionally, it includes provisions for encoding additional game state information such as castling rights and en passant squares. Our findings demonstrate that the Dynamic Method offers superior space efficiency compared to traditional Forsyth-Edwards Notation (FEN), particularly as the game progresses and pieces are captured. However, it comes with increased complexity in encoding and decoding processes. In conclusion, this study provides insights into optimizing the representation of chess game states, offering potential applications in chess engines, game databases, and artificial intelligence research. The proposed methods offer a balance between space efficiency and computational overhead, paving the way for further advancements in the field.

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