

DEVELOPING AN INTERACTIVE WEB BROWSER BASED GAME

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NATIONAL INSTITUTE OF TECHNOLOGY

CERTIFICATE

*This is to certify that the thesis titled “Developing an interactive web browser based game” submitted by **Abhay Srivastav (Roll No. 110ID0520)** and **Bharat Malik (Roll No. 110ID0609)** in partial fulfillment of the requirements for the award of **BACHELOR OF TECHNOLOGY** in **INDUSTRIAL DESIGN** at **National Institute of Technology, Rourkela** is an original work carried out by them under my supervision and guidance.*

The matter embodied in the thesis has not been submitted to any University/Institute for the award of any Degree.

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ABSTRACT

This project aims to develop an internet web browser based strategy game application. Strategy games engage the player for a long time and improve cognitive skills. This game application is divided into two sections. First section of game is virtual betting in which the user gets virtual money and uses that money to bet on real time sports. The money made in the betting section will be used in the second section of the game i.e. Business strategy game. This business strategy game is similar to the monopoly game in which user has to buy sections of the game and earn by renting it. To develop this web application we are using internet programming languages i.e. HTML, CSS, JavaScript, jQuery and PHP. The main aim of the game is to enhance users planning and thinking skills along with providing entertainment.

Various web platform games are available on the internet, and our game is also inspired from them. The virtual betting portion of the game focuses on the user's knowledge of the sports and their decision making skill and second portion i.e. business strategy game focuses on user's planning skills, budgeting their property and to make profit out of his property. We have tried to keep the user interaction simple and easy to understand as one has not to go many steps to accomplish a task in the game. A thorough study has been done and results from various paper related to web game user interaction has been included in our game. This is just the first model of the game, various possibilities exist for the future where we can extend the game. We have also planned to develop this application into a internet business where upgraded users have to pay real money to play the game and we'll provide attractive incentives to the winner of the game. This game will also be integrated with various social networking websites such as Facebook, so that we can amass a large number of players across the world. The main purpose of the game is to provide entertainment along with improving different cognitive skills. Such games attract a lot of consumers, who are eager to test their planning and decision based skills. Target users of the game are mainly school and college students along with interested adults.

We have coded the game using html, css, jquery & php and used Photoshop software for the graphic requirement of the game. Currently the game is available on Web platform, and we have planned to extend it to mobile as well as other game platforms.

Keywords: interaction design, online game, web games, strategy game, indian online games

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1. INTRODUCTION

An online browser game is a game which is played on internet using browsers. These browser games run using standard web technologies or browser plug-ins. such games usually involves use of standard web technologies as a front end and other technologies as a back end. Browser games include all video game genres and can be single player or multiplayer. Browser games are also portable and can be played on multiple different devices, web browsers and operating systems [1].

Standard web technologies such as HTML, CSS, PHP, and JavaScript can be used to make browser games, but these have had limited success because of issue with browser compatibility and quality. These technologies collectively termed dynamic HTML, allow for games that can be run in all standard-compliant browser [1].

As we advance in information technology, number of internet users are increasing day by day. In last few years, this number has increased significantly as people are being aware of the use of internet. Internet users like to gain information as well as keep them entertained by listening online music, playing online games, etc. A large section of the internet users like to play variety of online games. These games do not require any special requirement, any user can play such games using their internet browser.

Internet browser games have an advantage over Standalone games as they do not require any setup or special requirement on the players system. Browser games are easy to access and made short to provide entertainment and challenge to the user in as easy way as possible.

There is a large variation present in online games. Few examples can be shooting games, mathematical games, action games, puzzle games, strategy games, etc. But most of these games are developed by foreign countries' developers. So there is a lack of Indian theme based games in online game sector which lead us to take this project of developing an Indian theme game. Games to which users can relate, are more attractive and people like to play such games often. This project aims to fulfill such gap by developing an Indian theme based online game.

1.1 Problem Statement

In this era of information technology, internet has become an important aspect of human life. Day by day, number of internet users is increasing. Users like to gain knowledge off the internet as well like to keep them entertained by playing online games, listening music online, etc. There are number of online

games with lots of varieties available in them. Much of these games are not Indian games. To fulfill this gap, we are trying to develop an Indian theme based game.

So we arrived to the problem statement of this project as **to develop an interactive web based multiplayer strategy game targeting users' decision making and planning skills.**

1.2 Objectives

In order to develop a web based game, we analyzed various available games and picked strategy game to be our choice. Various strategy games are available on internet, among them, one is business strategy game, so we chose to develop an Indian theme based business strategy game commonly known as monopoly.

At the end of this project we aim to achieve following objectives:

- To develop the user interface of the game.
- To integrate user interaction in it.
- To develop and manage the back end of the game.
- To integrate game with social networking websites.

2. REVIEW OF LITERATURE

We started the project by referring to various online games and research papers on interaction design and game development. The results of the study is discussed as below.

2.1 Computer and Video Game History

Earliest online gaming started around 1969, but started to become popular around late 1970s and 1980s when Dial up bulletin boards became popular which was used by players to play online games.

Commercial online service was introduced in 1980s and interactive online games were introduced after that.

In the 1990s, with the introduction of Java and Flash technology, several online games were introduced based on these technologies. This gave a great boom to the online games.

2.2 A brief timeline of online games

Before developing the game, we looked into the history of online games. Online games trace their origin from year 1969 and are being updated till dated with various new concepts.

Here is a brief time line of the online games:

1969:

PLATO Internet Service offered a two player "Space War" game. By 1972, the game could host thousand players simultaneously.

1970 - 1977:

Many other multiplayer games introduced on the PLATO service.

1979-1980:

Essex University, U.K. hosted the first "MUD" online game on its system.

1982-1983:

Kesmai Corporation launched an ASCII role-playing game "Mega Wars" in 1983.

1983-1993:

Several games were launched as the online gaming gained popularity.

1994-1995:

Sony released its PlayStation and Nintendo 64 was launched.

1997:

Sony sold its 20 millionth PlayStation.

1998-2008:

Sony's PlayStation, Microsoft's X-box Live, and the Japanese company Nintendo create some of the world's most popular online games that attract an unprecedented number of new users to the world of online gaming.

2.3 The advantages of online gaming

Apart from the entertainment purpose that games are intended to provide. There are other benefits also which such games serve. Few such benefits are described below.

- **Realistic gaming experience**

In many online games, user plays against humans, rather than a computer, which provides more realistic gaming experience.

- **Educational benefits**

Several online games are there which focus on education. Playing this game provides pleasure as well as user learns in a fun way.

e.g. Mathematical games, Physics games, Online quizzes.

- **Relaxation**

Games are a great source of entertainment. People when stressed usually play their favorite games in order to escape from stress and to keep them relaxed.

2.4 Features of a good online game [2]

There is a large variation present in online games. Few examples can be shooting games, mathematical games, action games, puzzle games, strategy games, etc. But most of these games are developed by foreign countries' developers. So there is a lack of Indian theme based games in online game sector which lead us to take this project of developing an Indian theme game. Games to which users can relate, are more attractive and people like to play such games often. This project aims to fulfill such gap by developing an Indian theme based online game.

A good online game is one which engages users for a long time without boredom. According to a web article, following are the features of a good online game:

- A compelling and original concept
- Player support and community
- Great graphics and environmental diversity

- Good customer service
- Fun gameplay
- Add-on and mod support
- Built-in player-game matching service
- Content additions and refinements
- Ease of player interaction
- Accessibility
- Developer support of player feedback
- Control of cheating
- Challenge

A good game should pose a challenge to the users to think or react spontaneously. People like to solve challenging problems and are engaged in such activities for a long time. By accomplishing the task, user feel a sense of success.

- Feel

The overall look and feel of the game should fascinate the users. Look of the game should be interesting and not boring. The feel of the game includes graphics, presentation of the game.

2.5 Internet Sports Bettors

Internet sports gambling involves live-action betting (i.e., bets made on real time propositions about outcomes within a sporting event) and fixed-odds betting (i.e., bets made on the outcomes of sporting events or games).

The Harvard analysis of sports wagering found that the majority of bwin subscribers engage in moderate sports betting, with the median-level player making less than three sports bets of four euros (approximately \$5.25 in U.S. dollars) every fourth day.⁶ This study also revealed that new subscribers tended to adapt fairly quickly to betting online as evidenced by quickly developing declines in overall participation, number and size of bets. However, for the small percentage of individuals who are very involved in Internet gambling there might still be cause for concern.

Adaptation to online gambling was not uniformly apparent, particularly for live action betting. The authors recommend maintaining a focus on the impact of such games in future research[3]. Online gaming market in India has been growing in past few years. As more and more users are getting

access to internet presence of Indians on gaming site is increasing day by day. A study shows this growth as per depicted in Fig1. There is a clear indication in growth in Indian gaming industry.

Indian gaming market stats show that the gaming industry has increased its presence in the last few years. One such data is depicted in Fig.1.

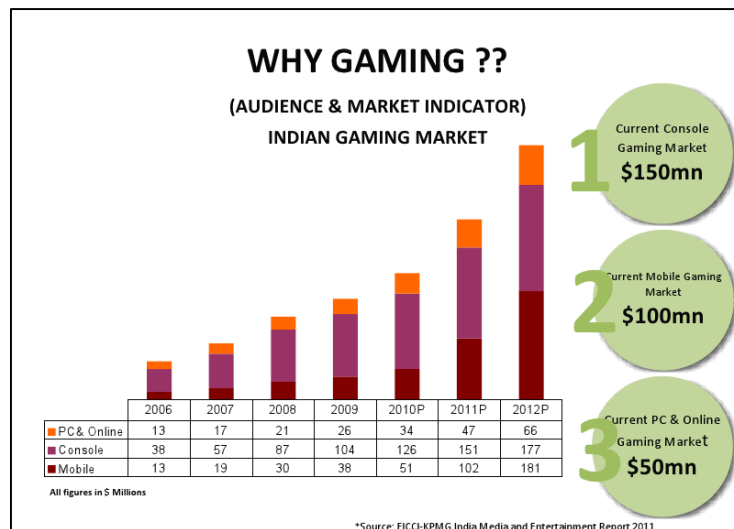


Fig.1 Indian gaming market statistics [4]

3. METHODOLOGY

We divided the whole process of game development into broad categories as depicted in Fig.2

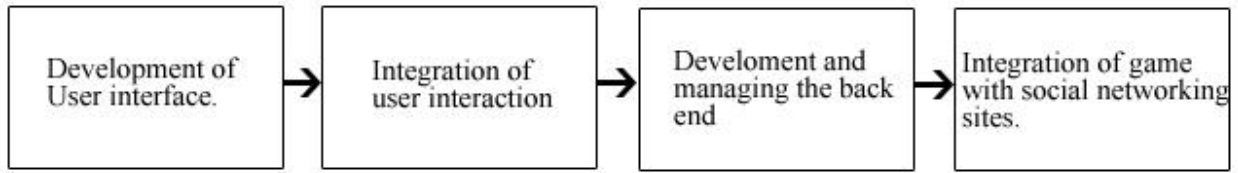


Fig.2 Steps in developing the application

3.1 Development of the user interface of the game

Whole game is divided in two sections i.e. Virtual betting and Business Strategy game.

3.1.1 Virtual Betting

When a user creates an account in our game website, he/she is given a specific amount of virtual coins which they can use to bet on the real live sports and based on the result of the game, they either lose or earn their virtual money.

Virtual betting interface requires display of the current games on which bets can be placed and an interactive method to place bets.

A thorough analysis lead us to the interface as shown in the Fig.2 for the virtual betting section of the game.

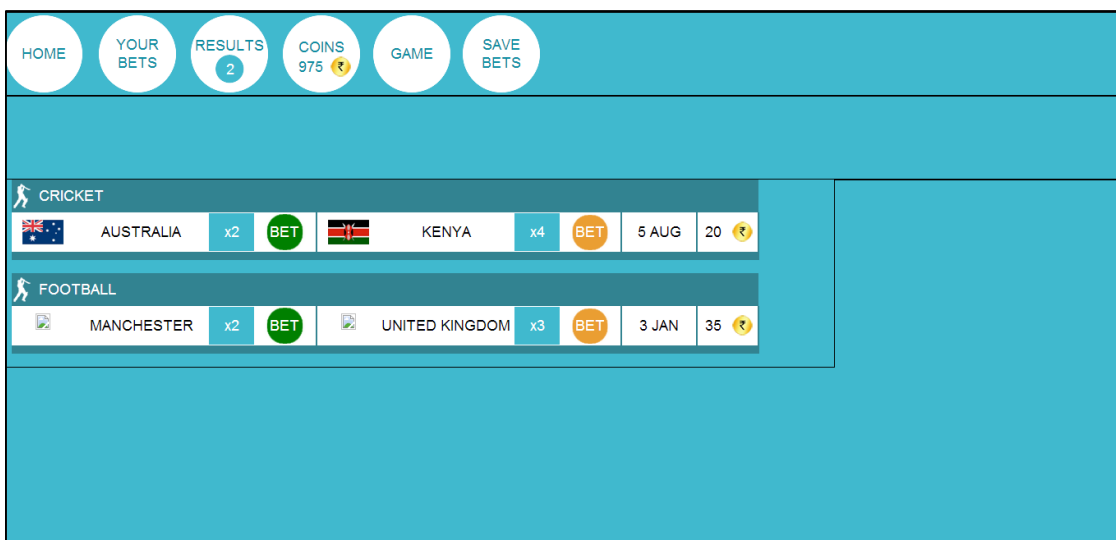


Fig.3 Interface of the Betting section of the application

3.1.1.1 Description of the interface

The whole interface is divided into various sections. Upper portion of the interface contains the menu buttons and lower section displays the main content of the matches and bets. Detailed description of the interface is provided below.

3.1.1.1.1 Menus

Menu buttons are used to navigate to various sections of the game like Result, Your current bets, home page. Following is the description of all menu buttons.

HOME – To view the current matches on which user can place bets.

YOUR BETS – On clicking this menu, you can view your current bets on the teams.

RESULTS – This menu shows, the results of the matches you betted on.

COINS – This menu displays user’s current virtual money balance.

GAME – This menu takes the users to the business game section if he has the sufficient coins.

SAVE BETS – This menu is clicked to finally save the bets.

3.1.1.1.2 Current games description section

This section displays the current matches description on which user can place bets in tabular form as shown in Fig.4.

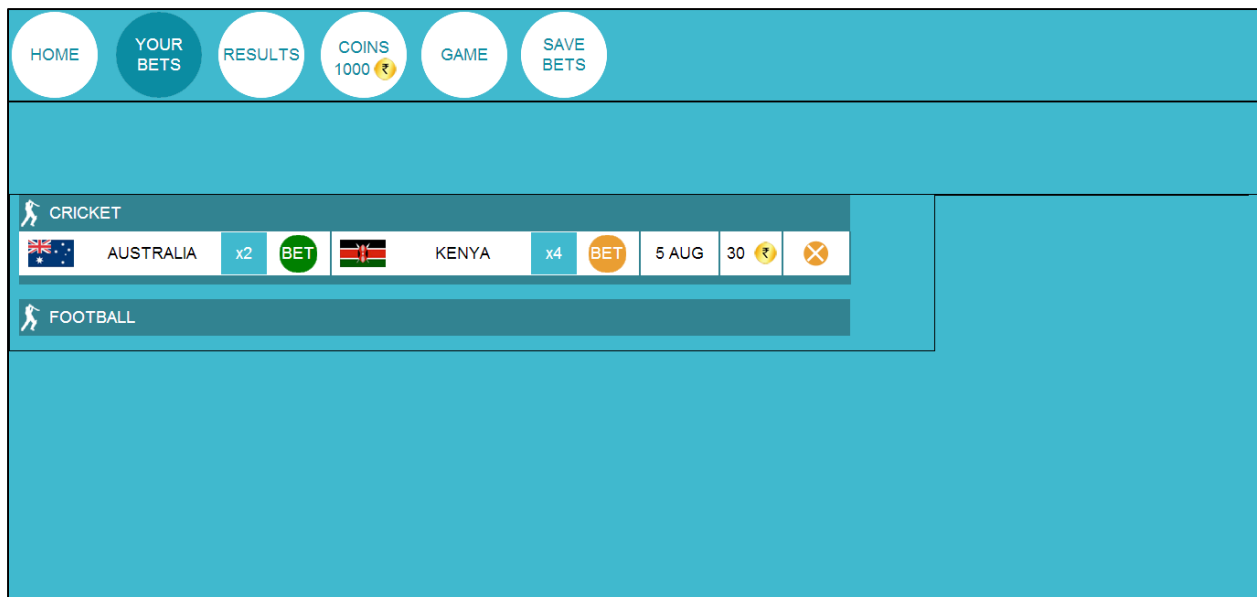


Fig.4 Your Bets menu

Each row contains information about the teams, their betting multiplier (how many times of bet, user will win if he places on that team), date of the match, betting button and the amount the user has placed on that match.

Result section of the game shows the betting results of the users' previous bets as shown in Fig.5.

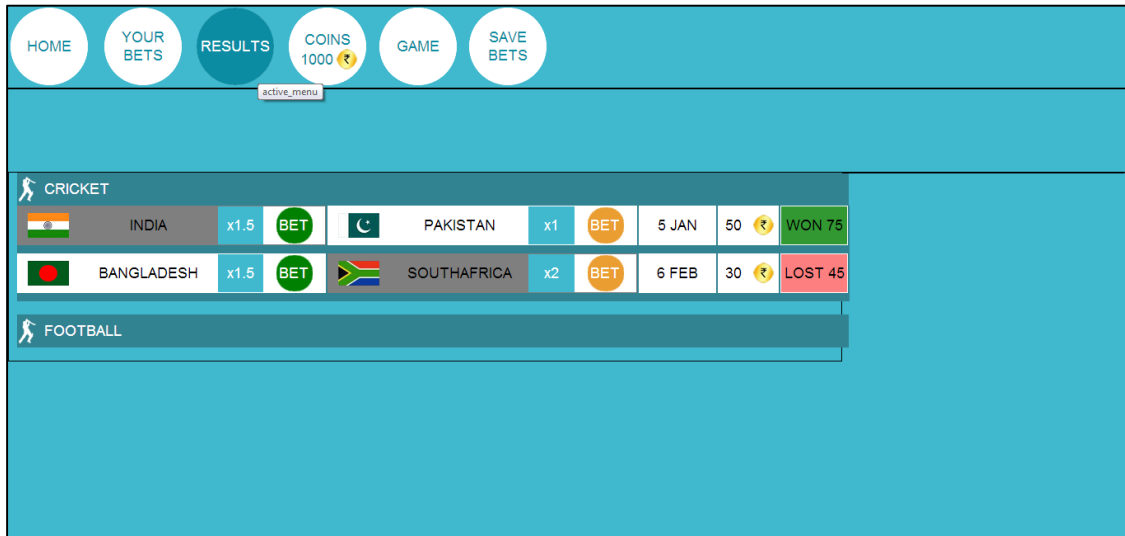


Fig.5 Results menu

3.1.1.1.3 Steps to place a bet

1. Click on the BET button against the team you want to place bet on

To place a bet on a match, user has to click the BET button against the team as shown in Fig.6 by arrow.

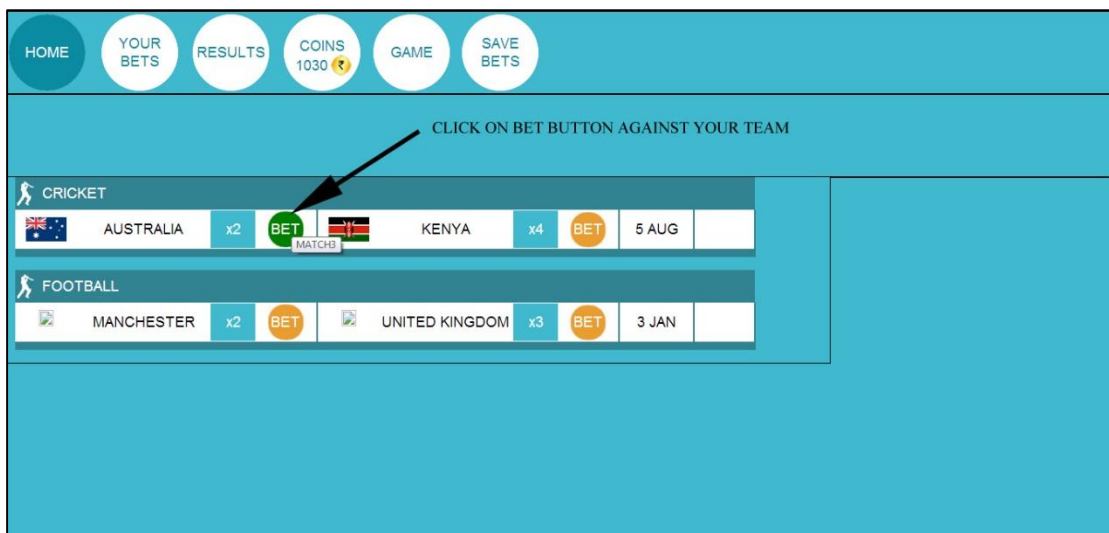


Fig.6 Step one in placing bet in the game

2. Enter the amount you want to bet

Once the user clicks on BET button, a bet dialog is opened, in which user has to enter the amount (coins), he wants to place in text box as shown in Fig.7.

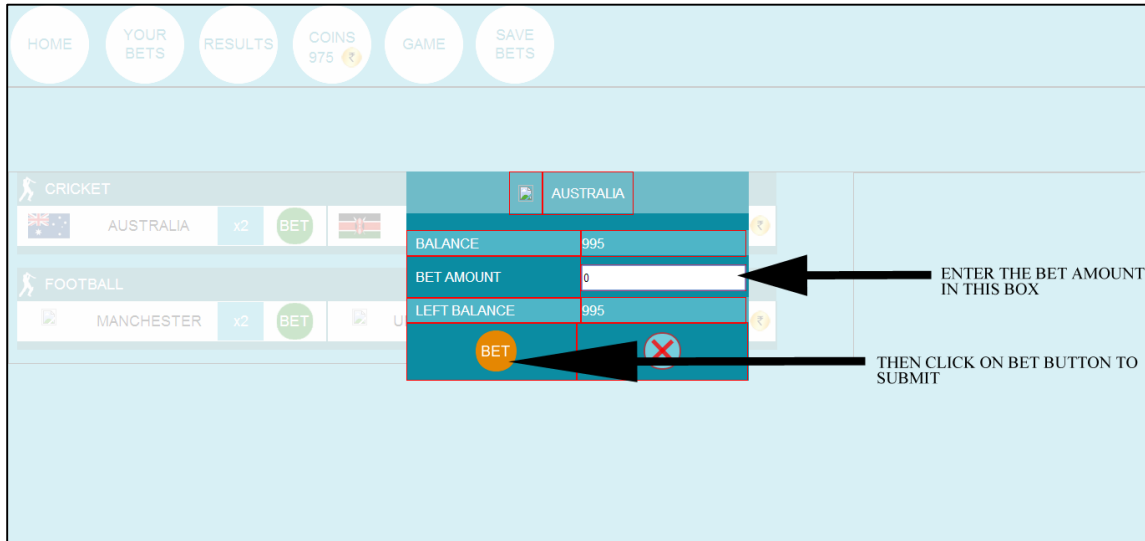


Fig.7 Step two in placing bet in the game

3. Bet is placed, now press on SAVE BET button

Once user has placed bets. He has to save the bets failing which would not save the bets and no changes will be done to the previous bets. To save the bets, user has to click on SAVE BETS menu button as shown in Fig.8

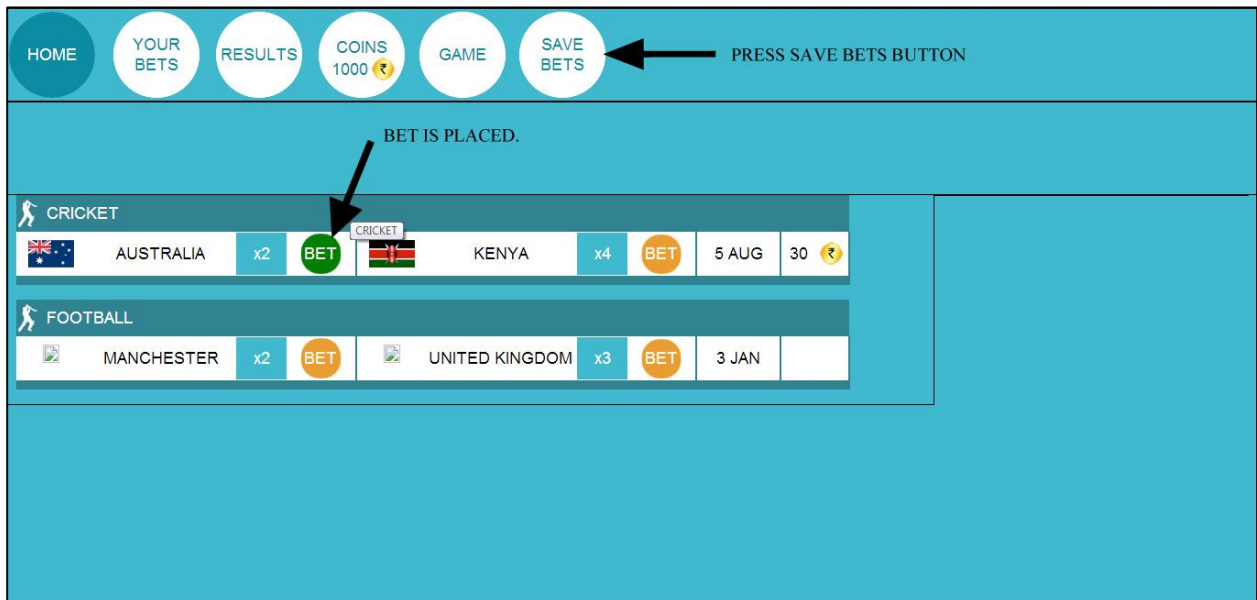


Fig.8 Step three in placing bet in the game

4. Saving Bet info is displayed

Once user presses the SAVE BET button, a saving gif is displayed showing saving process as depicted in Fig.9.

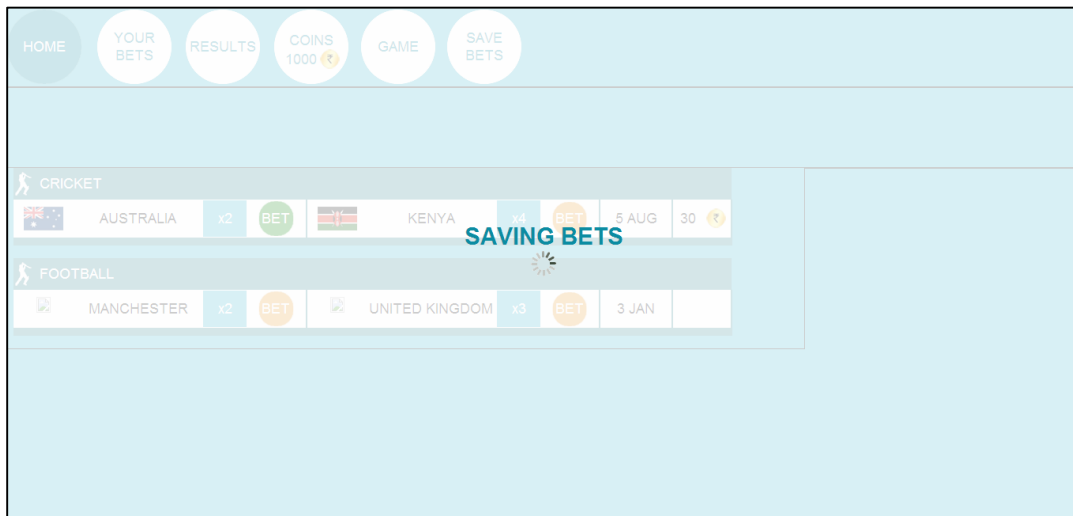


Fig.9 Step four in placing bet in the game

3.1.2 Strategy business game

To enter into this strategy game player need to have a minimum amount of virtual coins. Virtual money earned by the player in betting section is used here in this game to buy, construct property on the different plots marked on the game interface.

This is a turn based 2 player game.

3.1.2.1 Rules

As in every game, there are rules which need to be followed, our present game has set of rules which need to be followed, for the proper progress of game. These rules are as follows:

- First chance for rolling dice will be decided automatically at the starting of game.
- User has to roll dice and either buy or skip the block on his move within 1 minute.
- If user fails to roll dice, he is eliminated from the game and other player is automatically declared winner.
- Once the owner reaches his own block, he will be given an option of constructing property on that block of which he can retrieve rents apart from normal rent of the block.
- If player falls in the block owned by other player, he has to pay the rent as per the property of the owner on that block.

- There are 4 special blocks in the game namely CHANCE, JAIL, DISCOUNT CLUB, START. These have special rules which will be mentioned on the block itself.
- At the end of specified game time, the player with more assets will be declared winner.

3.1.2.2 Gameplay

Gameplay describes how the game proceeds with time. In our game, as it is a turn based game, each user turns the dice and proceeds the game by following instructions. Gameplay is described below.

- Player 1 rolls the dice and moves according to the number obtained on the dice.
- Player is offered a choice to buy or skip a block on the game. If the user buys, that block is owned by him or else he can skip.
- Now comes the turn of second player which then repeats the same above steps.
- If any of the player lands into the block owned by other player, he shall have to pay the rent for that block to the owner player.
- At the end of specified game time, player who has the highest assets in the game, is declared winner.

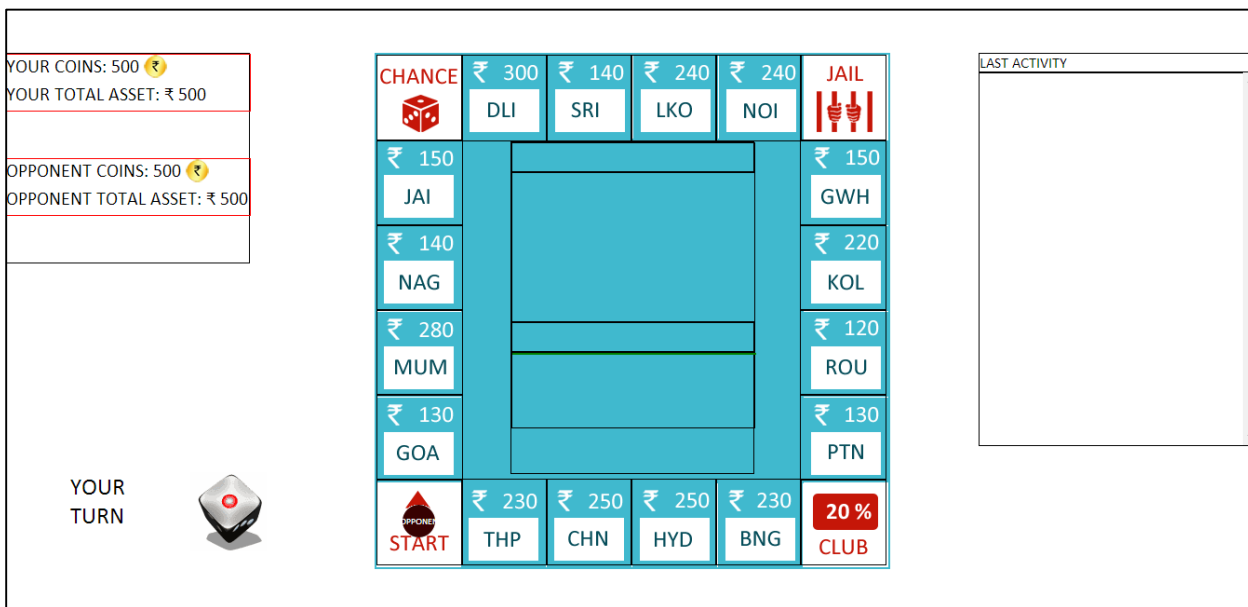


Fig.10 UX of the Business strategy game

3.1.2.3 Description of the Business game interface

Interface of the business game section has been divided into several parts, the middle section contains the board interface which is described in details below.

PLACE BLOCKS – 20 place blocks reside inside the main game interface, 16 of which are the city blocks that are related to major cities of India and 4 are special blocks which have their special rules.

SPECIAL BLOCKS – There are 4 special blocks in the game at each corner of the game square.

CHANCE – If player reaches this block with odd number on the dice, he loses 50 coins and if he reaches by even number, he wins 50 coins.

JAIL – If the player reaches this block, then he'll have options of either waiting for 2 turns or he can pay a bail of 100 coins.

DISCOUNT – If the player reaches this block, he'll get a discount of 20% on the next block he buys.

START – On each completion of round, user will be given a specific amount of money.

As the user reaches a block, a dialog is presented as shown in Fig.11.

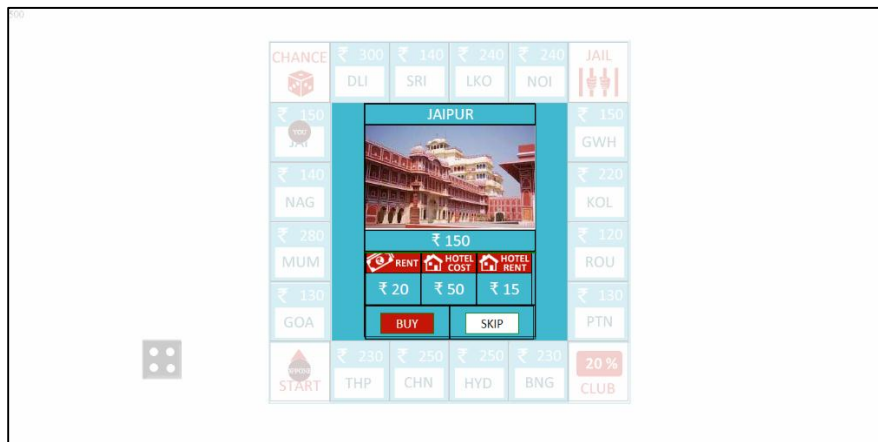


Fig.11 Buy or Skip dialog when a user reaches a block

Detailed description of the dialog box is depicted in Fig.12.

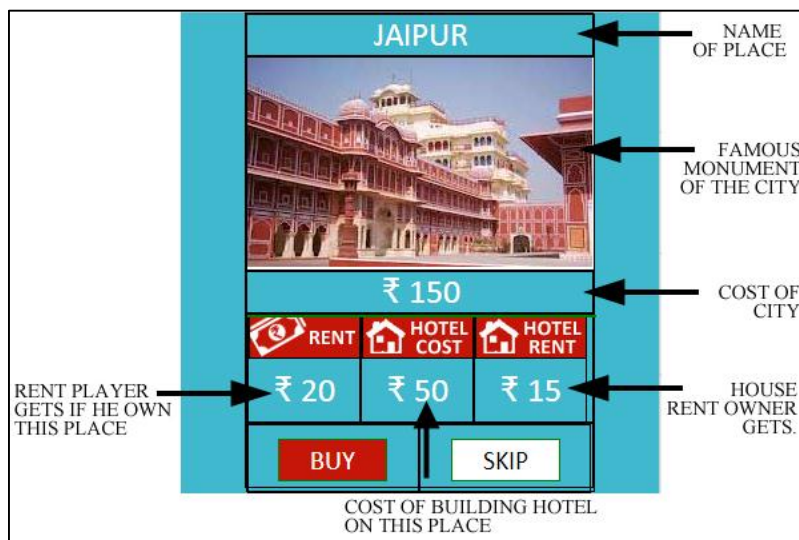


Fig.12 Buy or skip dialog detailed

3.2 Development of back end of the game

When a user rolls dice and buys/skips, this information needs to be sent to the other user, this is done by saving the user activity in a separate server and the server provides information of the player activity to the other player.

A simple illustration of the mechanism is Fig.13.

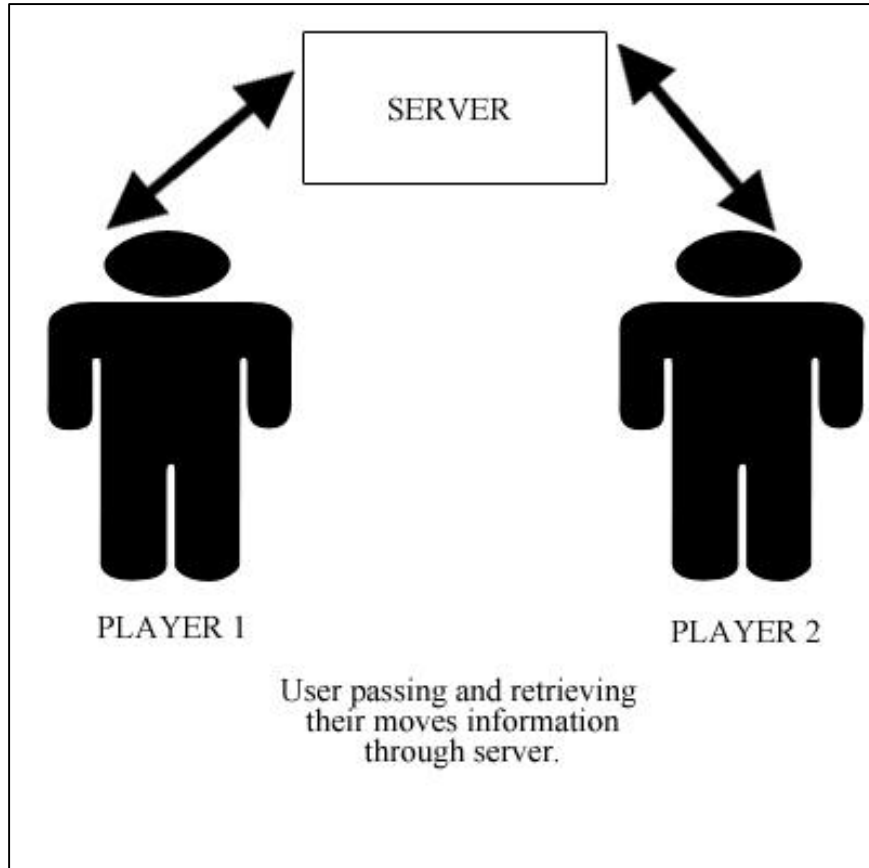


Fig.13 Data communication between Server and browser

3.3 Integration of game in social networking sites

User need to log-in using his social networking account.

Users' activities in the website will be displayed in the activity section of the user's social networking account.

This will help in increasing the reach of game and will attract new users

4. HEURISTIC EVALUATION OF THE INTERFACE

Heuristic evaluation is the technique of finding usability problems in a software application interface using heuristic evaluators.

According to renowned usability expert Jakob Nielsen, a “heuristic evaluation involves having a small set of evaluators examine the interface and judge its compliance with recognized usability principles (the ‘heuristics’)” [16].

Interface of the game as shown in Fig.14 is evaluated based on heuristic approach.



Fig.14 Interface to be evaluated using heuristic technique

4.1 Heuristics used for the evaluation

Heuristics are the general usability standards for an interface. Heuristics used for the present game interface evaluation is listed below:

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall

7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

4.2 Usability problems

The usability problems found in our evaluation of the interface by user surveys and testing are

1. Lack of instruction for new users.
2. Save bet alert while closing the application not available.
3. Inconsistencies between menu buttons and their functions.
4. Lack of information while doing some task.
5. Separate WON and LOST bets details in results.
6. Background of the application is not aesthetically pleasing.

#	Problem	Severity Ranking	Ease of Fixing	Heuristic Number	Broad Heuristics
1	Lack of instruction for new users	4	2	#10	Help and documentation
2	Save bet alert while closing the application not available	3	0	#1, #6	Visibility of system status, Recognition rather than recall
3	Inconsistencies between menu buttons and their functions	3	1	#4	Consistency and standards
4	Lack of information while doing some task	2	1	#7	Flexibility and efficiency of use
5	No distinction between WON and LOST bets in results	0	2	#7	Flexibility and efficiency of use
6	Background of the application is not aesthetically pleasing	0	0	#8	Aesthetic and minimalist design

Table 1 Heuristic Evaluation of the application interface report

4.3 Usability problem details

Each of these usability problems are categorized and appropriate solution has been suggested which are described below.

1. Lack of instruction for new users.

No specific instructions available in the application for a new user. User is totally bewildered, and clueless about the functioning of the application, when he uses it for the first time.

Solution

An interactive step by step instruction should be included on the first visit of user which will help him to get familiar of the function and interface of the application.

2. Save bet alert while closing the application not available.

User has to save the changes he makes before leaving the application by clicking on SAVE BET menu button. But no specific alert is available to guide him on exit.

Solution

A dialog box as shown in Fig.15 with option to save the bet should be presented before exit of the user.

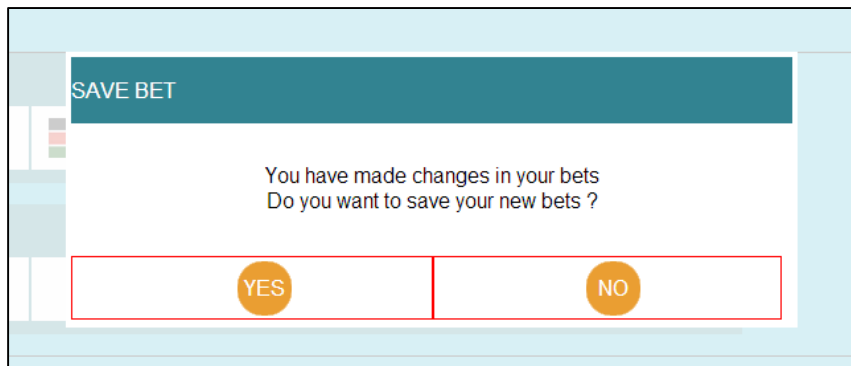


Fig.15 Dialog box to allow user to save bet before leaving the application

3. Inconsistencies between menu buttons and their functions.

Clicking on HOME menu button presents the current matches on which bets can be placed. User expects to reach to the main home page as he opens the first page.

Solution: A separate menu button e.g. CURRENT MATCHES as depicted in Fig.16 should be provided for displaying current matches. And HOME button should take the user to the very first page of the game.

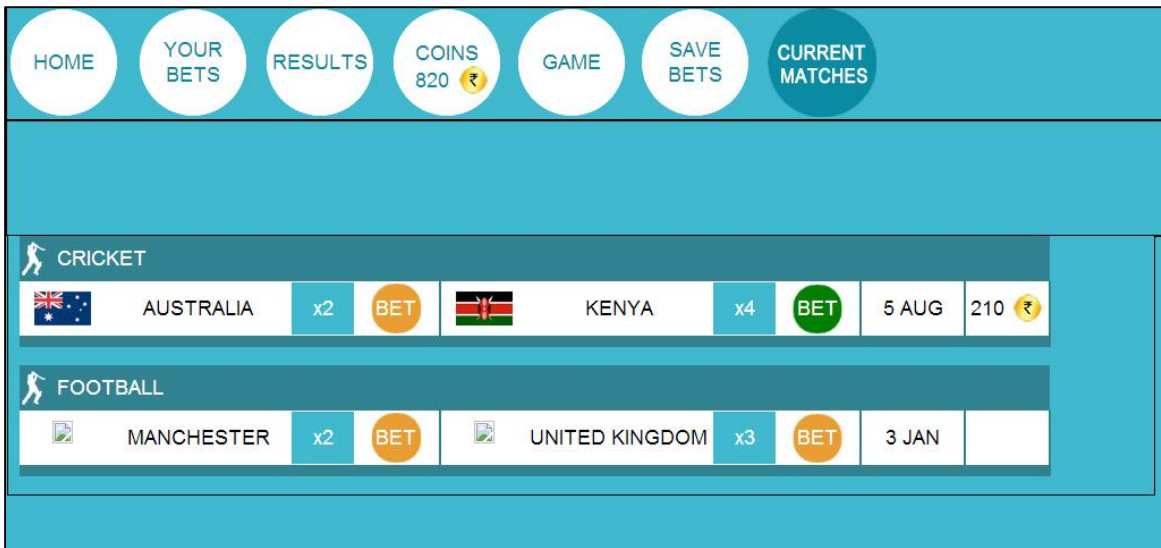


Fig.16 CURRENT MATCHES menu to display the current matches

4. Lack of information while doing some task.

No clear information about the total coins betted is available. User has to calculate the total amount by adding bets on each match.

On changing the bet, there is no display of the current bet amount on the particular match.

Solution Total number of coins betted can be displayed in YOUR BET menu button as depicted in Fig.17.

In the betting dialog box, current bet amount can be shown which will simplify the process of betting for the users.

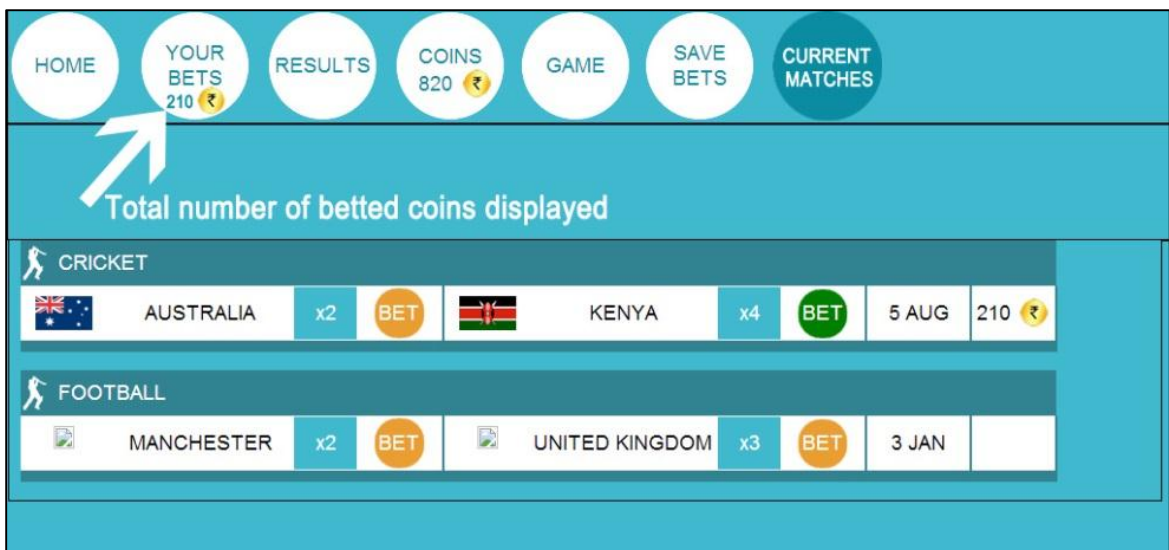


Fig.17 Display of total betted amount in menu

5. Separate WON and LOST bets details in results.

In the result page, WON and LOST bets are presented together.

Solution WON and LOST bets can be displayed separately which will simplify the interface.

6. Background of the application is not aesthetically pleasing.

Background color of the application is quite dull and isn't aesthetically pleasing.

Solution Instead of plain background color, some image or variation of colors can be used related to the use of the application.

5. RESULTS AND DISCUSSION

By following the interaction design principles we arrived at the final interface of our game. We developed a working version of the game which can be played currently on the internet.

The working model of the game was developed using web programming language: HTML, PHP, javascript, and jquery.

To improve the game we took various surveys from different categories of users and implemented user testing which gave us points to improve.

Heuristic evaluation technique proved to be very effective in improving the game interface.

Such interaction design principles and techniques should be applied while developing any application, as they significantly help in improving the current interface and eradicating the usability problems.

We created the fully functioning application which is currently available on the internet and the link to which can be found in the appendix

Such more Indian theme based games need to be developed and users should encourage such games and based on the success of the present game, we aim to create more such games which can strengthen the Indian game grasp on internet.

We arrived to the interface as depicted in Fig.18:

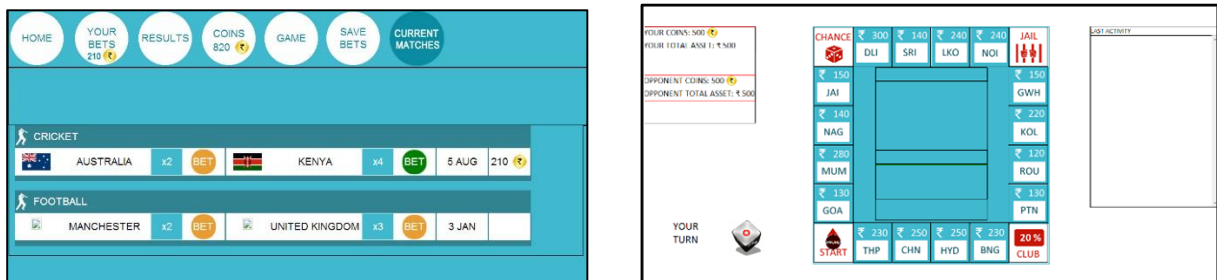


Fig.18 Final Interfaces of the game

5.1 Results from heuristic evaluation

Various usability problems were detected in heuristic evaluation and were categorized into broad heuristics and for each problem appropriate solution was recommended.

One such important problem recognition was lack of saving alert before leaving application which violated the heuristic: recognition rather than recall. So recommended solution for this problem was to provide a saving alert dialog which gives the user option to save the changes in bet before leaving application.

6. CONCLUSION

We started this project with the study of various available games on the internet and various papers related to interaction design and game development. Thus we arrived to our problem statement of developing an Indian theme based web browser game.

Among various interfaces proposed, we arrived at the final interface by taking users surveys based on rating to each interface. After designing the interface, we started to make prototype of the game using web programming language (HTML, CSS, JavaScript, JQuery).

Link to the working prototype of the game is given in Appendix A.

At the end of the project we have successfully fulfilled our objectives

- Developed the user interface of the game.
- Integrated user interaction in it.
- Developed and managed the back end of the game.

This game is currently available on the internet in its alpha version. It's a complete game with all the described features integrated. And we are still improving the game and aim to launch the new version of it in the near future. Link to the working game version can be found in the appendix.

6.1. FUTURE SCOPE

This is the first version of the game. Various possibilities exist which we will implement and improve the game with time.

Following are the future plans that we have currently for the game:

- We can convert it into internet business plan where users have to pay entry fees for playing games and winner will be awarded with attractive incentive.
- Apart from current business game, we plan to include various other games like Pool game, Chess, Racing games etc. in our gaming section.
- We plan to establish an online gaming company if we get, good response from the users.

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APPENDIX A: LINKS TO ONLINE GAME ON INTERNET

- Link to Betting section of the game: <https://abhaysrivastav.org/fbapp/app4/app.php>
- Link to the Business strategy game: <https://abhaysrivastav.org/fbapp/app4/game.php>