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Immersive Experience of Chess using VR

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Abstract:- **The system which we aim to create is a VR game, which creates a cinematic and immersive experience for the player while playing a game of chess. The final game would be played on an Android smartphone.To experience the game in VR, player needs to use a VR Headset like GearVR, Google Day-dream-view.Our concept is basically a combination of the aesthetically attractive aspect of technology and the basic but intelligent game of chess, it is an android application which used wireless VR headset and a wireless VR remote as a controller of the game to immerse the players into the detailed and graphically created environment.**

1. INTRODUCTION

Chess is a game originated in India and has very little prominence and recognition in its country of origin, our concept tries to combine the aesthetically appeasing aspect of modern games and the positive effects of chess on the human psychology and create a video game that attracts younger audience and works towards their personal development and entertainment.

We aim to create a virtual real-time experience of chess on android in such a manner that is feasible and available for everyone in the spectrum of "smart-phone users". This will be made available with the design of our game in such a manner that it is ready to use with a cheap and readily available Google Cardboard and obviously can be used on an expensive VR Headset like GearVR.

Chess is a very engrossing and challenging game it has benefits like: It can raise your IQ

It helps prevent Alzheimer's, It exercises both sides of the brain, It increases your creativity, It improves your memory, It increases problem-solving skills, It improves reading skills, It improves concentration, It grows dendrites, It teaches planning and foresight. There is saturation in 2d arcade- style chess games on consoles, smartphones and computer but few manage to deliver it and present it in an aesthetically attractive manner, which fails to attract and occupy a user, many users get bored and do not continue to the game we aim to counter that by presenting the game in VR with an immersive experience which has not been done on smartphones.

The fundamentals of the project are that the user will be able to interact with the pieces on the 3D Chessboard with the help of a wired or wireless remote gotten along with the VR headset. If a VR headset is just for viewing like the Google Cardboard the app will also provide voice recognition so the user can provide the move with a combination of the piece to moved and the location to move to, the UI will be the usual Chess UI with move prediction and also the add-on of cinematic animation for the event of "piece capture". The project implementation will be in Unity3D.

1.2 PROBLEM STATEMENT

Chess Improves mental abilities but Most of the people don't know chess game & they don't understand how to play. To solve this problem we are using VR so that User can play chess game from anywhere and learn without feeling tired.Also they will definitely play with more interest with this system.The games market lacks an engaging and interesting chess game with an immersive experience we aim to make that with the help of VR in UNITY3D. Being able to use this application with any and every VR headset with or without a VR remote. Shifting the focus of VR games from stationery machines like the desktop computer and Gaming Consoles like PS4, XBOX ONE and making VR more accessible within a feasible budget.

Below [Fig 1]. show Mobile inside-out VR Tracking on phone :

Fig 1. Mobile inside-out VR Tracking on your phone

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2. LITERATURE REVIEW

Many researches have been done on different methods and Different Technique For Implementing VR Chess Game. Here, some of the prominent works done in this field are discussed.

2.1 Speech recognition based chess system for visually challenged

A typical chess board is created in which audio to text recognition is done corresponding to all the possible notations in a chess game.

The system's move is implemented using 2 algorithms and a comparison was made between the moves generated by both of these algorithms. The system's move is then converted to audio and played to the user.[1]

Here They are using Techniques And Algorithm :

- Min-max model
- Alpha-Beta pruning
- K-nearest neighbour
- Gaussian mixture model

SPEECH RECOGNITION

The proposed system used an isolated word recognition system where in the features of the speech signal are first extracted using which an acoustic model is created. The first step in the proposed system is to recognize the move that has been uttered by the user. This is done by using the speech recognition system. The process consists of two phases[1]

- Training Phase
- Testing Phase

Training Phase

First, input speech data is collected by recording the speaker's utterances using microphone.The training data should be recorded in wav format. The data corpus contains the possible notations in a chess game are as follows:

1, 2, 3, 4, 5, 6, 7, 8, A, B, C, D, E, F, G, H,

PAWN, BISHOP, ROOK, QUEEN, KING and KNIGHT

Utterances of the possible notations are recorded 100 times by each of the three speakers. Totally the corpus contains over 6900 wav files. The second stage of the training phase involves extracting Mel Frequency Cepstral Coefficients(MFCC) features from the recorded utterances. The feature extraction process has the following steps: Initially a pre-emphasis is used to boost the signal spectrum approximately 20dB/decade. As speech signals are quasi- stationary in nature, the speech signals are divided into 10- 20ms frames. Then hamming window is applied to increase the spectral estimate accuracy. By applying Fast Fourier Transform (FFT) the signal in time domain is converted into frequency domain. Mel filter bank is applied to obtain Mel spectrum upon which Discrete Cosine Transform (DCT) is applied to obtain Mel cepstrum. The amplitude of the cepstrum contains Mel Frequency Cepstral Coefficients (MFCC). The next stage, involves the generation of HMM models for each utterance. Generation of HMM models involves initialisation and
re-estimation of HMM models and which are done by using Baum-Welch algorithm.

Testing Phase

The testing phase involves, testing the system with varying number of voice samples: 20, 40 and 60. The accuracy obtained in each of these are noted. Also, the number of mixture components were varied accordingly. A move was classified as correctly recognized only if all the three components were recognized correctly. For instance, if the user utters "Knight F 6" and the system recognizes it as "Knight H 6" the utterance is classified as wrongly recognized. Only if all the three components are rightly recognized, the utterance will be accepted.

2.2 Comparing immersive virtual reality with other display modes for visualizing complex 3D geometry

This experimental research was aimed at determining whether or not immersive virtual reality (IVR) technology gives a user a measurable advantage over more conventional display methods when visualizing complex 3D geometry. Subjects were shown an abstract rod sculpture in a variety of display and display-control modes, and were tasked with assembling a physical replica of the sculpture they were visualizing. They were scored on the speed and accuracy with which they assembled their replica sculptures.[2]
Head-tracked immersive VR was shown to have a statistically significant advantage over joystick -controlled display modes, especially in the case where the displayed sculpture was shown in super -scale, surrounding the subject.
The Paper will show Difference of 3D Display Mode and VR ,where a human subject's ability to comprehend and generate an internal mental map of a complex 3D object could be measured. This would give us a way to quantitatively compare the visualization capabilities of one user interface against another.
3d TV does the same thing (sends 2 images) which also produces depth to the image. the difference with VR is that you are Immersed within the artificial environment. if something is behind you then you can turn around and look at it.[2]

Here They are using Techniques And Algorithm :

- 36 subjects were used, one for each permutation of sculpture order times each permutation of interface order.

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CONCLUSION

These experimental results probably reinforce the intuition of many VR researchers in the sense that the biggest advantage between immersive VR and the modes representing the "flat-screen" workstation occurred when the completed sculpture was presented in super-scale. That indicates that immersion helps the most when the *data* is in some sense immersive, when the natural way to visualize a set of geometry is to be surrounded by it. Aircraft CAD geometry can serve as a canonical example.[2]

2.3 Real-time VR Strategy Chess Game using Motion Recognition

Virtual reality(VR) is known as immersive multimedia or computer-simulated reality, is a computer technology that replicates an environment, real or imagined, and simulates a user's physical presence and environment to allow for user interaction. Virtual realities artificially create sensory experience including sight, touch, hearing, and smell. Owing to the use of a single device in most VR contents, user have difficulty in manipulating user interface and game object. And also immersion of the game goes down because they can't see the mouse and keyboard in virtual space.

In this paper, we design and implement the chess game to easily and accurately control user interface to improve the immersion in game.[3]

Here They are using Techniques And Algorithm :

- Unity3D
- C# Language
- 3ds Max
- Leap Motion
- Oculus Rift

CONCLUSION

Since the existing VR contents control the user interface with a keyboard or mouse, there is a problem in that users are uncomfortable in operation and cannot experience the VR technology satisfactorily by reducing the immersion of the game. In this paper, using motion-aware lip motion, you can manipulate a hand-shaped model like a user's hand in the virtual reality world, making it easier to operate, ease of use, and immersion, the core of VR content. A chess game was implemented to maximize the degree. In addition, since real-time games are possible through a network connection, you can experience virtual reality games with other players. Since motion recognition sensors are used as input devices for VR devices, they can be easily operated, and it is expected that they can be used for a lot of other content development as they increase immersion. [3]

4. ADDITIONAL FEATURES

- Using VR to give a 3-dimensional experience.
- Replacing the models of chess pieces with more humane bodily figures to imitate and give more realistic experience to user.
- Not only keeping these humane structured model to static position but also giving them free movements more preferably to hands and legs to eliminate piece like factor and give more over soldier like feeling.
- Remote Controlled as well as Voice Controlled .
- Solve The Frame Rate issues and resolution problems

5. PROJECT IMPLEMENTATION

The main concept for implementing the project is first creating game of chess for compatible machine. Then adding immersive and aesthetic looks to game to make it more realistic and fun to play. Third stage will be making game VR ready.

All these stages will be segregated in scripts. There will be separate 6 scripts for each piece movement and logic. One script for handling all pieces. One for aesthetics and adding immersive experience. Two scripts will be dedicated for making game VR ready and controlling in VR mode, and of above scripts will be handled by one manager script that is board manager.

The system which we aim to create is a Virtual Reality (VR) game, which creates a cinematic and immersive experience for the player while playing a game of chess. The final game would be played on an Android smartphone. To experience the game in VR, player needs to use a VR Headset like GearVR, Google Day-dream-view. Our focus is to bring a virtual real-time experience of chess on android in such a manner that is feasible and available for everyone in the reach of "smart-phone users". This will be made available with the design of our game in such a way that it is ready to use with less expensive and readily available Google Cardboard and obviously can be used on an expensive VR Headset like GearVR. Scope also include the possible functionalities which hare supposed to be provided by the developers/designers which are vaguely termed as follows :

1. Overlook of entire chess board while giving first person perspective.
2. Remote Controlled UI for more gaming favored Experience.
3. Effective use of animations and after-effects to keep user focused

Tools and Technology Requirement:

• Hardware requirement

- VR Gear [4]
- Android Smart Phone
- Earphones
- VR set Controller.

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• Software requirement
- Unity.
- Blender.
- 3D Max.
- Visual Studio (C#).
- VR plugins.

6. DESCRIPTION

Methodology :

Chessboard : It consist of the 8 X 8 grid of Black and White boxes in which we have W tag and B tag for the white and black boxes respectively. To track the moves of the player.

Game Objects: This consist of all the six characters of chess games with their moves as per the chess game rules and their unique animations n after effects with the moves.

Path Trace: It is a block to trace the path that is the ability of the algorithm to block the path and to allow the piece to move on the path as per the chess rules. This block will also consider all the special moves.

Player : It is a specific class made for a player to trace the moves and also to save the results of the game with the history of each and every moves and strategy made in the game.

Chess Game : Main Block which controllers all the blocks is this Chess game block where all the methods and the scripts with the appropriate game objects are linked with all the animations files and the controllers of the game. We can say that this block is the integrity module of the game.

7. RESULT AND DISCUSSIONS

Results and Discussions Following are some of our implementation results.

A. Spawn Chess Pieces

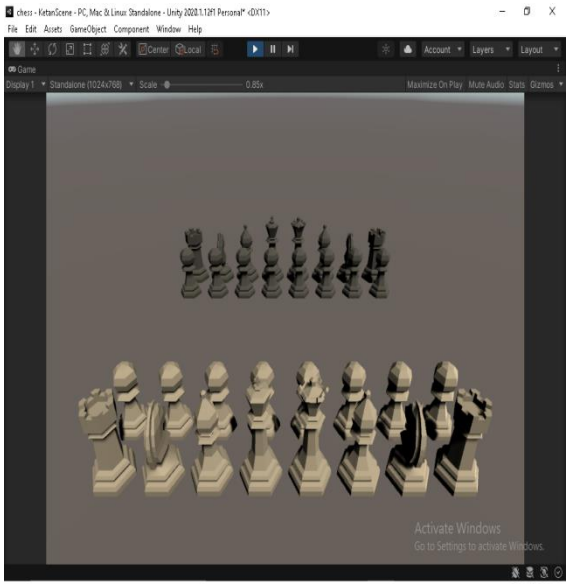

Fig 7.1 Spawn pieces

This is our first version of the game, In this image we have arranged all chess pieces on game scene.They have been arranged in the particular order according to chess rules[Fig 7.1].

B. Chess Board

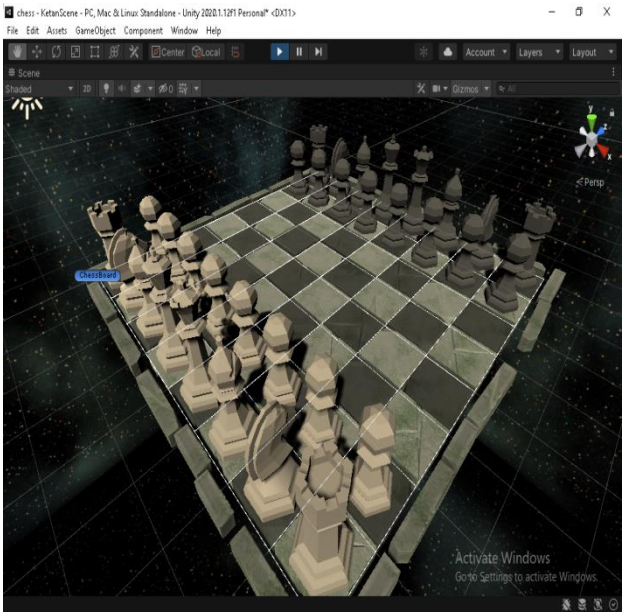

Fig 7.2 Chess board

In this image we have added the chessboard to game scene along with that it will manage the chess pieces and chess board simultaneously[Fig 7.2].

C. Unity Environment

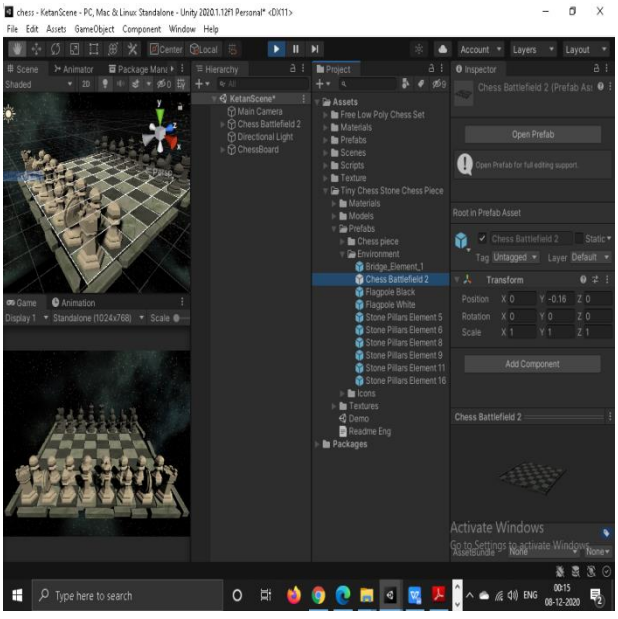

Fig 7.3 Unity Environment

The above image follows our unity environment[Fig 7.3].

D. Final Version

We are looking forward to give user the best experience with the best graphics and hence this will be the output of final version of game consisting of realistic feel and graphics.

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Multiple views which cover different angles are available in our game so that user can analyse the board positions and plan accordingly. These multiple views are very important as a chess player gets new ideas and baits for other player using these views.

Fig 7.4.1 Side View

Side views which shows how pieces are being developed for next moves. These view is very intresting as it can help you spot tricks from opponent which you might not get from default view.

Fig 7.4.2 White Piece View

The white piece view is the default view for white player and vice a versa is black piece view. This is most commonly used view while streaming but due to VR you will get the most enhanced experience through this view and you will feel like actually being involved in between pieces.

Fig 7.4.3 Top View

Top view shows the overall board and development of pieces in most effective manner. This view is best for audience as they can enjoy true contest of game from here.

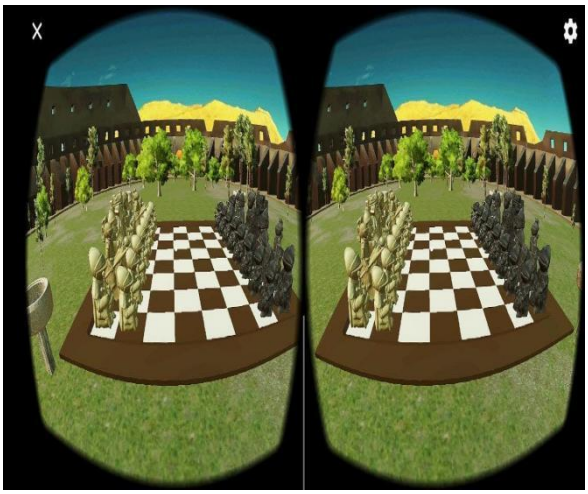

Fig 7.4.4 Mobile/VR View

Mobile/VR view which is basically welcome scene showing full board and stadium scenario.

8. CONCLUSION

Virtual reality gives a great exposure for Real time experience in a virtual world. It provides an immersive real time environment of the game by enabling user to have exciting experience of the game. Our VR Chess will allow users to experience a most booming field in technology as well as one of the most brain involved game to combine with each other and deliver unprecedented exposure.

9. FUTURE WORK

- Adding 8 Queen's problem to the game.
- Using VR to give 3-dimensional experience.
- Replacing the models of chess pieces with more humane bodily figures to imitate and give more realistic experience to user.
- Not only keeping these humane structured model

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to static position but also giving them free movements more preferably to hands and legs to eliminate piece like factor and give more over soldier like feeling.

- Remote Controlled as well as Voice Controlled.
- Solve The Frame Rate issues and resolution problems.

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