Augmented Reality Chess Engine Interface

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***Abstract*—Chess is one of the most popular games in the world, yet there isn't a good way to analyze a physical board using a chess engine without either using an electronic board which relays all piece locations to a computer, a solution that will cost at minimum 100 dollars, or by inputting all the piece positions manually, a solution which takes quite a bit of time. Our solution is to use an augmented reality phone application to read the location of the pieces and then to show the user the recommended chess engine move by displaying it in AR over the board.**

***Index Terms*—Augmented Reality, Computer Vision, Chess Engine**

I. Introduction

This paper presents a novel approach to using augmented reality (AR) technology to enhance the chess-playing experience by displaying optimal moves in real-time. By overlaying the chess board and pieces with AR, players are able to visualize potential moves and strategies in a new and interactive way. Our approach will utilize computer vision and the open source chess engine Stockfish to analyze the current state of the game and suggest the best move for each player.

II. Methods

The proposed AR chess system utilizes a combination of computer vision to analyze the current state of the game and suggest optimal moves for each player. The system is built on the Stockfish chess engine, which will provide the chess analysis since creating our own chess engine is beyond the scope of this project, and this is augmented with AR technology to display the suggested moves in real-time.

Computer vision is used to detect and track the chess board and pieces in the physical environment. A camera captures the current state of the game and a image processing algorithm is used to detect the chess board and pieces. Once the positions of the pieces are known, this information is then passed to the chess engine which can analyze the current state of the game and suggest the best move for each player.

There are many reasons we are using the stockfish chess engine, the main reason is that it is the current strongest chess engine available [3] but it also has adjustable playing strength. Stockfish is also free and open source which will make integrating it much easier. Stockfish also does not require a powerful computer to achieve very good analysis, with even the versions that run in a web browser being stronger than any human player.

The AR display of the system is implemented using Unity3D game engine with the AR Foundation package included with unity and the XR Interaction Toolkit, also included with unity, for any additional interactions. The AR display shows the suggested move as an animation on top of the physical chess board. This allows the players to visualize the move in the context of the current game and understand the potential impact on the game.

Once we had an idea as to how we wanted to approach this problem, we created a kanban board on trello to keep track of our progress. [Figure 3] The designated team leader is Noah because he has the most experience developing for Augmented Reality. For the team leader rotation, it will be Noah during the first month, Alan during the second month and Mitch during the final month.

III. Results

When doing our literature review, we realized there is no cheap and easy way for chess players to analyze the current state of the board in real time and help you find the best possible current move. All current methods of analyzing the current state of the board either involve manually inputting the positions of every piece, having an electronic chess board which automatically inputs the current position of the all pieces into a website like chess.com which has Stockfish analysis boards, or require you to take a photo and upload it to a software like Stockfish that will analyze only the state of the board uploaded and not the real time state of the board. There is already a phone application called Chessify [2] that does this however it just displays the moves using chess notation which is hard to visualize and even harder to understand for beginners. [Figure 1] The crossover between chess and augmented reality is very slim, there is an app that allows you to play chess in AR [1] but does not analyze the game at all. After researching all the other options, we started to follow the design thinking process in order to develop the ideas and design for the app. The first step was empathizing, and this happened when looking at all chess apps. One of our group members recently got into chess and found that many of the Stockfish analysis boards were very hard to read. After this we followed the next step in the design thinking process which is to define the problem. We found that almost all chess analysis software would output in notation and that they had basically no visual way to understand the moves. The ones that would visualize the moves had the problem of having to manually input the moves, or requiring an expensive electronic board connected to a computer. After considering all this, we defined the problem as "There is no good app to analyze and visually display chess moves." The next step in

the design thinking process was to ideate. We brainstormed and had the idea of using augmented reality to visualize the moves. Once we had this, we moved on to the prototype stage and we made a quick mockup in photoshop [Figure 2] to get an idea of what the app could look like and to see if we liked the concept after seeing it. Once we had our prototype mockup to look at, we knew this idea had potential for further more detailed prototypes.

IV. Conclusion

Looking at our design process and literature review, we feel as though we identified a gap in visually displaying chess moves and analyzing the board as 1 solution/application. We have also found through prototyping that an Augmented Reality solution using computer vision could kill 2 birds with 1 stone, having both game analysis and a visual display of potential moves.

V. Appendices

Parts of this paper were written using Chat-GPT created by OpenAI

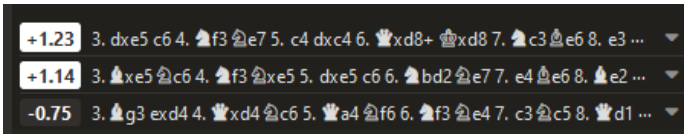

Fig. 1. What Stockfish outputs on typical analysis boards

Fig. 2. The mockup we made during the ideation step

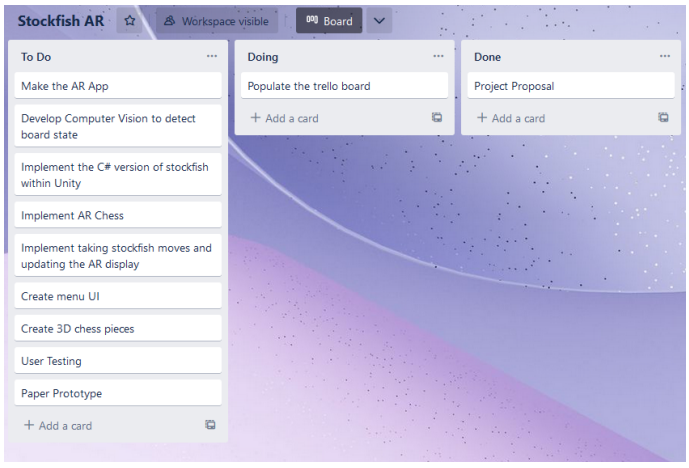

Fig. 3. The kanban board

REFERENCES

[1] ENSENA SOFT SA DE CV, "AR Chess", 2019, [Online] Available: "https://play.google.com/store/apps/details?id=com.ensenasoft.archess".

[2] Chessify, "Chessify", 2016, [Online] Available: "https://chessify.me/mobile".

[3] Chess.com, "Stockfish", [Online] Available: "https://www.chess.com/terms/stockfish-chess-engine".