**Introduction to Artificial Intelligence  
CA 3**

**Catherine Campbell  
x14428818  
BSHCYB4**

**Knowledge Representation**

**Square class,** allows each square to have a defined X & Y position on the chess board. This means it can find out if it has a piece on the square and what piece it is. This allows quick queries to be made of each square and then the square itself can decide if it can be moved upon.   
**Move class,** this extends the square class. This class takes the landing and start position on a square and defines it, using this is allows all pieces to be tracked for possible movements. Using this class allows the agents to evaluate the moves made, this eliminates the use of another data structure to evaluate the moves as the Move class already extends to do this.   
  
**Stack class,** uses the standard last-in, first-out principal. This means that objects contained in the stack can be added and removed using the principal. The reason we use the stack is because all possible moved that can be made by the AI agent can be stored in it.

**Logical Reasoning**   
**AI component,** looks at the board and decided what is the best move to make given the current positions on the board. Using the agents random move, score class next best move/greedy next best move and 2 levels deep this is the breakdown of the AI component we will be using.

**Random Move,** out of all the Agents this is the one that makes the use of the simplest way of make a choice. This AI Agent, doesn’t take into consideration if the move would be good or not because the move is generated randomly. Using the stacks, it selects one of the moves that is available and generates a number from random basing it on the stack size. With the number that was generated the AI Agent that uses it to correspond with a move that can be played.

**Score Class,** the score class influences both Next best move and 2 levels deep. This class gives each piece a value which is then used to determine the winner of the game.   
Values assigned by highest to lowest are;  
King - Winner (i.e in chess if you check the King you win)  
Queen - 9  
Rook -5  
Knight - 3  
Bishop – 3   
Pawn - 1

**Next Best Move**, this decision-making method, doesn’t take into consider ration what is happening on the board. So, it just takes the piece it can with looking around the board to see if it potential leaves a piece of its own that is considered a higher score open to be taken by the other player. Score class influences the Next Best Move. Although if in a turn there are no pieces to be taken and would leave all values equal. A move would be pieces using the highest scoring move and it would capture the piece that would give it the highest reward and the agent would try and take that piece when possible.   
For example; the black pieces are the AI and the white is the player. If the black queen is able to take a white’s pawn, not taking into consideration that in doing so allows the white to capture the black queen under Next Best Move the queen will take the white pawn and allow its queen to be taken even though it’s worth more than the pawn.

**Two Level Deep,** this is an extension on the Next Best Move. This AI agent considers all the possible moves and evaluates which is the best move to make. From there it evaluates what possible moves the opponent could make to the moves that the AI agent was considering. Two Level Deep’s goal is to give the greatest win to the AI and lowering the potential for losses for it. After both the AI and the players move have been done, the function called utility function then goes and picks the move that is the highest valued. Once this has been completed the stacks that contained the black and white potential moves is then emptied, as the chess board has changed state and potential moves that may have been used before become invalid.

# References

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