**A Dissertation Report on**

**Online Multiplayer Chess Game**

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**Online Multiplayer Chess Game**

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**Submitted in fulfilment of the requirements for the degree of**

**BSC COMPUTING (SOFTWARE ENGINEERING)**

**The University of Northampton**

**2023**

1. **Introduction**
   1. **Dissertation Background**

Chess is a strategic and brain game that has attracted players for many years. There are many different tactical possibilities available while playing this historical battle on a square board with individual pieces. Due to the influence of technology and the internet, chess has not only survived but flourished in the modern era.

Chess has experienced exceptional growth in recent years due to advances in technology and increased online access. Chess has been transformed by websites like chess.com and lichess.org, which have opened it up to a worldwide fan base. Players of all skill levels can participate in thrilling matches on these platforms, analyze their games using sophisticated software, and interact with other chess players from across the world. Chess has been given new life by the digital revolution, which has changed it from a static, regional pastime into a vibrant, global activity.

My dissertation thesis is at the meeting place of software development and the gaming industry which takes center stage within this quickly expanding online multiplayer gaming ecosystem. The main goal of this project is to create a multiplayer online gaming platform that can accommodate the wide range of modern gamers' preferences. This system has several features designed to improve the gaming experience, including a user-friendly portfolio for tracking progress, simple multiplayer functionality with integrated chat, an effective rating system with leaderboards for competition, several gaming modes to suit different tastes, an advanced analysis tool for strategic improvement, and a variety of entertaining puzzles for entertainment and challenge. In a time when playing video games is no longer just for fun, my project aims to make an important addition to the field of online multiplayer gaming where strategy, social interaction, competition, and entertainment come together to rethink the future of interactive gaming.

We will go into the specifics of this software engineering dissertation as we delve into the field of online multiplayer gaming, looking at its design, development, and creative solutions for the gaming sector. We will explore the inner workings of this project in the upcoming chapters, breaking down its architecture, functionality, and practical applications. We'll see how technology has changed the gaming scene by making connections and challenges possible across borders. With this dissertation, i hope to promote understanding of the rapidly developing field of gaming on the internet and the important impact that software engineering will have on its future development.

* 1. **Aims and Objectives**

The project's goal is to develop an effective online multiplayer gaming platform that improves gameplay and creates a sense of community. The key aims include:

* Making the whole gaming experience better.
* Promoting online gaming interaction with one another.
* Utilizing analysis techniques to enable strategic improvement.
* Offering a range of game options.
* Maintaining fair competition with a strong rating system and leaderboards.

The project will carry out the following technical activities to achieve the aims listed above.

* Create a responsive and visually impressive user interface (UI) for gameplay using HTML5, CSS3, and JavaScript (JS).
* Use MySQL as the database system and Laravel as the framework for effective backend administration to ensure smooth user interactions and data management.
* Use WebSocket technology to provide real-time online matchmaking and chat features that allow for quick connections and communication between participants.
* Create and build an adaptive rating system that gives newly registered players initial ratings and uses statistical methods to change ratings in accordance with game results.
* Pairing players with similar skill levels, a rating system which provides fair matchmaking for proper challenging opponents in online games.
* Give players access to a variety of game modes and categories, including time-based games like blitz, bullet, and traditional variations within the online multiplayer framework, to improve the gaming system.
* Make interactive leaderboards that encourage players to improve their game and compete for the top places.
* Create a tool that allows players to carefully analyze their matches by integrating the Stockfish API.
  1. **Dissertation Methodology**

Agile is the software development methodology selected for this dissertation. It is an approach that emphasizes flexibility and customer participation throughout the development process and is highly adaptive and iterative. To provide continuous feedback, improvements to changing requirements, and active stakeholder involvement, it divides projects into tiny, manageable units known as sprints. Agile is well known for its benefits, which include the capacity to adapt quickly to changing priorities, reduce project risks through incremental project delivery, improve client satisfaction, and enable quick replies to feedback. It is essential to recognize the disadvantages as well, such as the decreasing importance of complete paperwork and its limited applicability for projects with predictable requirements. In-depth study of the concepts, benefits, and drawbacks of the Agile methodology's applicability as well as its impact on the creation of an online multiplayer gaming system will be provided in this dissertation.

Some advantages of agile methodology are listed below:

* Agile is flexible and adaptable, making it a good choice for projects that are dynamic and constantly changing.
* In Agile, incremental releases help detect problems early and address them quickly, lowering the chance of project failure.
* Constant engagement with customers encourages a collaborative environment, ensuring that the finished result closely matches the client's expectations.
* It starts delivering functional components early in the project, giving stakeholders a sense of concrete progress and early access to important features.

Some disadvantages of agile methodology are listed below:

* It can be difficult to keep detailed records of design decisions and requirements since agile promotes functioning software above detailed documentation.
* It is most useful for projects with rapidly changing requirements, for projects with fixed requirements, it may add unnecessary complexity.
* It can be resource intensive as it requires a large amount of time and effort investment from team members, stakeholders, and customers.
  + 1. **Software Requirements Engineering and Solution Specification**

This research equally focuses on three important techniques in the fields of Software Requirements Engineering and Solution Specification, interviews, study of comparable systems, task observation. To completely understand the project's requirements and objectives, it is essential to use all techniques mentioned here.

Advantages, Disadvantages, and proper justification for using these techniques are mentioned below:

|  |  |  |  |
| --- | --- | --- | --- |
| Technique | Advantages | Disadvantages | Justification |
| Interview | * Wide understanding of opinions from individual users. * Direct and interactive communication. * Allows clarification and immediate feedback. | * Limited to individual viewpoints. * Scheduling and conducting takes a lot of time. | Interviews are chosen as a requirement gathering technique due to its unique ability to provide in-depth and personalized insights directly from users. This approach allows for a proper exploration of individual perspectives, requirements, preferences, and expectations in system solution. It also encourages direct and engaging dialogue, allowing for quick explanation and feedback, which can greatly improve the quality of information gathered. Additionally, interviews provide a chance to establish a connection with customers, establishing an environment favorable to open and honest dialogues. |
| Comparable System Study | * Provides ideas of designs and best practices. * It can prevent possible system failure. | * Possibly won't address specific project needs. * Chances of not considering latest innovations. | Comparable system study utilizes established techniques which improve project reliability by accepting proven processes and best practices. This not only reduces risks but also offers a strong framework for carrying out projects successfully. |
| Task Observation | * Gives a direct understanding of system working mechanism. * Proper findings of inefficiencies and limitations. * Quick detection of problems | * Expensive in terms of time and resources * Regular tasks of users may be disturbed. | Task observation is an important technique for identifying the need to customize software to users' specific requirements, which makes the system more efficient and increases its usability. Investigators get essential insights into customers' regular operations, difficulties, and unique requirements through the careful observation inside their working environments. |

* + 1. **System Analysis and Design**
    2. **System Implementation**
    3. **Database Development**
    4. **System Testing**
    5. **System Evaluation**

1. **Requirement Engineering**

We are going through the detailed documenting of client interviews, task observations, and a comprehensive review of related systems in this section. By combining these efforts, we can ensure alignment with user requirements and industry standards by filling the gap between the features of our product with other comparable systems that were originally developed.

* 1. **Elicitation Activities**

The elicitation activities section of the report starts with interviews which serves as a foundational starting point. These interviews are important for gathering critical information from users, helping us to find useful insights into their needs, preferences, and expectations. In addition to interviews, we will also walk through alternative techniques such as task observation and a detailed evaluation of comparable systems. These activities work together to shape the software's fundamentals that ensure fulfillment of user expectations.

Mr. Nishedh Karki, an intermediate chess player with a rating of 1600 on chess.com, was interviewed. His experience is not just limited to a single chess platform, as he has experience of utilizing multiple other chess platforms like lichess.org and stockfish for skill enhancement. His thoughts and point of view towards variety of chess platforms were gathered which provided us proper understanding of user expectations and preferences in the field of online chess game.

* + 1. **Interview Plans**

Client: Mr. Nished Karki

Interview Date: Friday 22nd June 2023

Time: 01:00 to 03:00 PM

Location: Baneshwor, Kathmandu

|  |  |  |
| --- | --- | --- |
| Objective | Interview Question | Interview Answer |
| Motivation | How long have you been playing chess, and what motivates you to continue playing? | I've been playing chess since childhood, and it has always been a hobby of mine. Playing chess online has become my primary source of entertainment after exposer to the internet and technology. |
| Which platform do you primarily use for playing chess online? Is there a specific reason for choosing this platform? | I primarily use chess.com for online chess gaming. I wouldn't say there's any specific reason for choosing it, but I find chess.com very useful because of its extensive user base. The broad user community offers a wide variety of matches, which aligns well with my playing strategies and preferences. |
| Do you feel that the platform you use currently fulfills all your needs for online chess gaming? | The platform I use is sufficient for playing multiplayer online modes, although other features are very limited. As a free-to-play player, I would appreciate having access to more varieties of games within the same platform to enhance the overall gaming experience. |
| Platform details | Can you explain in detail about the most appreciated features of current platforms? | As a free-to-play user, I primarily engage myself in online multiplayer games, solving puzzles, use game analysis tools, and keep up with community updates of chess.com. These features contribute significantly to my overall experience and skill development. |
| Is there anything about your present platform that you dislike or find problematic? | While I appreciate using chess.com, its profit-driven approach has several negative impacts. Frequent advertisement and restrictions for free players are extremely irritating. Furthermore, the limitation of puzzle and game analysis tool frequently slow down my skill improvement. |
| How important is the user interface and overall visual experience on your current platform? Are there any aspects you particularly like or dislike? | User engagement is dependent on the user interface and visual experience. Chess.com has a user-friendly UI, although there is always room for improvement. The overall gaming experience is boosted because of its simple and user-friendly layout. |
| System limitations | Have you ever encountered any major imperfections or problems while using the current chess platform? | Yes, my biggest dissatisfaction with the existing system is with the game engine and the rating system. Traditional chess engines can fail to deliver accurate evaluation in important positions. Furthermore, players need to engage themself in large number of games to achieve the ratings they deserve. |

* + 1. **Interview Findings**

Mr. Nishedh Karki, a competitive chess player, provided excellent information related to real world of online chess gaming platform. His experiences and perspectives as a player who has been deeply involved in chess for many years have provided an in-depth knowledge of the motivations, preferences, and challenges that players face in the online chess community.

The interview findings clearly show his dissatisfaction with current system and would be very excited if we deliver a chess platform with following features:

* Chess platform with responsive and attractive UI design.
* Providing a wide variety of puzzle games that are unlimited.
* Strong analysis tool that can even outperform traditional chess engine.
* A platform with many supportive chess communities.
* A platform offering a wide variety of multiplayer modes online.
  + 1. **Comparable System Analysis**

Comparable System Analysis research was carried out by closely evaluating important platforms and software such as chess.com, lichess.org, and the stockfish engine. The study investigated the complexities of these systems to obtain useful information and benchmark against standard practices which can contribute to proper development of our chess platform.

* + - 1. **Chess.com**

Chess.com is one of the most well established and important sites for online chess gaming. It was founded in 2005 by two friends, Jay and Erik, who saw a need for a more reliable and feature-rich chess website. Chess.com has evolved rapidly since it was launched, and it is now a global hub for chess lovers. With over a decade of experience, it has evolved into an extensive platform that not only provides a gaming area but also promotes a strong chess community. We are having an in-depth review of Chess.com, evaluating its strengths and weaknesses to guide the development of our own chess platform.

Strengths of chess.com are listed below:

* Chess.com has a massive and interactive community which promotes a diverse and active group of chess players. This environment allows players to interact with opponents of a variety of skill levels, leading to a dynamic gaming experience.
* One of the strongest features of Chess.com is its vast teaching resources. From instructional videos and tutorials to articles and puzzles, the website provides players with the resources they need to further enhance their chess knowledge and abilities. This dedication to player development guarantees that users have access to useful educational materials.
* It conducts a variety of competitions and events on a regular basis, focusing to both casual and competitive players. These events not only give an environment for friendly competition, but they also serve as a tool for evaluating one's abilities on a stage, which gives a sense of belonging within the chess community.
* It provides a diversity of game variation along with time settings to meet the different needs of its user. Along with that, the platform enables a variety of playing styles, whether players choose a rapid blitz game or a more silent and long-lasting classical match.

Weakness of chess.com are listed below:

* Chess.com has some of the interesting and helpful features and many important functionalities, such as limitless game analysis and infinite puzzles which are only available for paid subscribers. This creates dissatisfaction among free-to-play users looking for a complete chess experience.
* It has been a long time since this platform has been established resulting in huge number of functionalities in current time making the interface very complicated for new players.

In conclusion, Chess.com is a major online chess gaming platform which having its specific strengths and weaknesses. The success of this platform is represented by its active community, educational offerings, and numerous gameplay possibilities. However, limitations in advanced features, interface complexity, and player portfolio management highlight significant areas for improvement.

* + - 1. **Lichess.org**

Lichess.org is an open-source chess server developed by donations and volunteers which is a popular chess platform known world widely. Thibault Duplessis founded lichess.org in 2010 with the goal of delivering a free-to-play chess experience to chess players all over the world. He started as a hobby project making this site an open source for anyone to read the source code or make any contributions. Today, more than five million games are played every day in Lichess remaining 100% free. This section conducts an in-depth review of lichess.org, finding its strengths and weaknesses.

Strengths of lichess.org are listed below:

* The main difference that lichess.org offers lies in being completely free and open source. This makes sure that all its features are available to users without any payments, restrictions, or advertisement. This strategy not only attracts chess players but also developers who want to contribute to such a platform.
* Even though it is completely free, this chess platform has an extraordinary set of features. A strong game analysis tool, a wide variety of chess gaming modes, and proper training tools are some of the features. It also provides an open API, which encourages developers to create chess-related projects.
* It has created an active chess community. Its lively forums, discussion boards, and chat tools encourage interaction among chess player giving them feeling of linked to a larger community of chess lovers.

Weaknesses of lichess.org are listed below:

* The status of lichess.org as a nonprofit organization can lead to many problems. Such problems include delays in the development of new features as it lacks strong financial support.
* The user interface of this platform is less visually appealing as compared to its commercial rivals. It requires more improvement in its appearance and usability for improving overall user experience.

In conclusion, lichess.org is a competitive online chess platform which has a good reputation for its dedication to open-source ideals and free access. Its wide range of features, active community, and commitment to fair play makes this platform a strong competitor. However, financial resources and user interface design are still under the area of improvement.

* + 1. **Task Observation**

This section investigates the findings from our observations of Chess.com, lichess.org, and the Stockfish chess engine. These observations will be helpful in finding the specifications for our chess project. We will gather important knowledge on user behaviors, platform functionalities, and the chess engine's decision-making processes by closely looking into the features and procedures of these platforms.

Some significant observation in online chess platform is mentioned below:

* Attractive User Interface:

Both chess.com and lichess.org have impressive user-friendly and visually appealing interfaces that significantly contribute to the online chess gaming experience. Chess.com has a simple design with clearly displayed chessboards, game controllers, dashboard and navigation making it very simple to use. It also provides a full range of tools and materials for improving chess knowledge. lichess.org, on the other hand, focuses on responsiveness and minimum design with the idea of offering a clean design that favors chess players. Users can customize their experience by choosing a variety of boards and pieces representing their taste. Both platforms' interface designs prioritize comforting user experience by giving quick access to important functionality which delivers a satisfying user experience.

* Well implementation of ratings

Both platforms have a strong dedication for well implementation of rating systems. The dynamic matchmaking algorithm between similar rating opponents is very impressive. Along with that the statistical algorithms for increasing or decreasing rating after each match completion ensures update in players rating.

* Working mechanism of stockfish

Observing how Stockfish chooses the best move and evaluates chess positions is an important part of knowing how it works. This task observation is carried out by running Stockfish in the command-line for information related to analyzing positions and moves with commands.  
  
Command for finding best move with specific depth and fen position in stockfish.

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Description automatically generated

Output generated by stockfish.

A screenshot of a computer screen

Description automatically generated

* 1. **Requirements Specification**
     1. **Problem Domain Description**

After conducting interview and a study of comparable systems following problem domains are identified:

* + 1. **Functional Requirements**
    2. **Performance Requirements**
    3. **Design Constraints**
    4. **Commercial Constraints**

1. **System Analysis and Design**
2. **System Interface Design**
3. **System Build and Technical Notes**
4. **Test Strategy**
5. **Conclusion**
6. **References**
7. **Appendix 1 – Project Timescales**
8. **Appendix 2 – Project Diary/Log**