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Research Article

User Interface Designing Principles for Real-time Games Strategies

Muhammad Sheharyar Bin Riaz[1] and Ahsan Javed[1,]

[1]Department of Computer Science, University of Management and Technology, Lahore, 54000, Pakistan
[*]Corresponding Author: Ahsan Javed. Email: ahsan.javed@umt.edu.pk

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Abstract: In advancement of every field, game design has made great progress in the Human-computer Interaction. But as looking about the information between the player and computer have some constraints as resultant the interaction and entertainment of specific game has much more restrictions. As this terminology and taking Human computer interaction (HCI) as analysis tool, this paper describes about the principles of HCI in game design. For decades, the fields of human-computer interaction and computer games have had little to no interaction. However, a number of interactions have emerged in recent years, both in academics and in practise. Based on cognition theory, this work outlined the idea of "User Experience" and the strategy of human computer interface, considered the human loves the quality, offered design concept of "Bottom—Up User Experience," proposed scenario-based user behaviour model for the first time. Finally, we arrive to useful ideas and recommendations for developing everyday applications, particularly 3D user interfaces, such as screen layout, navigation, selection, feedback, and so on.

Keywords: Human Computer Interaction; Real-time strategy game; HCI models, Gaming Interface; Game design; HCI principals.

1. Introduction

As we looking back in the 1958 where the first game Pong was invented and change the whole world scenario towards the entertaining themselves. From 1961 year's Space War, the development history of game has just less than half a century, these innovation provides people with different type of cultural and recreational activities and entertainment but as we look for the world's economy they get a rapid growth in game designing [1]. These statics show that how game designing make a strong impact now a days. Computer games are the combined products of computer technology with traditional factors and games art form and movies and so on. As with the rapid growth of the game designing, most of the game's idea based on the film and any other kind of art forms. The purpose of getting idea from films to bring player a richer entertaining experience. To make more effective their game play use the loud and fast music with high level of animation and other artistic elements enrich the content. But the games are always drawing a clear distinction with the referent art [2]. The main concern in these art is to make player/participant who is in real life; in the games, although some of the rules are same as traditional games, the virtual character and environment generated in computer have become interactive objects for the players, in which people are active participant and they make interactive life cycle with computer, so human computer interaction is essential distinction between computer games and traditional games.As we know about game designer Chris Crawford said: "Graphics, animation, sound and music are the essential elements of the game, and they have important role but not the focus of game. Interaction is the real focus in the game [3]." In order to improve the interaction elements and show the unique media advantage of the game, human-computer interaction theory has strongly received game industry's attention in recent years. European and the United States game industry have begun to apply the HCI researches and its technique in game designing, at the

same time they have two way communication with the academic research institutions are becoming increasingly active:

- In the game education curriculum developed by the Game Education Committee of the IGDA (International Association of Engineers), HCI theory is categorized as an integral part of the game design curriculum.
- Microsoft Game Studios for Microsoft is hosting the forums for three consecutive years without GDC (Game Conference Developer) to promote their user testing methods and ideas in the game industry [3].

First, we demonstrate the validity of this idea by developing a semantic differential model of "UE" (User Experience) and comparing user behaviour models in daily applications to player behaviour models in computer games. Furthermore, the "Game-like Interface" viewpoint is described, and the Real-time Strategy Games, particularly on the interface design and information representation levels, are further investigated. Finally, there are certain design considerations for building a 3D user interface [3].

2. Process of HCI in Games:

Don Norman once aforesaid that "Interactive Cycle "model for the HCI procedure in computer software that is the universal model describing HCI/human machines interface. As a special kind of computer software, games even have similar operation methodology; computer presentation of the virtual player, atmosphere and sound with correct manner, this is often called the output of the game. Supported by the receiving info in steps with the principles of the game, player build decision [4]–[6]. In figure 01, Player express/show their intention through operative hardware input devices like controllers, key board and mouse. This step ought to be called as player's input. On different hand, with the principles of game, player take the action and computer calculate the score of the player that is named player's action. This action conjointly called the computer processing. When this step it'll come back to the 1st step again enter into next round of HCI cycle.

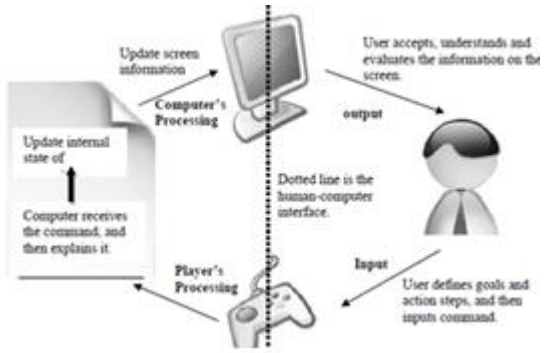


Figure 01: Process of HCI Games

Human-Computer Interaction isn't solely important feature of the game however conjointly the core of the numerous game parts. From the procedures of HCI within the game, we are able to see that the method of whole game is truly based on a cycle; as we can see that during this cycle; player and computer play a motive role like flip by turn. HCI plays a vital role in different elements and their link with game components. If the quality of the game is increased, then hci should be improved completely as the first priority in the game. Optimizing the HCI completely in the game need a correct principle to guide how game should be design [7].

3. Design Principles of HCI in Games:

At the start, the planning field of human-computer interaction within the game continues to be wanting theoretical system; after all there's a touch affiliation between HCI field and also the game design field: "Usability and its goals" is a crucial analysis of HCI field of area whereas games field have heaps of concerning with this in gameplay, that is truly basing on the usability of game software [1], [7]. Through the deep link between theory of games and HCI's usability theories, we are able to learn the experiences that created the HCI field to guide the design of the game, taking full quantity of special natural gameplay, apply the "Simple, natural, User friendly and Consistent," principles to guide of hci style in games [1].

3.1. Simple Principle

Simple principle is especially concern with process of hci within the game ought to be as easy as possible. Creating the games a lot of difficult suggests that of interaction isn't solely prejudices to the precise player to understand and handle the game however conjointly can usually interrupt the player's diversion expertise that greatly reduces the diversion impact of the game. Largely game designer should concentrate on the game experience instead of interaction process. Therefore game designer should take players out from the complicated interface of hci to cut back interfaces of interaction on the player's thought and experiences [1], [6]. Throughout the method of player's input, the easy principle embodied within the game is that whether or not the amount of action is suitable or not for the player to succeed in at bound goal; except for the game, the number of operative the buttons aren't the less the better. The explanation lies in the indisputable fact that goal of the game is giving players a sort of diversion expertise instead of finishing a selected work. If simplifying all the operations, in fact, the method would be simplified at an equivalent time, which can scale back the fun of the player and reduce the probabilities of the interaction of the player towards gameplay. For example, within the action journey game (AVD) in figure 02, the player's main concentrate on creating the right} operation through hand-eye coordination at proper moment and management the virtual character to beat the varied objects/obstacles. If such an advancing method designed as easy as depression process.

Figure 02: Simple Principle

As in this game that gameplay is simple to play with the mouse- cursor movement and clicking operation. The player aim to shot the ball with aim and get interacted by those player who are fond of these type of games. The main thing that took player's intentions are the color them, music and efficiency of the game as defined in HCI principle. While if look as this below figure 03, of adventure game, this game needs the operation through keyboard. The main thing of the different color schema with background and obstacles placed in the game play which play important role in the player intention for the long time usage for this game.

Figure 03: Different Colour Principle

With the discharge of the game release, an easy principle, game enclosed and price for the data sent to the players at the same time is that this acceptable or not. Quantity of data transferred to the player within the game depends on 2 factors: one feeling player modes employed in the game (such as visual etc.), and another variety of things for players every feeling of tension at constant time. In style of the game, designers should portion to players logically the receiving capability is restricted to the unit time and ensures that players are ready to access the specified information. Sort of the details don't have anything to

try to to with the game machine nonetheless plays an ornamental role in rising the performance of the game entertainment, which can even be called useful information.

With the discharge of the game, the easy goal makes it easier key details that begin in an exceedingly complicated way. A straightforward principle doesn't apply to useful data output within the game, as a result of helpful information does not needs additional player attention, however can bring players higher enjoyment of the senses.

3.2. Natural Principle

Natural principle in the main concern with the method of human-computer interaction within the game ought to be unbroken in such the simplest way with player's life expertise and cognitive habits. To use this principle, a game should be style in such a way that player is totally integrated in the game's world and its environmental conditions. So as to realize such quite goal, we have a tendency to acquire all player's recognition and integration from all aspects. If player experience is completely different in games than the real life, they might be excluded from the games [1]. The result of that effort to guide player intentions and integration towards game is greatly reduced, leading the loss of diversion of a game eventually. Within the method of player's input, natural principle embodied in the game with whether design of input devices confirms to people's habit and intentions. In everyday life, we have a tendency to create a typical actions stupidly regarding how to do. Within the player operation designs, designer ought to focus on the natural degree with daily life. As declared in easy word that the operations performed by the gamer in virtual reality also present in the real life. The most effective example of this principle is adopted by the VR play technology that are adopted by several massive gaming associations.

Figure 04: Natural Principle

As seen in this figure 04, that VR technology is mainly base on the natural principle, like player feel like natural factors play the game. The original motion of the player give the virtual augmented system movement of the character in the game like Call of duty game in the figure. While if we are looking the figure 05 below given of Tekken 7 VR design it provides only player see the environment of the game and feel like virtual character feel in the game. This is the example of natural principle base game design. The key point of this technology is to take all intention and thinking towards game and gameplay as well. Natural principle needs the planning input from player with full physical and mental intentions [1]. Whereas physical habits corresponds to the form of design of the input devices and mental habits corresponds with perform design of the input devices. With the game release, the goal is natural Combined with the game and what the output data is in accordance with human habits of understanding. Though the virtual world created from games isn't real, it's depth communication with real world however additionally completely different from real life naturally. Empowering players to be ready to integrate with the virtual world could be a necessity for the game to fulfil player's entertainment in now a days. The game release in accordance with the cognitive feature habits of the players can facilitate them quickly connect the expertise in real world [1], [8].

Figure 05: Natural Principle

3.3. Friendly Principle

- Reasonable forms of information:

Taking the information virtually as example, the kinds of information is shaped in group wise and then visible to the players, at the same time, using different functions performing and show the important information and secondary information as well. In figure 06, the game is example of reasonable form's information, in this important information like button of actions performing and secondary information like status of the gun and player's health.

Figure 06: User Friendly Principle

- Giving automatically correction tips to the input do not confirm to rules of games:

This is often the overlook of the gameplay. The most common error that almost every game faces with the virtual character is with walls in the game, because when character comes near the wall; the player is blocked because of continuously walking towards wall. The result is that virtual character is auto sided from the wall.

In figure 07, the character in Minecraft game is blocked by the wall and auto sided by this, the main reason is that walls are actually the constraints. There are many similar problem in the game play that auto correct the player's operations like counter block. The animation of the gameplay is design in such a pattern in which virtual character is stationary or shield or counter block by wall constraints.

Figure 07: Minecraft Game

Player should make a lot of decisions of their own according to specific circumstances during game. So it is necessary to facilitate the player with proper information as possible and show them through the relevant sense. For example in the figure 08, shooting games, the player have aiming option and heath indicator of the virtual character that is totally handle by player.

Figure 08: Shooting Game

This above example of the shooting game in figure 08, where player have fully aiming option with actual scope option. The figure 09, below is displaying the virtual character heath indicator and second it partially process through the natural principle like the blood shedding when killed by the opponent.

Figure 09: Virtual Character

In figure 09 shows the game rules comply with the principle of simplicity and the principle of nature in the human- computer interaction, but the fact is that it doesn't meet with the people's habit which they can feel in real life. In fact, good design of the game should give the player some tips with virtual character health's indicator with blood shedding. May be shown on screen the action of bloody photographs or let the whole screen red for a few seconds in appearance; or on hearing, it can play a voice of moaning when the characters are in pain. As a result, players can clearly receive a "painful" message from visual characters and do not need to deliberately pay attention to the value of life.

- Provide comprehensive help system:

Some of the designer have a misconception that ordinary players are just like the experts in this game, and they think that players can play the game smoothly without help. In fact, any simplification should have a complete set of help system, but in games, it seems that the traditional way of help is completely different from the whole world of net. Because help will hinder the progress of the game and reduce the level of commitment of the players.

This point is for those gamer who the expert in get are good mentally and physical interaction with game in depth. Like for normal gamers they cannot get the hint in this figure 10. But the experts look the gameplay highlight colors them in the giant's weapon and got the point to solve the stage. But look at the design principle there also should be a hint like that for expertise as well.

Figure 10: Expert Games

- The operation which can be configure and many operation for the same function:

This point describes that the default operation in the game sometimes doesn't comply with the real habits of the player, so they design the mode of operations can be configure, such as the mapping between the hardware devices like key board's keys and the virtual action perform by the character in the game can be defined by the players themselves. The figure 11. below shows the customize panel for players.

Figure 11: Customize Panel

There are the plus point if game's action controls can be editable by the player's choices that makes for attractive for the player to play the game on their manner; the result is that game's flow while playing with full mentally intention and player goes to depth of the game. The figure 12, below shows the default panel for the players.

Figure 12: Default Panel

- Adequate Feedback:

Any official performance from the players should be given a response from the computers. It doesn't matter if the form is a script that tells the players to win or the music category, the answer can tell the players the results of the performance and give them a sense of achievement.

There is a technique name the Feedback Loop that work on the loop function in which gameplay show the option of feedback after some game play or some levels to check the player's point of view about the gameplay, sound and other objects shows in figure 13.

Figure 13: Feedback for Games

3.3. Consistency principle

This principle is about the output of the computer and the input of the player should maintain the consistency and proper flow not only in the appearance of the gameplay but also the logically. Only the consistency/ proper flow of the game make continuous interaction of the player towards the game, the edge point of that the communication would be easily gain by the player in the process of the interaction and engaged the player in the game entertainment experience earlier. The consistency principle of the game is mainly in following points:

- For the games, whether the forms are same:

For the many games of different kinds, the information whether there is difference in them. So looking at this, each player has a fixed habit of receiving information according to the games. Just look the example in figure 14, is that if there would be two doors in the game then their design has a proper difference at some level of gameplay. There should a color difference or one would be open able or second one not.

Figure 14: Dual Option Level

The player came to know with experiences of both door or sometimes its thinking about the game can help him to reach the actual door because of deep interaction with the game. So the game design in such a way of consistency that player can get a proper choice between the critical stages and options.

- People know to play is process of learning:

This term is describe as that the similarities of the operation perform in the game. Like if player memorize the object where some points hidden or memorize how to buy things then it would be fulfill this point by the player. But if the purchasing one item is same but buy some other things in shooting games or adventure game then it would be high chances to lose the player intention shows in figure 15, because player find the difficulties in every time they buy something in game.

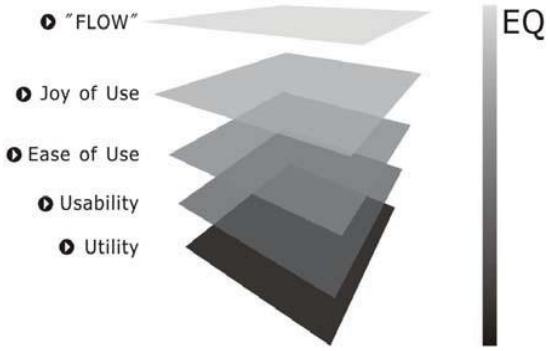
Figure 15: Lose attention

4.Hierarchical Semantic model of "UE":

Shneiderman and Nielson, two HCI pioneers, come to different conclusions on the design goals of interactive systems based on user interface design and usability engineering shows in Table 1. In fact, all of the aforementioned characteristics may have an impact on the user experience. Experience is the consequence of a specific encounter between a person and an artefact (or other species) in a certain setting, which is facilitated by innate psychological and individual surroundings made up of motivation, habits, and a range of cognitive factors [9], [10]. A novel notion called EQ (Enjoyment Quality) is introduced, and a hierarchical semantic differential model based on EQ is constructed, in order to quantify user experience and compare it to different types of interactive systems (e.g., see Figure below) .

Table 1: Usability Engineering

No.	Ben Shneiderman	Jakob Nielson
1	Learning Time	Learnability
2	Executing Time	Efficiency
3	User Retention	Memorability
4	Error Rate	Errors
	Subjective Satisfaction	Satisfaction



Industrial and commercial applications, office applications, and household applications are all commonplace. As a result of the disorganised display, complicated and stuffy operation procedure, incomplete function, irregular job sequence, and insufficient feedback information [3], "Usability" and "Ease of Use" are often highlighted. Such issues are being paid attention to and gradually remedied efficiently, thanks to the twenty years of development with usability engineering. This group's design purpose is to move: Usability has become a widely recognised quality feature of a wide range of technical items, from software to washing machines. It has, however, just added a new partner, the so-called "Joy of Use." [4]

5. Interactive principle on Interface Design of RTSG:

- Information Minimization of Screen Layout

As a complicated system, RTSG is made up of several components. As the game progresses, the amount of information and data that the player must cope with grows. The problem of "how to organise information efficiently" became a huge task. At the end of the day, all RTSGs use a screen layout with clear and concise information classification. The screen should consists of three parts that are always visible (no pop-up windows or screen switching): “Top”, “Main Window”, and “Bottom”. When this kind of screen layout is used, no information is hidden or covered at any time. This way a game player can operate at the lowest level and at the same time keep an overview of the entire process [8]. Here, we take Pubg Game and discuss all the feature in below section.

TOP Screen

In the top bar there are several portions. The first thing to see when the game starts or when the players are in plane is map that is at the right side of the screen. By clicking on it the player can see the route of plane in which axis it will go and the player can choose a mark point to where it wanted to land and let its teammates to know. Furthermore, the player can also zoom in and zoom out in the map. After choosing the location or viewing the map the player can click on eject button to drop or the system will eject the player when the route of plane ends. Below the map option there is a chat button where the player can send and receive messages from other it’s team mates. Beside the map there are three buttons for setting in which the player can change the control settings according to its need below that is mike and speaker option from which the player can hear and speak with its teammates and other players (when they are in 20m meter range). On the top left side there are two text boxes which shows the number of players they will be changed when the players in the arena dies and with that the player kill count is shown. Below that the player and its team mate’s health is shown.

MAIN WINDOW

The main screen is divided into four sections. On the top left section, the player can see its profile by clicking profile icon below that it can see its friend list and friends who are online and can invite them to play below that there are several other features. On the bottom left there is button to select game mode and to start the game. On the top right the player can see its game money which it can spent to buy items and below that some game events and store buttons are shown. On the bottom left the main trigger to control the game mission, inventory and other important features buttons are shown.

BOTTOM Screen

In pubg the bottom area can be divvied into three sections. First let’s move to the left side there is an option of bag showing in which the player can carry its items during the game. Beside it there is the control centre for navigation from which the player movement can be controlled during the game. Moving on centre section on the bottom there are two slots shown for the guns that a player can carry as primary and secondary. on the right side of centre section there is dropdown shown for additional items like grenade, moliv and other items. On the left side of centre section there is dropdown shown for medical items. On the right section there are several option like the jump button, the gun reload button, aim button, the gun fire button and button for crouch

6. **Sensitive and High-Efficient Feedback System:**

According to Shneiderman's concept of "Direct Manipulation," feedback is an important component. According to RTSG, such "parenthetic operations" as manipulating interface must lower the player's both perceptual and cognitive burden as much as possible in order to maintain the user's experience flow, especially when players are physically and intellectually engaged in the game world. A multi-model, sensitive, and simple-to-understand feedback system could improve the cognition and evaluative abilities of players.

Visual Feedback

In figure 16 Pubg game, we enumerate typical scenarios: When plane is crossing over us in the game it drop suddenly some box names as Air drop which is also called "loot box" in Pakistan. When this air drop fell on somewhere into the map area it indicates all the gamers through the colored air gas that where it has been dropped. Secondly, in the game if some opponent open fires to us then we can see clearly our health indicator starts to drop and turns red, also we can see when the bullet hits us some blood drops appears on the screen and in addition to this we can also see the bullet indication on the map through bullet icon that from where it has been fired.

Figure 16: PubG Game

Powerful Navigation

Even if players cannot execute on objects with full six-dimensional flexibility in RTSGs, the interface can still be viewed as a tri-dimension user interface (a constrained 3DUI). Together with the other three researchers, Bowman believes that human behaviour in a 3D environment comprises four elements: "navigation," "selection," "manipulation," and "system control." Could a participant in a large-scale 3D environment be aware of both his own position and the position and orientation of other objects? By providing powerful navigation real time strategy games resolved all these issues. Here we take an example again of pubg as we are quoting the same for above, in pubg game they provided us the map through we can navigate throughout the game till the end. We can see all other players' progress through the map that from where they are firing at each other, in addition to this when some firing takes place the map shows bullet icon so that we can see the exact axis from where the firing is ongoing. Secondly, when the game starts all opponents are sitting in the plane and we decide that where we should be dropped through map and locations mentioned on that consisting a location marker which we used to mark the drop of location, see below figure 17.

Figure 17: Map Location

7. Conclusion:

Human interaction with the computer, is a key part and a vital part of the game, the most bit feature of any game is quality. Within the human-computer interaction delineate by Don Norman, the goal of "simple, natural, friendly and consistent" should be shown altogether aspects of game development. Straightforward to use these principles in the construction of the game of cooperation not solely found out smart communication channels between players and computers, however additionally gain amusement range of games. However, we must always even be aware that these principles are incomprehensible ideas. References to specification, steerage on the way to shape game designs, is essential key of the subsequent research. The first aspect could assist us in macroscopically defining the system's design purpose. Aside from that, it might assist us in creating and comparing various design plans. The second factor aids in the selection of an acceptable interaction model.

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