Hindawi
Wireless Communications and Mobile Computing
Volume 2022, Article ID 2903124, 8 pages
https://doi.org/10.1155/2022/2903124

Research Article

The Influence of Social Function of Mobile Game Augmented Reality and Virtual Reality Environment on Mobile Phone Users' Addiction

Chuan Liang,[1] **Yang Song**,[2] **and Bin Wang**[3]

[1]*Shangqiu Medical College, Shangqiu, Henan, China*
[2]*College of Biology and Food, Shangqiu Normal University, Shangqiu, Henan, China*
[3]*School of Humanities, Shanghai University of Finance and Economics, Shanghai, China*

Correspondence should be addressed to Chuan Liang; 0021091@yzpc.edu.cn

Received 16 December 2021; Accepted 17 January 2022; Published 10 March 2022

Academic Editor: Narasimhan Venkateswaran

The study explores the influence of social function in mobile game augmented reality (AR) and virtual reality (VR) environments on mobile phone users' addiction. This study uses the mixed research method of social function on the basis of enhancement and VR and mathematical statistics analysis to study the situation of mobile game addiction. In this research work, a collision detection algorithm (CDA) with machine learning is proposed. The collision detection algorithm aids in the detection of the intersection of two objects in the virtual environment and is implemented in games that support augmented reality and virtual reality technologies. It is assumed that the intuition for playing games is obtained from social networking sites, which may lead to the person becoming addicted to playing. This research focused on the analysis of AR and VR-related games by considering mean, standard deviation, and error parameters.

1. Introduction

Addiction to virtual reality games has become commonplace as they become more popular with the general public. In the same way that social networking and other technological advancements may lead to addiction, virtual reality gaming can do the same. As a result, appropriate measures must be implemented to deal with addictions like these. VR is a computer-simulated environment that allows users to experience a virtual area without actually being there [1]. With this method, a near-approximation to reality is achieved. Gaming and 3D movies are the most common uses of virtual reality. Gloves, headsets, and helmets are common interactive equipment used to achieve this. New and improved interaction may be achieved with most computer games when they are converted to virtual reality (VR). New games and material have appeared throughout 2018 as the year progressed. In comparison to the Oculus Rift and Gear VR, virtual reality gaming has come a long way. HTC's Vive headset, Google Cardboard, and Sony's VR headset are among the most recent offerings. Virtual reality has progressed as a result of rapid technological growth and cheaper VR devices. The virtual reality gaming market already has a sizable proportion of the overall market and is expected to continue expanding at a rapid pace. Gaming addiction can arise in this situation and needs to be addressed. In other sectors, such as medicine, VR has proven to be a success, particularly in the realm of robotic surgery. VR is not the issue. Students can go on virtual field trips, for example, [2]. Besides this, virtual reality has found its place in the entertainment and tourist industries and the military, as well. Addiction is defined as the desire for anything that is both unhealthy and addictive. In certain cases, virtual reality gaming can lead to an addiction that resembles a drug or alcohol addiction, which can have a severe influence on both the person and those around them [3]. Due to its immersive computer-generated world, VR enables the user to react exactly the same way as in real life. Devices that allow users

to explore interactive virtual environments in three-dimensional images are known as virtual reality (VR) devices (i.e., desktop, television, or mobile phone). Virtual reality (VR) has been proven to have a favorable effect on gaming in the past. As an example, the game allows players to communicate with each other online. There are a range of psychological demands that can be met by playing virtual reality (VR) games, while others are just a means to pass the time or avoid reality. A growing number of studies are looking into the potential educational benefits of virtual reality (VR) games. While playing virtual reality games, it is possible to learn skills that could be used in the real world. People's cognitive abilities can be honed through a number of games [4].

Students' usage of VR games may have a negative impact on their relationships with their families, teachers, and peers, and this may lead to VAD. As part of a cognitive-behavioral framework, a model for virtual reality game addictions was developed using structured equation modeling (SEM) in this study. Structural equations can be used to model the relationship between variables and latent constructs. Estimating parameters of a probability distribution using the likelihood function was used to evaluate the model's fitness and path coefficient. Maximal likelihood estimation (MLE) is the name given to this technique. It includes everything from education to entertainment to health. IT has become an integral element of our modern life. IT has made life easier, but it has also raised serious worries (e.g., IT addiction and stress) about this exposure [5]. Addictions to technology have also been studied, and numerous types of addictions have been identified. Users who have become addicted to the Internet in this way tend to gravitate toward activities such as pornographic content, gambling, and electronic gaming, among others. Addiction, according to some studies, can have both positive and negative effects [6]. Definitions are still up for debate among academics. The American Society for Addiction Medicine (ASAM) defines addiction as a primary, acute illness of the brain reward, consciousness, and related circuits. As a result, addiction is defined as the inability to abstain constantly, the loss of cognitive control, and the lowered awareness and dysfunctional response to essential cognitive issues and interpersonal interactions. It is a severe disease that can lead to early death if not treated. Among the most commonly studied kinds of IT reliance are Internet dependency, gambling disorders, smartphone dependence, and social network dependency. There are some similarities and distinctions between the two when it comes to IT addictions.

Studies have shown a correlation between FBA and Internet addiction. Facebook has had a significant impact on social media studies [7]. According to the company, there are 241 million monthly active users on Facebook. The Internet and American Life Program of the Pew Research Center describe technology use as an essential part of daily life [8]. Cellphones were detected in 94% of young adults between the ages of 18 and 24 in an online poll conducted by Pew Research. Because of their overreliance on mobile devices, teens and young adults' health suffers. According to some academics, the fear of being without a smartphone is known as "nomophobia." Furthermore, OGA is considered the most important public health issue. Those who are addicted to video games are incapable of controlling their actions because of their excessive gaming. In addition, DMS-5 and ICD-II now include IGD, but the issue of addiction is still up for debate [9]. According to DSM-5, "gamers" are people who spend all of their free time on the Internet playing video games. According to current research, a gaming disorder may or may not be associated with prolonged play of video games. Addiction to video games has been connected to a strained connection with one's parents, a sense of isolation from others, and an increase in time spent online with friends [10]. In other words, according to a study, Internet game addicts are aggressive and have sleep disorders like insomnia, anxiety, and narcolepsy. There is evidence to suggest that consumers' use of virtual reality is changing their behavior [11]. This investigation found no evidence that VR and e-games have ever been utilized in tandem in the past. Because of the expensive cost of the necessary technology and the small number of games accessible, the virtual reality gaming business is expanding slowly. The cost of VR equipment and software is expected to drop in the near future, which could lead to an increase in the popularity of pornography and virtual reality game addiction (VAD). In addition, past studies have mostly focused on various forms of ICT addiction, such as those associated with social networking sites, gaming, and online gambling. It is hoped that this study will add to the current literature on the dark side of virtual reality (VAD). Virtual reality game addiction has the same harmful effects as any other media addiction. In the same way that any media addiction can lead to mental health issues such as melancholy, anxiety, and attention deficit disorder (ADD), playing virtual reality games for long periods of time can also lead to obesity, sleep issues, and increased aggression [12]. Children and adults alike are affected by these consequences. People who play virtual reality games for lengthy periods of time risk damaging their brains to the point that they cannot tell the difference between virtual and real. In addition, VRR has a significant impact on the addiction of its users. It is possible to increase the number of people who play games by making them more realistic and interesting. For educational purposes, they are better than for amusement. In the same way that a therapist treats media addiction, a therapist can help a gamer overcome their addiction to VR gaming [13]. Working with the gamer's family might also be a great way to help. It works better when the gamer is a teenager or a child. In order for this strategy to work, it is necessary to organize family vacations or spend more time with the gamer's family. Players must be aware of and in control of their own actions. Common knowledge among gamers is the danger of playing video games for extended periods of time. Rather than relying on others to help them, gamers should take responsibility for their own health and well-being by learning about the dangers of virtual reality addiction, testing to see if they are hooked, and taking steps to recover. Research shows that mobile phone users are keen on electronic games. At present, researchers still have differences in their definitions

of game addiction [14]. Some researchers believe that addiction can also have a positive impact. Some institutions define addiction as an acute disease-related circuit of brain reward and consciousness [15]. This study focused on the social function of mobile game augmented reality and virtual reality environments on mobile phone users' addiction.

2. Materials and Methods

Video games are constantly improving in terms of graphics and gameplay, but customer expectations indicate that more appealing gaming applications are necessary. The specifications of new gaming implementations using the collision detection algorithm with machine learning are experimentally investigated, as well as a classification among the most important game design problems. To better understand not only the problems surrounding video but also virtual reality gaming, an interactive experience engine was created, as well as a traditional double arcade game called breakthrough season, which was transferred as a study case. Based on Newton's laws of physics, control mechanisms are supported here between the application's visual effects elements. A measurable platform for playing engaging lobbed games using video visit places and virtual reality techniques is suggested to test the efficacy of our methodology. A general aviation experiment was undertaken to evaluate the effectiveness of every application, and the preliminary findings of the study are displayed.

As shown in Figure 1, the proposed system's architecture shows that the user and the real server will play a significant role. All the details related to the online games will be available in the database of games which is a part of the real server. These servers and the databases will be equipped with intelligent technology to make automatic suggestions of games by obtaining specific keywords from the user. These servers will have games of varying types in a local classified block. The variety of games may range from two-dimensional to augmented reality, in terms of cost, game size, complexity, and many more. The user can select the game as per their requirements. The real server will be connected to the cloud computing platform to make the playing process easier. Playing games at a higher level directly on the server may cause specific issues. Cloud concepts are utilized to avoid unpredictable disturbances to the system. Depending on the complexity of the game, the automatic decision of cloud execution is made. Not all games may need cloud execution. Administrators will be available to monitor and control the cloud, real server, and database. The details about the users will be available in the database, and hence, depending on the details, the users will have login credentials. If a game has multiple levels, login credits will indicate whether the user has to make the payment or not. Users who have mobile phones will be able to play games. To play virtual reality games, the user will need specific types of equipment to play (depending on the game they play). In the updated technological world, each game may have special equipment like gloves, glasses, and many more with inherited technologies that make the users feel the environment through virtual reality technology.

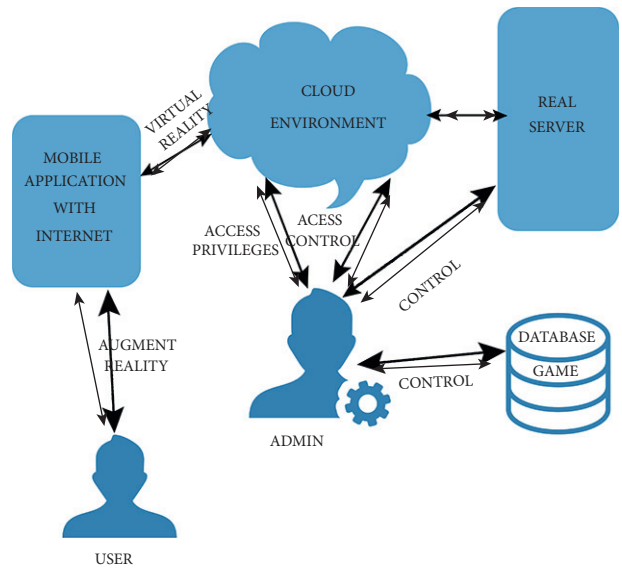

Figure 1: Architectural diagram of the proposed system.

Whereas, augmented reality is a combination of the physical world with the virtual elements of the computer. Augmented reality games can be played on mobile phones with the concept of superimposing images. The games are designed with attractive colours and make the users curious to know the toughness of the next level of the game. This curiosity will make the user play games for a prolonged duration and may result in addiction to game playing. Curiosity is the term that pricks the inner child of every human being while surfing on social networking sites, where they may receive requests from their friends to play. This may result in the continuous playing of either individual or group games online. Users who are willing to play games in the online mode will access the games through mobile Internet facilities. Most online games, which the user prefers, might be available in the cloud environment instead of direct access to the cloud server. To access the game resources, the user should obtain user credentials by registering themselves on the gaming website. According to the credentials, the user will be allowed to play the game in that mode. To make a user play a database game, a user will have to possess both the credentials and the required environmental setup as specified by the game creators. However, with the available credentials, the user can be provided with a virtual environment in both the paid and unpaid modes. In this scenario, the paid version of the game will contain limited provisions and resources to play the game. On the other hand, when the user gains interest in the game, he will be ready to change from unpaid mode to paid mode, and hence, he will get maximum control over the activities and resources of the game. As a result, the user has complete control over the database games.

T0 and E0 reflect the time and price limits of player i, and $\widetilde{\theta}_j^{-i}$ represents an estimate of the grand sum of bids from other contenders. The effects of price are indicated by equation (2), but instead (3), as well as the time on player i's put in an offer. Both of these equations revealed that the classification bid e_{in} is obtained in comparison to

competitors' preceding competitive bidding $(j<n)\widetilde{\theta}_j^{-i}$, present θ_n^{-i}, and the future $\widetilde{\theta}_j^{-i}$ $(j>n)$.

$$\widetilde{\theta}_1^{-i},\ldots,\widetilde{\theta}_n^{-i},\widetilde{\theta}_{n+1}^{-i},\ldots,\widetilde{\theta}_m^{-i}, \tag{1}$$

where $\widetilde{\theta}_{n+1}^{-i},\ldots,\widetilde{\theta}_m^{-i}$ is an estimate of competitive tenders.

To simplify thinking and problem solving, it is presumed, but others in the network stay unchanged; as a result, the game is modeled as a static play with full information. However, because such matters are farther in the reality and contenders try to obtain its most utility, in practice, the knowledge of the environment is incomplete, so an estimate of the grand sum of bidders by other contenders especially in comparison to their previous era should be acquired is based on the past $F(\Theta)$ and its consistency function $F(\Theta|\Theta_n)$, as shown in the following equation.

$$F(\Theta|\Theta_k)=\frac{F(\Theta|\Theta_n)F(\Theta)}{\int F(\Theta|\Theta_n)F(\Theta)\mathrm{d}\Theta}. \tag{2}$$

The supervised learning method can be used to calculate $F(\Theta|\Theta_k)$. The nearest quantity of energy price could be expected using probabilistic learning, and subsequent bidders could be estimated as in the following equations.

$$\widetilde{\theta}_{n+1}^{-i}=D(\Theta|\Theta_k)-D\left(e^i\right)\cdots, \tag{3}$$

$$\widetilde{\theta}_{n+1}^{-i}=D(\Theta|\Theta_{m-1})-D\left(e^i\right)\cdots, \tag{4}$$

where $D(e^i)$ denotes the vector of bidders made by player i. The three parameters α_n^i,β_n^i, and γ_n^i are described as rival company knowledge and is calculated in the following equations, respectively.

$$\alpha_n^i=\sum_{j=1}^{n-1}C_j^i\theta_j^{-i}+\sum_{j=n+1}^{m}C_j^i\widetilde{\theta}_j^{-i}, \tag{5}$$

$$\beta_n^i=\sum_{j=1}^{n-1}C_j^i\sqrt{\theta_j^{-i}}+\sum_{j=n+1}^{m}C_j^i\sqrt{\widetilde{\theta}_j^{-i}}, \tag{6}$$

$$\gamma_n^i=\sum_{j=1}^{n-1}C_j^i+\sum_{j=n+1}^{m}C_j^i. \tag{7}$$

By substituting C_j^i in $F_n^i(\Theta_n)$ in equation (2), the operate effectively $F_n^i(\Theta_n)$ is acquired as described in the following equation.

$$F_n^i(\Theta_n)=\frac{\left(D_0-\alpha_n^i-C_j^i\Theta_n\right)^2}{2\left(\beta_n^i\right)^2}\left(\sqrt{1+\frac{4\left(\beta_n^i\right)^2\Theta_n}{\left(D_0-\alpha_n^i-C_j^i\Theta_n\right)^2}}-1\right). \tag{8}$$

In reality, feature $F_n^i(\Theta_n)$ means that the proportion of reliance of bidders is not solely on the budget and also decided to offer quantity that can modify within next stage due to changes in responsibilities. By simplifying the above equation and applying derivation, ultimately, the value of $A_{ij}=A_{ij}\sqrt{(\theta_n^{-i}/\theta_j^-)}$ will be obtained.

Two-dimensional similar byproduct with regard to value parameter is

$$A_{ij}=\frac{L_0-\sum_{j=1}^{m-1}N_j^i\theta_j^{-i}-N_m^i\theta_m^{-i}-\sum_{j=m+1}^{n}N_j^i\theta_j^{-i}}{\sum_{j=1}^{m-1}N_j^i\sqrt{\left(\theta_j^{-i}/\theta_m^{-1}\right)}+N_m^i+\sum_{j=m+1}^{n}N_j^i\sqrt{\left(\theta_j^{-1}/\theta_m^{-i}\right)}},$$

$$\text{mean}=\frac{\sum_{j=m+1}^{n}N_j^i\theta_j^{-i}}{N_m^i+\sum_{j=m+1}^{n}N_j^i\sqrt{\left(\theta_j^{-1}/\theta_m^{-i}\right)}}, \tag{9}$$

$$\sigma=\sqrt{\frac{\theta_j^{-i}}{\theta_m^{-1}}+N_m^i+\sum_{j=m+1}^{n}N_j^i\sqrt{\frac{\theta_j^{-1}}{\theta_m^{-i}}}}.$$

Standard deviation is represented by σ.

Three-dimensional similar byproduct with regard to value parameter is

$$A_{in}=\frac{\sum_{j=1}^{m-1}N_j^i\sqrt{\theta_j^{-1}\theta_n^{-i}}+N_n^i\theta_n^{-i}+\sum_{j=n+1}^{n}N_j^i\sqrt{\overline{\theta}_j^{-i}\theta_n^{-i}}}{A_0-\sum_{j=1}^{n}N_j^i}. \tag{10}$$

Besides substituting C_j^i in equation (3) with Θ_n-e_{in}, the feature $g_n^i(\Theta_n)$ is obtained, which conceptualizes the offer according the time limit as in the following equation.

$$\begin{aligned}g_n^i(\Theta_n)=&\frac{C_j^i}{A_o-\gamma_n^i}\Theta_n\\&+\frac{\sqrt{\left(\beta_n^i\right)^2+4\left(\beta_n^i\right)^2\left(\left(A_0-\gamma_n^i\right)-\left(A_0-\gamma_n^i-C_n^i\right)\right)\Theta_n}}{2\left(A_0-\gamma_n^i\right)^2}\\&-\frac{\left(\beta_n^i\right)^2}{2\left(A_0-\gamma_n^i\right)^2}.\end{aligned} \tag{11}$$

This elevated conformity equality function is dependent on and demonstrates that since no funding limit is set for the purchase price, it can keep growing restrict as well as time limit, which is written as follows: if θ_j^i is assumed as the payoff, all players tend to have the most speed in task execution. Therefore, the least payoff is for the best choice. On the other hand, if the price is considered as pay off F_j^i, the most cost constantly dominates alternate strategies as in the following equation.

$$\varphi=\frac{\left(\rho_e,In\sum_{j=1}^{n}F_j^i+\rho_tIn\sum_{j=1}^{n}\theta_j^i\right)}{\rho_e}. \tag{12}$$

Because the goal of all players is to save time and cost, the overall desirability purpose of a player i is $\min\varphi$, which is calculated using the following equation.

$$\begin{aligned}&\text{Player to }\sum_{j=1}^{n}A_j^i\le L_0,\\&\sum_{j=1}^{n}F_j^i\le G_0.\end{aligned} \tag{13}$$

In order to acquire the allocation of resources, the following equations are utilized.

$$G = \varphi + \theta_e^i \left(\sum_{j=1}^{n} A_j^i - L_0 \right) + \theta_t^i \left(\sum_{j=1}^{n} F_j^i - g_0 \right), \tag{14}$$

$$\frac{\partial G}{\partial A_{ij}} = \frac{\rho_e}{\rho_e + \rho_t} \cdot \frac{N_j^i}{\sum A_{ij}} - \frac{\rho_t}{\rho_e + \rho_t} \cdot \frac{N_j^i \theta_j^{-1}}{\sum F_j^i A_{ij}^2} + \theta_e^i N_j^i - \theta_e^i N_j^i - \theta_t^i \frac{N_j^i \theta_j^{-i}}{A_{ij}^2} = 1. \tag{15}$$

3. Results and Discussion

The study investigates the effect of the social gathering of mobile game augmented reality (AR) and virtual reality (VR) environments on the addictive behaviors of mobile subscribers. On that basis, this study employs a qualitative research methodology of social function enhancement and VR, as well as computational statistics analysis, to investigate the situation of mobile game addiction. A collision detection algorithm (CDA) with machine learning is suggested in this scientific work. The collision detection algorithm is used in games that support virtual, augmented, and virtual reality technologies to detect the connection between two objects in such a virtual environment. The perception of reality in playing games is thought to be obtained from social networking (cloud) websites, which may lead to the person becoming addicted to playing. This study concentrated on the evaluation of AR and VR-related games using mean, standard deviation, and error parameters.

The first part of the questionnaire included multipurpose questions focused on understanding users' attitudes towards all kinds of games, such as conventional and video games. It is indeed worth noting that there is a whole crop of kids who grew up with online technology, and as a result, they are predicted to be more encouraging.

It is certain that 80% of users prefer to play board games, while 70% prefer to play video games. Surprisingly, only 54% of people play conventional games on a regular basis, while 62% favor video games. This is an interesting statement because, despite living in a society where video games appear to be popular, users still favor older games. However, due to several factors (including cost, excitement, accessibility, and visual effects), most players would prefer online games. Without a doubt, AR appears to present an alternative solution to users' needs by combining traditional and gaming consoles.

Breakout of VR vs. AR efficiency (Figure 2) depicts the very first correlation that compares the stream processors efficiency of the two experimental application areas. Figure 2 shows that the user response takes the VR split into account (mean = 5.4, SD = 0.98302, SE = 0.41351) which is significantly more efficient than the AR breakout (mean = 3.7, the standard deviation is 2.35565, and the standard error is 0.48324). This was a foregone conclusion (Table 1) because the 3D breakout requires less processing power than AR

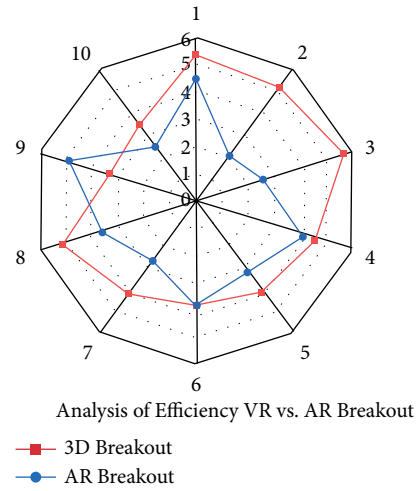

Figure 2: Analysis of efficiency VR vs. AR breakout.

Table 1: Result analysis of efficiency VR vs. AR breakout.

Mobile game	Mean	Standard deviation	Standard error
AR breakout	3.7	2.35565	0.48324
VR breakout	5.4	0.98302	0.41351

breakout as much or more computing capability as a result of video and image processing activities such as video capture and video combining.

The second similarity seeks to assess the overall usefulness of 2 different prototypes in order to identify who is more enjoyable to play, as shown in Figure 3. According to Figure 2, there is also no strong preference in user behavior (Table 2) between both the VR breakout (mean = 4.6, SD = 0.74551, SE = 0.35185) and also the AR breakout (mean = 4.3, SD = 1.57221, SE = 0.34376). It is important to note that five consumers favored the AR application, two or more users favored the VR breakout, and three consumers saw no variance.

Regarding that, the quality of realism in terms of visual was determined, as shown in Figure 4. Eventhough both processes used that graphic design engine, most consumers favored the traditional way of presenting graphics in the case. The VR breakout (mean = 4.2, SD = 0.85625, SE = 0.47215) received a marginally higher score than the AR breakout (mean = 3.6, SD = 0.936142, SE = 0.14785). The primary reason for this is that AR breakout application combines a computer graphics scenario (Table 3) with a series of images captured by a low-resolution webcam (740484, 1.5 MP). The merging procedure drastically reduces the realism of graphics displayed in the AR scene, but if a high-resolution image is used, the realism is restored.

Figure 5 shows the results of a fourth quantification, which compares respondents' ability to study how else to play the breakout performance. Although neither system is considered an instructional game, users can learn different sets of skills about how to play the game. Amazingly, most regular contributions are that the AR breakout (mean = 4.7, SD = 0.73548, SE = 0.35678) is much easier to adjust and improve to than VR breakout (mean = 4.1, SD = 0.953372,

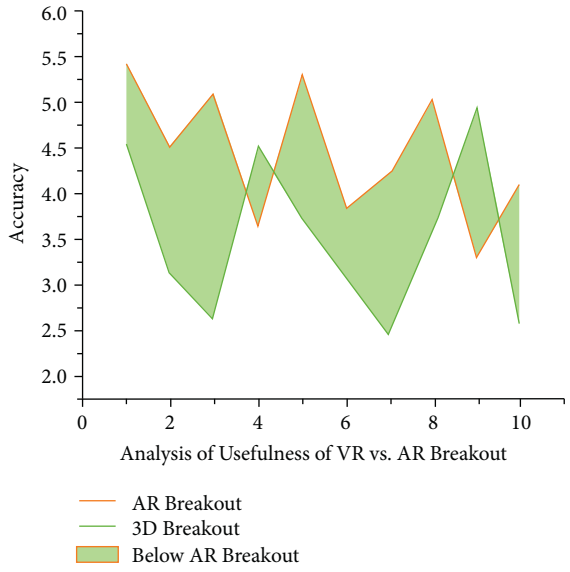

Figure 3: Analysis of usefulness of VR vs. AR breakout.

Table 2: Result analysis of usefulness of VR vs. AR breakout.

Mobile game	Mean	Standard deviation	Standard error
AR breakout	4.3	1.57221	0.34376
VR breakout	4.6	0.74551	0.35185

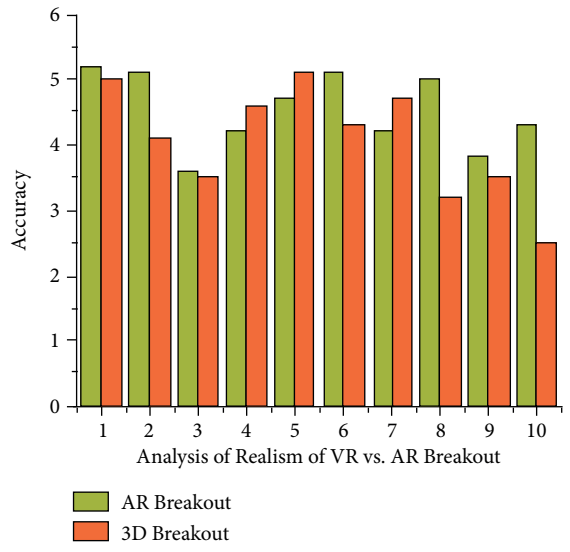

Figure 4: Analysis of realism of VR vs. AR breakout.

SE = 0.256347). This is worth noting that a latest survey of surgery prescribers revealed that they will have stronger reactions after 30 minutes of playing a video game (Table 4).

Moreover, as shown in Figure 6, collaborative and interactive techniques in both VR and AR playing games were evaluated. Once more, the AR breakout (mean = 4.2, SD = 1.0328, SE = 0.3266) scored (Table 5) was significantly higher than the VR breakout (mean = 3.1, SD = 1.59513, SE = 0.50442). The immediate explanation is being that the AR breakout enables tangible manipulations by combining standard I/O devices such as the touchpad with access points

Table 3: Result analysis of realism of VR vs. AR breakout.

Mobile game	Mean	Standard deviation	Standard error
AR breakout	3.6	0.936142	0.14785
VR breakout	4.2	0.85625	0.47215

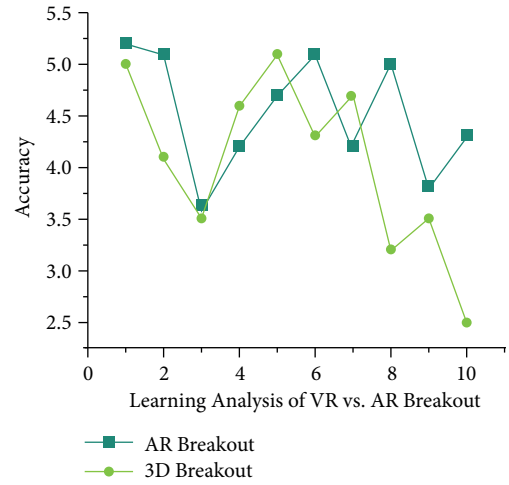

Figure 5: Performance learning analysis of VR vs. AR breakout.

such as permanent marker cards. Communication within the VR breakout, on the other hand, is restricted to standard I/O relationships.

Eventually, the camera movement was evaluated by comparing, and also, the results are shown in Figure 7. The camera in the VR breakout can be manipulated as well as positioned anywhere else in the digital environment by only using predefined shortcut keys. Users of the AR breakout, on the either hand, must physically move the web camera inside the real world. As predicted, the camera manipulation methods (Table 6) in VR breakout (mean = 4.8, SD = 2.68754, SE = 0.39873) appear much more user-friendly than those in AR breakout (mean = 3.9, SD = 1.65073, SE = 0.39638), owing to the fact that most users were used to moving a physiological web camera.

For exploring the virtual environment and the length of game participation experience, there are significant differences between different categories. This shows that different types of game participants have significant differences in the acceptance of game experience content under VR and AR technology. In short, the interactive ability of the experiencers in the virtual exploration category and the experiencers in the interactive category is strong, but game participants in the virtual exploration category spend considerable time exploring the virtual environment. In particular, it is important to note that the number of interactions between different categories of game participants, the exploration of virtual environments, the success rate of interaction, and the duration of the game participation experience are different. Game experiencers can adjust the experience time between interactive performance experience and virtual environment experience. The comparison suggests that the success rate of interaction is relatively low, so it can be concluded that the mastery of

Table 4: Learning result analysis of VR vs. AR breakout.

Mobile game	Mean	Standard deviation	Standard error
AR breakout	4.7	0.73548	0.35678
VR breakout	4.1	0.953372	0.256347

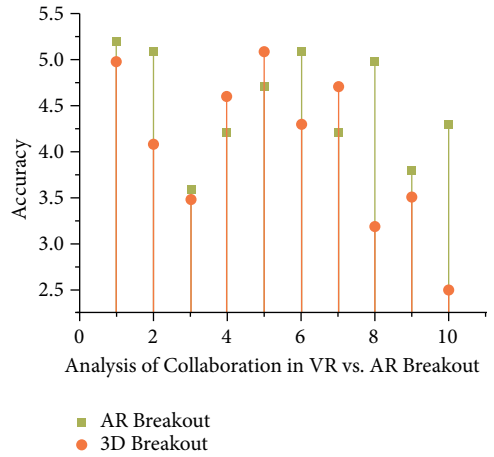

Figure 6: Performance analysis of collaboration in VR vs. AR breakout.

Table 5: Result analysis of collaboration in VR vs. AR breakout.

Mobile game	Mean	Standard deviation	Standard error
AR breakout	4.2	1.0328	0.3266
VR breakout	3.1	1.59513	0.50442

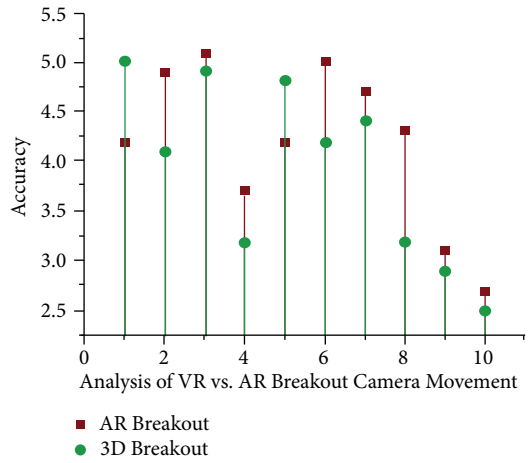

Figure 7: Performance analysis VR vs. AR breakout camera movement.

Table 6: Comparison result analysis VR vs. AR breakout camera movement.

Algorithm	Mobile game	Mean	Standard deviation	Standard error	Accuracy
Collision detection algorithm	AR breakout	3.9	1.65073	0.39638	98.99
	VR breakout	4.8	2.68754	0.39873	98.97
Existing method: image classification method	AR breakout	2.8	0.3523	0.1324	96.12
	VR breakout	3.5	1.2133	0.1423	96.01

interactive performance of game participants in the virtual exploration category is very common. However, there are two reasons for the longtime addiction of virtual exploration game participants in VR and AR game experiences: the acceptability of game content and the participants' desire for knowledge of the virtual environment from the side, which

further stimulates the exploration psychology. Compared to the existing method, our proposed method provides the best overall accuracy for the existing method (96.01%) for VR breakout and 96.12% for AR breakout. In this proposed work, AR breakout overall accuracy is 98.99% and VR breakout overall accuracy is 98.97%.

4. Conclusion

With the rapid development of science and technology, various new technologies emerge endlessly. The development of AR and VR has become a trend. In this research work, the comparison of mobile games with augmented reality and virtual reality is performed by considering the mean, standard deviation, and standard error as the parameters. On this basis, the study explores the influence of the social function of mobile game AR and VR environments on mobile phone users' addiction. The longer the game experience, the deeper the addiction of mobile users. The limitation of this study is that the survey sample is too narrow, and the number of samples is also small, which has a certain impact on the results of this study. It is believed that the future research can avoid these problems and conduct relevant research from multiple perspectives and levels.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

This study was supported by Foundation for 2021 Henan Province Key Science and Technology Project (212102310984 and 212102310911) and General Topics of the 13th Five-Year Plan of Educational Science in Henan Province (2020YB0635).

References

[1] R. C. El-Kassem, "Factors influencing reading news on the mobile devices in Qatar in light of augmented reality (AR) & Virtual reality (VR)," *International Journal of Advanced Research in Engineering & Technology*, vol. 11, no. 5, 2020.

[2] A. R. Games, "Characteristics of game transfer phenomena in location-based," *Augmented Reality Games I: Understanding the Pokémon GO Phenomenon*, p. 15, Springer, Berlin, Germany, 2019.

[3] J. Hamari, A. Malik, J. Koski, and A. Johri, "Uses and gratifications of pokémon go: why do people play mobile location-based augmented reality games?" *International Journal of Human-Computer Interaction*, vol. 35, no. 9, pp. 804–819, 2019.

[4] B. Heller and A. Bar-Zeev, "The problems with immersive advertising: in AR/VR, nobody knows you are an ad," *Journal of Online Trust and Safety*, vol. 1, no. 1, 2021.

[5] Y. Jang and E. Park, "An adoption model for virtual reality games: the roles of presence and enjoyment," *Telematics and Informatics*, vol. 42, Article ID 101239, 2019.

[6] Y.-H. Lin and H.-C. K. Lin, "Using an augmented-reality board game for drug addiction prevention at a university in Taiwan," in *Proceedings of the International Conference on Innovative Technologies and Learning*, pp. 24–32, Springer, Tromsø, Norway, December 2019.

[7] M. Ma, L. C. Jain, and P. Anderson, "Future trends of virtual, augmented reality, and games for health," in *Virtual, Augmented Reality and Serious Games for Healthcare 1*, pp. 1–6, Springer, Berlin, Germany, 2014.

[8] C. H. Miller, *Digital Storytelling: A Creator's Guide to Interactive Entertainment*, CRC Press, Boca Raton, FL, USA, 2019.

[9] J. Park and D. Ko, *Catch Me if You Can: Effects of AR-enhanced Presence on the Mobile Game Experience*, Emerald Publishing Limited, Bingley, UK, 2021.

[10] M. J. Park, D. J. Kim, U. Lee, E. J. Na, and H. J. Jeon, "A literature overview of virtual reality (VR) in treatment of psychiatric disorders: recent advances and limitations," *Frontiers in Psychiatry*, vol. 10, p. 505, 2019.

[11] B. Samji, "Analysing immersion, presence, and interaction and its effects in augmented reality (ar) mobile games," M.S. thesis, University of Dublin, Dublin, Ireland, 2018.

[12] W. Tan, W. Li, X. Zhou, and X. B. Zhang, "Shifting from a computer game to a physical game: a case study of ePet," in *Proceedings of the 2008 International Symposium on Computer Science and Computational Technology*, vol. 2, pp. 335–338, IEEE, Shanghai, China, December 2008.

[13] M. S. Uddin, M. Rahman, M. N. Hasan et al., "AR & VR based child education in context of bangladesh," *Saudi Journal of Engineering and Technology*, vol. 4, no. 12, pp. 514–521, 2019.

[14] X. Zhai, F. Asmi, J. Yuan et al., "The role of motivation and desire in explaining students' VR games addiction: a cognitive-behavioral perspective," *Mathematical Problems in Engineering*, vol. 2021, Article ID 5526046, 10 pages, 2021.

[15] X. Zhai, M. Wang, R. Zhou et al., "The nexus between VR affordability, cognition, and VR addiction: a gaming perspective," in *Proceedings of the 2020 6th International Conference of the Immersive Learning Research Network (iLRN)*, pp. 116–124, IEEE, San Luis Obispo, CA, USA, June 2020.