Analysis of Human Behavior using Gaming Effects and Social Factors in Video Games

Subhashree K, Bhanu D, Lavanya S, Bhuvaneshwari K S, Aarthi D

Abstract: The most popular, pervasive and insidious form of entertainment are video games which creates the leisure gaming activity among the adolescents, especially among male adolescents. Problems arise when players loses control over their gaming behavior. Video games can be played in two modes say, online mode and offline mode. The paper deals with various positive and negative effects of online video games among players and various social factors that influence the gaming behavior of individuals as well as team in the online game playing environment, added with analysis of human behavior from multiplayer online game logs which stores information of all the gaming event activities.

Keywords: Gaming, game Log, Human Behavior, Social Factors

I. INTRODUCTION

Video games usage is steadily increased over time [1]. Adolescents, children and a huge percentage of male play a vital role in spending more time in playing video games compared to female, especially through online is an significant research area in modern days [2]. Video games such as pro-social games [3], action games [4], and fast-paced games [2] have both positive and negative consequences leading to video game addiction [5] which blows up in research arena.

Online games or Multiplayer Online Games (MOGs) are games played online with external people. In addition, there are two categories of MOGs one focuses on Online Games (MOGs) and another on Online Role-Playing Games (MMORPGs). MOGs are off-the-shelf games that call for continuous play [6]. The only difference between multiplayer games and massively multiplayer games is the number of gamers involved in gaming activity. For example Counter Strike is multiplayer online games which have 32 players up to 64 players [7]. On the other hand, Everquest is the massively multiplayer online game which is played by thousands of players [7]. In massively multiplayer online role-playing online game, a virtual game world is created where lot of people can meet each other, communicate and play [8].

Large communities comprising of individuals, groups, and networks, whose social and behavioral dynamics are modelled by Massively Multiplayer Online Games (MMOGs). MMOGs become popular among millions of people around the world. MMOGs are online spaces, which provide users with an isolated virtual universe. Each of the users will have their own context and mechanics about the universe they are in which will create a mirror of their physical world.

II. THE CHALLENGES OF VIDEO GAME PLAY

There are both optimistic and pessimistic effects exist in video games and hence it is required to know about various mechanisms which affect players in gaming. The two different perspectives are a) General Learning Model (GLM) and General Aggression Model (GAM) b) Five Dimensions of video game effects.

A. GAM:

In the domain of media violence [9], the effects of violent games [10] in players play a major role in analysis of human aggression. There are various models of aggression in specific [11, 12], from which key ideas are integrated in GAM to provide a framework for understanding how social, psychological and biological factors all of which interact to bring about aggressive behavior. GAM helps in understanding both Short-term process (STP) and Long-term process (LTP) shown in Fig 1.

Fig. (a) General Aggression Model

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Short-term process deals with the immediate situation of how media violence effects on aggression whereas, long term process helps in understanding the process of aggressive personality development. STP analyses the factors of media violence which influences the players internal state (cognitive and arousal states), thus leading to aggression. Creation of psychological arousal and increase of aggressive thoughts takes place in playing violent video games. Player’s internal state variables could affect decision making processes resulting in impulsive actions which could be aggressive or non-aggressive by immediately provoking a player after playing a violent game which have the likelihood of getting aggressive response due to aggressive thoughts and likewise, the aggressive behavior tend to get increased with such aggressive feelings. Such behavioral responses would result in aggressive actions and this cycle overtime results in LTP letting exposure on aggressive knowledge development causing positive attitude towards violence and building hostile nature [13].

B. GLM:

Theories learned from multiple specific domains are incorporated to form a larger meta-theory in general learning model [14]. Mechanisms related to multiple learning such as observation learning, habituation etc. can produce learning outcomes both serially and parallel [15]. The process of changing trait hostility, beliefs and attitudes of players are done by learning experience. The learning process placed by GLM can be applied to social behavior as well as for aggression too. Literature on prosocial behavior [16] and helping provides actual support for GLM.

C. Five Dimensions of Video Game Effects:

The five dimensions [5] that affect players in video games are structure, amount of play, context, content and mechanics. Each of these factors causes specific effects on players.

Structure: Visual-spatial processing is affected by the way the video game is structured and displayed on the screen. Video game such as fast-paced videos games provides positive effect in visual and special skills on players by letting them to perceive faster visual reaction times, mental rotation [4] and getting improvement in target localization.

Amount of Play: Factors which gets affected for adolescents or children by spending huge time in playing video games are high risk of childhood obesity [17], reduced academic performance [18] and gaming addiction [5] which displaces players from other activities.

Context: Playing video games with friends may result in moderate effects in behavioral characteristics [19] of players.

Content: Content-specific learning such as educational games helps out for learning school subjects [20]. Prosocial video games aid development of helping and empathy, whereas violent video games results in aggression.


D. Violent Video Game Effects:

Most of the researches on analyzing the effects of video games had focused mainly on the effects of video games that are violent, thus leading to aggression. In both short-term and long-term contexts [10], a number of meta-analyses and huge studies related to correlational, experimental, longitudinal studies confirmed that increase in level of aggressive behavior, reduced likelihood of helping [16], lessen empathy at players are mainly due to playing violent video games for long duration of time.

Experimental studies: Experiments in laboratory demonstrates the short-term causal relationships between aggression and violent video game play where aggressive thoughts [10] and aggressive behavior due to violent video game play are experimented.

Correlational studies: The association between aggression in real-world and exposure to violent video game is examined in correlational studies. The increase in positive attitude towards violence [22], physical fights involvement, likelihood of loneliness is mainly due the greater amount of time spent in violent video games by the players.

Longitudinal studies: The long-term relationship between aggression and playing violent video games are determined by longitudinal studies in which it is been showed that, a remarkable predictor of later violence [23] and crime is violent video game.

E. Critics and Proponents of Violent Video Games:

The statistical analysis that combines the results of multiple scientific studies is nothing but meta-analysis. There are seven meta-analysis [24, 25, 26, 27, 28, 29] been published on violent video games. The two fascinating aspects of meta-analysis are 1) It is been found that for many violent video games there were identical effect sizes on hostile feelings, opinion and deeds 2) Although the effect sizes are identical, Ferguson [28] and Sherry [29] expound it as unimportant whereas Anderson and colleagues expound it to be the most important. However the authors seemed to disagree with expliciation between aggressive behavior and exposure to video game, they do not disagree with rest other effects i.e even though Ferguson [28] senses aggressive behavior with video game exposure to be unimportant, he did not sense the same for effects on aggressive feelings, thoughts and behaviors. Meta-analysis concur non-zero relationship on aggressive feelings, thoughts and behaviors due to video gaming. Attention problems will get raised for those children and adolescents who play video games beyond the overall time for it.

School Performance: The displacement of time from educational activities is caused by the usage of electronic media for long which negatively influences the school performance. A recent survey on American adolescents and children had stated that light media users of about 23% secured good grade in school whereas poor grades are secured by 47% of heavy media users [1]. Students, who do not concentrate in school education, tend to
pay more attention in video games which adhere to poorer school performance [30].

**Video Game Addiction:** As like gambling, video games nowadays starts as a form of entertainment which will start to produce negative consequences [31] in life. Shapira and colleagues [32] briefs that the most typical primary disorders such as impulse control disorders, substance use disorders, personality disorders, mood disorders and anxiety disorders are more likely to prone pathological gamers. An improvement in children depression, social phobia, anxiety and school performance happens, if children stopped being pathological gamers. The seven factors which determine the game addiction scale are: Tolerance, Withdrawal, Conflict, Salience, Mood Modification, Relapse and Problems.

**F. Positive video game effects:**

**Visual-Spatial Skills:** Video game players extract specific spatial information from the screen to improve their visual-spatial skills. With those information, the garners makes non-gamers to outperform on visual and spatial tasks in numbers, thus evincing improved target localization, mental rotation and faster visual reaction times which is demonstrated in correlational studies [33] as the positive effect of video game play on visual-spatial skills. Whereas experimental studies [34] reveals that only 10 hours play of video games would result in improved mental rotation [33] and spatial attention. It is very important to note that, to analyze the effect of video games on players, fast-paced video games are chosen in studies typically which is violent, stating that video games play can have both positive and negative effects in players.

**G. Non-Violent Video Game Effects:**

**Prosocial Video Games:** Playing prosocial games decreases hostile nature, aggressive/antisocial thoughts, behavior and feelings while increasing prosocial thoughts such as sharing, empathy, cooperation and helping behavior in adolescents [19] and children as its long-term effects. Prosocial games concentrate mainly on helping other characters in games which is distinct from hero-centric violent video games where the enemies are killed by player's character.

**Educational Video Games:** Educational video games are used in wide range of domains such as for teaching in schools (mathematics) [20], reading, healthcare (biology), etc. aiding effective teaching methods. Students behavior can be reinforced by making them to involve actively [35] in playing educational video games in multiple occasions with the provision of clear objectives. Job skills for employees are also taught in online games eg, Volvo had used online game to train car salesman.

To boost up healthier lifestyle, the educational video games play aids as effective teaching tools in explaining and making youths to understand better health conditions such as diabetes and cancer which would result in behavioral change. Studies on the effects of video games revealed that playing video game on diabetes self-management for about six months, when compared to those in the control condition resulted in reduction of number of visits made by the diabetic youth to the emergency room than

**Exergames:** Interactive video games that involve exercises to play can be termed as exergames. Exergames contribute to physical fitness and psychological health exhibiting improved quality of life and relieving from sub-syndrome depression. Traditional exercises such as yoga or boxing that would incorporate creative movement such as jumping over an obstacle or dodging a ball, creates excitement over children in playing exergames.

Research on exergames focuses on three areas such as activity preference, activity time and energy expenditure. Attraction towards exergames in children makes them to expend more energy for longer time with more frequency of playtime than traditional games [36], thus creating enthusiasm in parents and pediatrician for a healthy life.

**III. THE INFLUENCE OF SOCIAL FACTORS ON GAMING BEHAVIOUR**

Online game which is mostly associated with problems is massively multiplayer online games (MMOGs). A critical factor that correlates time spent on games with the game addiction rate is the social factor whose influence is more in determining problems associated with adolescents gaming behavior and game addiction. The three most important social factors for analyzing players gaming behavior are: Subjective Norm (SN), Descriptive Norm (DN) and Social Pressure (SP). Regarding the game addiction scale and the amount of time spending on games, these three factors describe the association with online friends. Online gaming is more associated with subjective norm (SN) than offline gaming whereas, social pressure (SP) and descriptive norm (DN) pay attention on both online and offline gaming and are good predictors of gender and game addiction scale (GAS).

These three social factors are interrelated as shown in the Figure 2. Subjective norm can be defined as “individual's perception of social pressures from important others to perform the behavior” [37]. Likewise, descriptive norm can be explained in terms of social pressure. There is a belief that, “important others also perform the behavior” [37] and hence descriptive norm can be experienced through social pressure to perform behavior. Thus both the terms of subjective and descriptive norm refer to social pressure, where first one is the indirect feeling of pressure and later is a direct perceived behavior of others.
Subjective norm refers to the perception one has of what friends, peers and so on expect [8]. The three factors which influence the planned behavior of players are subjective norm, attitude and perceived behavioral control. Behavior intention is one of the primary predictors of behavior and as such also for game behavior which includes referent identification and norm compliance. Attitude defines the operation of analyzing the expectations of other people.

IV. ANALYZING HUMAN BEHAVIOUR FROM MULTIPLAYER ONLINE GAME LOGS

MMOGs operate on a large volume of users populating them, where each of them plays a role and interacts among using the mechanics and tools provided in the multiplayer online gaming environment. MMOGs provide a means of an entirely isolated universe for the online game players, where each and every actions are been logged. The granularity level and completeness of the information collected seemed to be difficult to be gathered from the real life environmental setup.

Analyzing MMOG logs, building models of social interactions in games, understanding effects of various environmental factors in user’s relationships are performed using the mechanism of knowledge discovery. MMOGs provide mechanisms to promote social activities among users, by allowing them to form clusters, associations, corporations etc. and attempt collaborative tasks, e.g., marauding a dungeon for gold. The facts composed from these means provides an excellent means of studying human social behavior with respect to the complete context of the environment, which is not feasible for real life activities as it is rarely possible to follow and trace complete information on a huge inhabitants.

Fig. (b) Attributes of Players Planned Gaming Behaviour

In this popular virtual world, it is quite common to have hundreds of thousands of players participating in many different activities at any given time and thus generating copious volume of data. MMOGs usually have thin-client architecture as shown in Fig. 3, where all the actions of each player in multiplayer online gaming are captured practically as a click-stream and logged at the server. The logged data comprises of numerous records of every players in-game interactions, activities, economic status, accomplishments etc. Separate personal profiles for each of the players are also stored in the server. Analysis of the logged data in MMOG is performed to find the relationships among the players in gaming activities.

Game Data and Social Networks: The research on Sony's popular MMOG Everquest II, focused on three types of data namely, in-game behavior, player demographics which includes real life gender, age, geographic location, etc. and avatar characteristics provides data on game players virtual avatars which also includes avatars damage statistics, health, gender, faction, race, etc. Small sample of players survey results includes data on multiple facets such as players psychological fitness, feelings towards the game and other users in the game and real life behavior outside the game.

The data comprising records of each and every users (game players) activities in the game is stored in the in-game behavior logs which are time-stamped and that can be broken down (parsed) to
discover (uncover) the wealth of information. At any point of time an event of significance occurs, such as the user completes a quest, kills a monster, engages in trade, and forms a group with other users. These information in each and every events are stored in the in-game behavior log.

The most important information which is gleaned from the in-game behavior logs is about user relationships in their gaming activities. Game players socially interact with other users using the methods provided by the virtual universe MMOG mechanisms. The gamers (users) form clusters to clutch monsters, trade jointly among one another, go on chasing in a combined environment, form and connect guilds, articulate different stages of trust, mentoring other players, etc. These activities can be represented as a social network among these online game multi-players, to analyze how the players and environment are impacted and affected by those activities. Below mentioned are the different types of relationship networks constructed from the players’ in-game behavior logs.

**Combat Network:** To study the dynamics of game players in a team (users group), it is important to understand the formation of task-oriented groups. Formation of users group is highly impacted by the online game players interests on challenging tasks. Team performance is correlated positively to group size because players with less experience in gaming are more likely to participate in group events for difficult tasks.

**Mentoring Network:** In MMOG, mentoring refers to the phenomenon of novice players gaining skills from the experienced players in a particular domain. The experienced players helps novice players in the group for reasons such as duty towards guiltiness, helping friends, altruistic reasons and few miscellaneous reasons[38] too.

**Trust Network:** Mapping trust relationship among users in the trust network is difficult and hence it is difficult to be analyzed. But still, online interactions among the users in the network help to know about the trust relationships in the network. For example, In EQ2 MMOG, players are allowed to buy virtual houses and they can grant access to other players in the network to their houses with varying levels of grant access. Hence, trust in such kind of MMOGs is described with respect to a commodity. This kind of trust networks analysis reveals that their properties are quite similar to trust networks in other domains. It is been observed that, networks generated by the in-game processes have a close analogy in the real world, e.g. consider money transactions, which will have similar behavior in both game and real world, whereas unique in-game phenomenon is that, role-playing networks are different from real-world networks.

**Applications:** Data extracted from MMOGs are used for both commercial and scientific purposes. Commercial purposes include identifying undesirable behavior, predicting player churn, recommendations based on social influence, etc. Scientific purposes includes data-intensive studies on numerous social science models including team dynamics, performance and achievement, organization behavior, mentoring and team work, competition and cooperation.

**Performance and Learning:** For analyzing human behaviors, games and virtual worlds serves sound in recent years. Especially in educational psychology communities and in learning sciences, players interactions and their performances are captured and stored in game logs which helps in understanding association, Snowiness, social involvement and knowledge trajectory at both entity and cluster levels. In virtual environments [39], simulation-based training is widely used by military where, human instructors are tasked to abstract information from the behaviors of individual soldiers to the behavioural goals of teams. One of the pitfalls with this idea is that, behavior elucidation and its interpretation depends on the instructor and it can show a discrepancy among different instructors. Additionally, another problem is that it is difficult for the human instructors to capture the information related to rapidly emerging events or those information that are too much at low level of granularity. Hence, it remains a challenging task to determine what the teams are doing, why they are doing it and how they are doing it.

**Player Churn Prediction:** Churn analysis helps to understand various players’ different motivations. Individual players [40, 41, and 42] affection, accomplishment and players level of in-game socialized connection with other players are the two primary key indicators of player engagement in role-playing MMOGs. Models built on a combination of these two keys factors for churn prediction seemed to have greater prediction than those that are not modelled with these key factors. Role-playing online games have its own working models range from subscription mode of playing to free mode playing model. In addition, based on the originality of the subscription mode, the churn analysis and prediction models differ with each other. Nowadays user (player) retention and acquisition is a major concern for game companies. Web-mining techniques [43] are used to analyze the in-game behavior of players and which when grouped with subscription mode, related insight into the mechanics of player engagement and their probability to mix and play [43] is gained. A game developer uses this knowledge to improve their user (player) retention and marketing strategies and enhance player engagement.

**Identifying undesirable behavior:** Gold farming is a prohibited practice of trading virtual goods in online games for real-world money making. Gold farmers are lured by the game developers because they may make certain areas in the game difficult to be accessed for the legitimate players, go against the characters of fair play, and interrupt the economic balance of a game's virtual economy. As a result, the game administrators deliberately desire to ban gold farmers from their games. Gold farmers can be classified as gatherers, bankers, mules and marketers. Here “gatherers” are those who accumulate gold, “bankers” hold gold in reserve with low-activity in accounts, “mules” play as instant characters valid for only one time acts as a link in the
chain to stay customers away from the process, “marketers” are one involved in advertising the services of a company. Online-gaming attributes includes period of play time, ordering of play, organization of players among themselves and other offline-game features such as gender, location and language [36] can be used to model the problem of gold farmer detection. Various online-game and network characteristics are used to detect each type.

V. CONCLUSION

Massively Multiplayer Online Games (MMOGs) are becoming increasingly popular and have tens of millions of communities of it. In our daily life, with the huge availability of high bandwidth internet, the facility to capture data with high resolution over each and every players gaming activity is improved and logged in a server which can be used for gaming activity analysis purpose. Video games have both positive and negative effects which states that positive effects on players would result in improved attitude while the negative effect would result in aggressive behavior on players. Numerous social factors of video games also influence the players in different aspects. It is been analyzed that, males spend more time in gaming than females and have higher game addiction scale. Males score higher than female. Based on the relationship between social factors and amount of time spent on games with game addiction, the analysis is performed. The social factors are more associated with online gaming than offline gaming. Game addiction scale is well predicted by the gender and social factors.

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