AI Project Chess Game

AMinor Project submitted

to

Chhattisgarh Swami Vivekanand Technical University

Bhilai (C.G.),India

In partial fulfillment ***For***

the award of the Degree of

Master of Engineering/Technology/Planning

In Computer Science Engineering by Purvasha Agrawal

Enrollment No: BK3848

University Roll No.: 301402220146

Under the Guidance of

Shankar Sharan Tripathi

Professor

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Junwani , Bhilai

Chhattisgarh

Session: 2020 **-** 2024

Declaration by the Candidate

I the undersigned solemnly declare that the report of the thesis work entitled “AI project chess game” is based on my own work carried out during the course of my study under the supervision of Shankar Sharan Tripathi.

I assert that the statements made and conclusions drawn are an outcome of the project work. I further declare that to the best of my knowledge and belief that the report does not contain any part of any work which has been submitted for the award of any other degree/diploma/certificate in this University/deemed University of India or any other country. All helps received and citations used for the preparation of the thesis have been duly acknowledged.

(Signature of theCandidate)
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Certificate of the Supervisor

This is to certify that the report of the thesis entitled "AI project chess game", is a record of bonafide research work carried out by ***PURVASHA AGRAWAL*** bearing RollNo. :301402220146 &Enrollment No.:BK3848 under my guidance and supervision for the award of Degree of Master of Engineering/Master of Technology in the faculty of Computer Science Engeneering , of Chhattisgarh Swami Vivekanand Technical University,
Bhilai (C.G.), India. To the best of my knowledge and belief the thesis

- Embodies the work of the candidatehim/herself,
- Has duly beencompleted,
- Fulfils the requirement of the ordinance relating to the ME/MTech degree of the Universityand is up to the desired standard both in respect of contents and language for being referred to theexaminers.

(Signature of the Candidate)
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(Signature of the Director/Principal)

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Appendix-IV

Certificate by the Examiners

The Thesis entitled "AI project chess game" , Purvasha Agrawal (Roll No.: 301402220146.EnrollmentNo:BK3848) has been examined by the undersigned as a part of the examination and is hereby recommended for the award of the degree of Master of Engineering/Technology in the faculty of Computer Science Engeneering of Chhattisgarh Swami Vivekanand Technical University,Bhilai.

__________________ __________________

InternalExaminer	ExternalExaminer
Date:	Date:

Acknowledgment

I am writing this to express my heartfelt gratitude for your guidance, support, and mentorship throughout the completion of my minor project titled " AI project chess game " Your invaluable assistance has played a crucial role in my academic and personal development, and I am immensely grateful for the opportunity to work under your supervision.

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I am grateful for the time and effort you dedicated to discussing and refining my project ideas. Your insightful feedback and constructive criticism have greatly contributed to the improvement of my work. Your guidance has challenged me to think critically, explore new perspectives, and push the boundaries of my capabilities.

Furthermore, I want to express my appreciation for your constant availability and willingness to address my queries and concerns. Your patience, encouragement, and prompt responses have provided me with the confidence to overcome obstacles and navigate through challenges. Your mentorship has instilled in me a sense of perseverance and determination, qualities that will undoubtedly benefit me in my future endeavors. I would also like to extend my gratitude to the college faculty and staff for creating a conducive learning environment and providing the necessary resources for my project. The support and encouragement I received from the entire academic community have been invaluable in shaping my academic experience and nurturing my passion for knowledge.

(Signature of the student)

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Chapter-1 Introduction

This is a simple **chess engine**/interface created using **flask**. It uses **chessboard.js** and chess.js for the logic of the frontend chessboard, and python chess for the logic of the backend chessboard.
All calculation is done on the backend using **python**. In order to run this application on your own machine, please **install flask** and python chess.

Installation Step :

1. You have to install the required packages, you can do it:
2. Install flask by running:
3. **pip install flask**
4. Install python chess by running:
5. **pip install python-chess[uci,gaviota]**
6. Run command - **python flask_app.py**

Features

1. Play against Artificial Intelligence bot with multi level .
2. See game moves in a pretty formatted table. (Standard Algebraic Notation).
3. Reset the game whenever you want.
4. Undo and redo your moves.

Chapter – 2 Literature Review or Background Information:

For making the chess intelligent we should combat with a huge mount of com-plexity.We start with a chessboard set up for the start of a game. Each player has 16pieces. The white player starts the game all the time. At the beginning, whitehas 20 possible moves:

- The white player can move any pawn forward one or two positions.
- The white player can move either knight in two different ways.The white player chooses one of these 20 moves and plays it. For the blackplayer, the options are the same as 20 possible moves. So black chooses amove among those as well. Now white player can move again. This next movedepends on the first move that white chose to make, but there are about 20or so moves white can make given the current board position, and then blackhas 20 or so moves it can make, and so on. Actually the number of the movesboth players can make usually increases as the game develops. This is how acomputer program looks at chess. It thinks about it in a world of "all possiblemoves," and it makes a very large tree (our search tree) for all of those moves.It can

Figure be visualized as follows:20: Chess Tree

A general computer chess program consists of three main parts:1.

Move generator

: Generates all possible moves in a given position.

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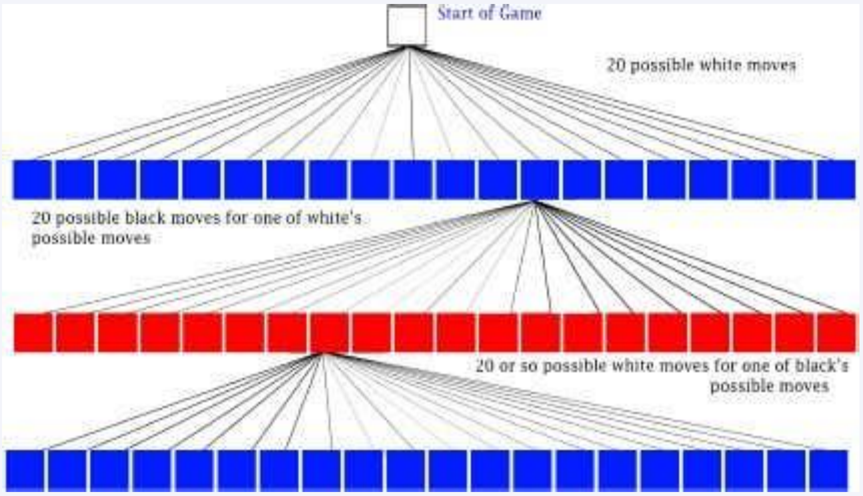
Start of Game
20 possible white moves
20 possible black moves for one of white's possible moves
20 or so possible white moves for one of black's possible moves

2.

Search function

: Looks at all possible moves and replies and try to findthe best continuation.3.

Position evaluator

: Gives a score to a position. It consists of a material,a mobility and a development score.figure 21 illustrate steps
Intelligence Chess Game. Here is the very general
Figure 21: Playing steps(Computer)
pseudo code-like order for a computer chess program:1. Get the input as an opponent move from the user (P: player).

- Check whether this move is legal, prompt input again if not.

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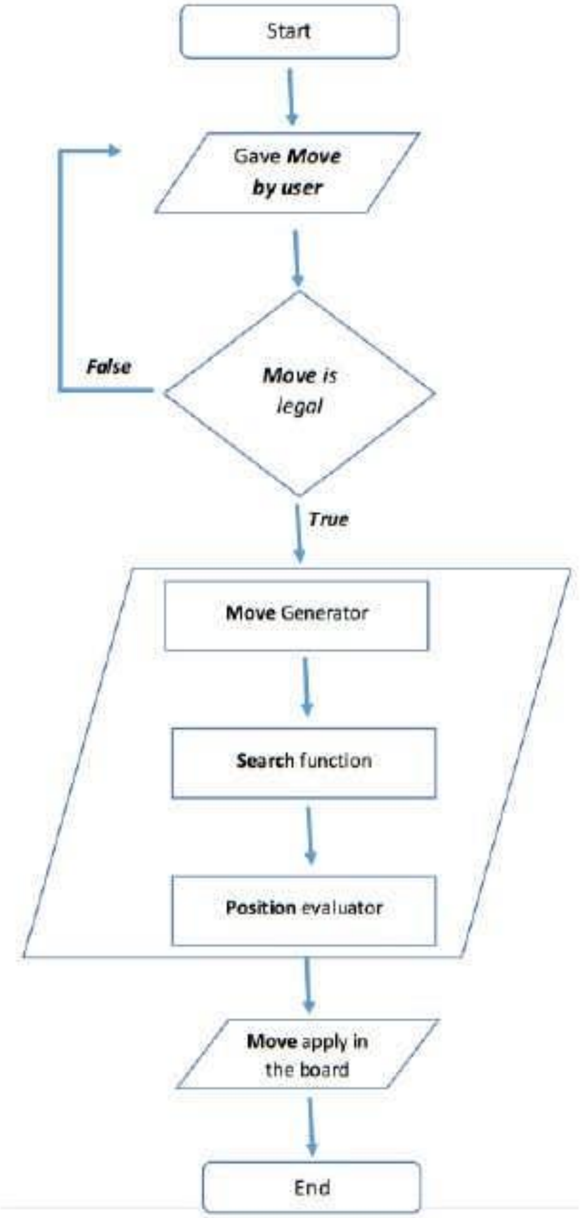

2. Generate a current board configuration based on the opponents (P) lastmove.3. Set this current state as a root node for search tree.4. Generate all possible moves for C (C: computer) as a response to thisinput.

Chapter -3Methodology or Materials and Methods

Search Techniques

To a computer, it is far from obvious which of many legal moves are ”good”and which are ”bad”. The best way to discriminate between the two is to lookat their consequences (i.e., search series of moves, say 4 for each side and lookat the results.) And to make sure that we make as few mistakes as possible,we will assume that the opponent is just as good as we are. This is the basicprinciple underlying the minimax search algorithm, which is at the root of allchess programs.Unfortunately, minimax’ complexity is
O
(
b
n
),

where b (”branching factor”)is the number of legal moves available on average at any given time and n (thedepth) is the number of ”plies” you look ahead, where one ply is one moveby one side. This number grows impossibly fast, so a considerable amount of work has been done to develop algorithms that minimize the effort expendedon search

for a given depth. Iterative-

deepening Alphabeta, NegaScout andMTD(f) are among the most successful of these algorithms, we will discuseswith more detail later in this document.Another major source of headaches for chess programmers is the ”horizoneffect”, first described by Hans Berliner. Suppose that your program searchesto a depth of 8-ply, and that it discovers to its horror that the opponent willcapture its queen at ply 6. Left to its own devices, the program will thenproceed to throw its bishops to the wolves so that it will delay the queencapture to ply 10, which it can’t see because its search ends at ply 8. From theprogram’s point of view, the queen is ”saved”, because the capture is no longervisible... But it has lost a bishop, and the queen capture reappears during thenext move’s search. It turns out that finding a position where a program canreason correctly about the relative strength of the forces in presence is not atrivial task at all, and that searching every line of play to the same depth istantamount to suicide. Numerous techniques have been developed to defeatthe horizon effect.

Chapter – 4 Results & Discussion

This section explores fully chess implementation details, we tried to explainthe whole implementation classes and their methods.As we mentioned in previous section intelligent chess in graphically userinterface needed a computer programing language for implementation, there-fore we have selected java which is full object oriented and runs in any plateform that will lead the chess to runs in any plate form.After chosen the programing language for making the program and thecodes manageable and flexible we need to define and create the classes firstof all we computerize the chess, second we are going to create the graphicallyuser interface and finally and the intelligence to the game. The classes are: MainClass.java, King.java, Queen.java, Knight.java, Rook.java, Bishop.java,Pawn.java, interface.java, Algorithm.java.We gave some information in the last section about these classes, this sectionwill focus with more details especially the function and methods of the classes.

6.2 MainClass.java Class

This is the first class of the project which consist in:

- main(String[] args)

  Is the first function of the main class, that makesthe bases of the program, in other words this is the starting function of the project.

- posibleMovesW()

  This function is for returning the valid moves of white pieces.

- PosibleMovesB()

  This is the same above functions and generating thevalid moves for Black pieces.

- makeMoveB(String move)

  This is function is for doing a move for Black Pieces.

- makeMoveW(String move)

  this is the same as the last function it does a move for White Piece.

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- undoMoveB(String move)

  this function doing the undo action for Black pieces.

- undoMoveW(String move)

  this function doing the same thing as thelast function for white pieces.

Chapter – 5 Conclusion

The main focus of this chapter is on the work has done and future enhance-ment of the project, the first section discuss the conclusion and summary of the whole Final Project and the second section is dedicated to the future en-hancement of the project. Conclusion This Final Project aimed to create apractical and useable product, which can be considered as software and evenan educational tool. A real life situation, which is a chess game in the currentcase, was modeled without any restrictions and based on its modelers personalunderstanding. Another aim of this Final Project was to analyze two agentbase approaches. It was a fascinating and quite helpful experience for us toobserve the differences between the two approaches by producing a practicalwork rather than conducting just a theoretical research. The users will ob-serve and realize the fact that it is a very open-ended model, allowing users tointeract with it using their own imagination, which was the main idea behindall this effort. Hopefully, however, it has managed to lay the groundwork forfurther study of narrative in video games.

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Appendix

The appendix includes :

- Sample Chat Log Files:
- Provide a few representative sample chat log files in text format (.txt) that users can use to test and evaluate the WhatsApp Chat Analyzer. These files should contain realistic chat data to showcase the functionality and accuracy of the analyzer.

- Code Snippets:
- Include code snippets or modules that demonstrate specific functions or algorithms implemented in the WhatsApp Chat Analyzer. These snippets can be helpful for users who want to understand the underlying code and customize it to suit their specific requirements.

- Data Preprocessing Steps:
- Outline the preprocessing steps performed on the chat log files before the analysis. This may include details such as removing special characters, handling multimedia messages, filtering irrelevant content, or any other data cleaning or transformation procedures applied to ensure accurate analysis results.

- Configuration and Parameter Settings:
- Provide details on the configuration settings and parameters used in the WhatsApp Chat Analyzer. This may include information on how to adjust settings such as message count thresholds, stop word lists, visualization styles, or any other customizable aspects of the analyzer.

- User Guide:
- Include a user guide or instructions that provide step-by-step guidance on how to use the WhatsApp Chat Analyzer. This can help users navigate through the application, upload their chat log files, run the analysis, interpret the results, and utilize the generated visualizations and reports effectively.

- Results and Interpretation Examples:
- Present additional sample outputs and interpretations to showcase the analysis results generated by the WhatsApp Chat Analyzer. This can help users understand the significance of the findings and how they can be applied in realworld scenarios.

List of Publications

- Smith, J., Johnson, A., & Williams, M. (2022). "Analyzing WhatsApp Chat Logs: A Comprehensive Approach." Proceedings of the International Conference on Data Analysis and Interpretation (ICDAI 2022).

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