Available online at www.ijapas.org

IJAPAS

International Journal of Applied Arts Studies

IJAPAS 5(3) (2020) 15–30

The Role of Virtual Theatre Components on Scenery Quality of Virtual Theatre using Austin Wang's Approach

Sara Noori[a], Mohamad Ali Khabari[b]*

[a]*Ph.D. Student, Faculty of Arts, Central Tehran Branch, Islamic Azad University, Tehran, Iran*
[b]*Assistant Professor, Faculty of Arts Jihad Board, Central Tehran, Islamic Azad University, Tehran, Iran*

Received 19 October 2020; revised 08 November 2020; accepted 07 December 2020

Abstract

Audience feedback in modern societies has fundamentally changed primarily due to developments in time and the process of replacing signs of virtual reality with reality has taken place. Moreover, there is an opportunity for a large number of audiences to be recognized and to actively engage with a few limitations. Meanwhile, the designers of some countries, due to the lack of attention to environmental, security, social and economic considerations, which are considered the most important aspects of using this function, have not been able to keep pace with the needs of their audience which resulted in diminishing this art. Therefore, the present article examines the fundamental changes and developments in security, economic and social methods of attracting and experiencing augmented reality and the performance of cyberspace in order to develop theater stage design, considering Austin Wang's works on the concept of place, its essentiality and time in theater. The research method is correlation, and statistical tests of Smirnov's Kolmograph, multiple regressions and Pearson correlation test were put to use so as to determine the relationship, intensity and direction of the relationship between independent and dependent variables. The results indicate that the "sense of helplessness" variable is the most effective variable on the virtual theater stage, and then, the second priority is the independent variable "environmental fluidity" and the third priority which is "color intensity" variable has the greatest impact on the scene. They have virtual theater production, and finally the following fourth to tenth variables are based on similar priority: "space scale and layout", "scene variety", "light quality", "imagination", "sound", "speed of movement" and "sense of innocence" which are necessary for the virtualization of the theater stage.

Keywords: Virtual Reality; Virtual Mis en Scene; Virtual theater; Austin Wang

* Corresponding author. Tel: +98-9125792004
E-mail address: ma.khabari@gmail.com.

1. Introduction

Human life has been always affected by technical developments and new achievements in different fields. Like any other sciences, are is also influenced by such effects. Modern art makes use of different and varied instruments to transfer different meanings and concepts. New computerized technologies play a significant role in dramatic arts dynamically and flexibly (Holten, 2005). Virtual reality has been also influenced both formally and aesthetically by visualized arts, photographic arts, theater and it was the source of many direct and indirect effects on these arts (Zellner, 2009). Although virtual reality has applied other artistic elements in its form and content, it is dissociated from other arts due to its exclusive features including mutual impact, multifaceted relationship between users, and the use of artificial intelligence. It's regarded as an independent art in itself (McEvilley, 2005). Upon the emergence of virtual reality in theatre in the 1960s, the basics of relations in the theatric world had undergone significant changes, and the relationship between space, actor, and audience, changes into the relationship between audience and space (C. Eisenhower, 2009).

Thereafter, the audience didn't ac passively in theatre; dramatic actions have been substituted by real ones and the audience played an active role regarding how to do the actions (Shakener, 2007). Indeed, digital and virtual theatre not only attempts toward preserving values of traditional and classic theatre but also, tries to rejuvenate that because it considers more prominent goals such as attracting a higher number of audiences and responding to the natural needs of the new generation of audiences (Pantley, 2002). Despite the novelty of the branches of digital media, modification and extension is increasingly growing in different domains. The only problem here is not the interaction form of digital technologies with the world of theatre, but also it concerns having an impact on modern performances and changing meaning through the provision of new potentials in expressing ideas; that's because the interactive platform is the main feature of contemporary arts combined with computerized technologies (Nadel, 2013).

Even though digital media is considered as a product which had a delayed arrival in Iran, but insufficient studies have been undertaken to study the basic evolutions and modifications required in security, economic, and social domains to enhance the performance of the virtual world in theatre and especially to develop the scenery design. Therefore, the main objective of the present study is to find out the basic impacts of virtual reality in theatre and especially in theatre scenery design.

2. Theoretical Foundations

2.1. Virtual Reality

Virtual reality is defined as a kind of technology in which a virtual environment will be displayed in front of users; eyes and the user would be able to interact with the virtual world through moving head and body. In other words, as soon as an individual installs a virtual reality headset on his head, s/he will see an environment which changes according to any change in his/her physical position, and the human's mind will gradually learn and accept that it's a real-world, but a virtual one (Cavallo and Couch, 2004). In the physical world, the scales will be measured through the proportion of elements' size to the user; however, in the virtual world, is not endowed with any intrinsic dimension; therefore, the scales in the virtual world will be determined according to the speed of users' movement (Carrol, 2006). Besides, new forms of communities will be formed in the virtual world and they give way to gendered, racial, and existentialist modern relations. In this world, the user would be able to create a new personality for himself, the one which would be

different from his/her gender, race, social class, and the physical world he/she belongs to (Sutton, 2005).

Fig 1 Hologram - Reverse Kinematics is used to express an avatar by recording the movement of the head, wrist and ankle (https://www.dezeen.com/2017/03/07/es-devlin-map-backdrop-set-design-ugly-lies-the-bone-play-virtual-reality-london-national-theatre/)

A virtual reality environment is created by wearing a virtual reality headset and using particular applications. Some of these environments are in the form of computerized and three-dimensional graphics and others are only 360 degrees videos or photographs from real-world which have been recorded recently. This virtual reality capability made individuals capable of watching your location and facilities very well. One of the common mistakes in recalling virtual reality technology is calling it "augmented reality" (Szilas, 2005: 194). Augmented reality is a kind of technology in which the 3-D picture or information in the form of a text or picture will be displayed on a vibrant picture which is going to be displayed through mobile phones' or tablet's camera. Of course, this technology is accompanied by its limitations which slowed down its development and popularity (Alan et al., 2009). On the other hand, virtual reality is the integration of three-dimensional content and recorder pictures from the environment through virtual reality applications and using the cameras located at the back of mobile phones (Szilas et al., 2007: 6).

Fig 2 A virtual exhibition of Van Gogh works (www.worlds - Aerial hoop performer in Emily Carr University Concourse Gallery.com)

Virtual reality has been introduced from the beginning of the 1980s and its environment being developed through the computer didn’t exist, but the audience gained a realized conception from

that. The design of virtual reality wasn't limited to computerized games and this technology is used in different domains nowadays, it dominated different scientific and artistic domains as well as television studios, cinema, and animation and it eventually emerged in theatre which remained unknown so far (Changhoon et al., 2003).

The idea behind using this performance has been first applied in 1990 to experience a fight with full details and this simulation has been first applied by the USA air force (Childs, 2009).

The virtual world is detached from the complexities and difficulties of the real world. It's a kind of environment detached from earthly qualities that don't require material properties and some limited structures of the real world. There isn't any suitable instrument in the virtual world requiring an enclosed level, defining a particular kind of design. Besides, there's no graphic limitation in the virtual world and no boundaries are defined (Darroch, 2008: 96).

2.2. Virtual Theater

The first dominant study which diverted human's attention toward the theatrical quality of human-computer mutual interaction was "Computers as Theatres" in 1990 by Brenda Lorel. Virtual theatre is a simulation of a situation that is experienced by the audience in the real world. Since playing the role of multiple network terminals by playwrights or actors occurred just recently, the virtual theatre not only experiences the observer inside the artwork but also allows him to be present inside the picture and control it to some extent (Coates, 1992).

Though the theatric virtual reality experienced by the audience is the product of simulation, but the impacts of such simulation on the audience are high. According to reality, what is seen and interpreted is the same as a simulated artifact; however, it lacks the real affair which impacts the observer (Dixon, 2006). Furthermore, virtual reality theatre immerses the common temporal and spatial functions in the art. In virtual reality theatre, we're faced with computerized terminals and video monitors, not a distinct existence from here and there (Eaket, 2010).

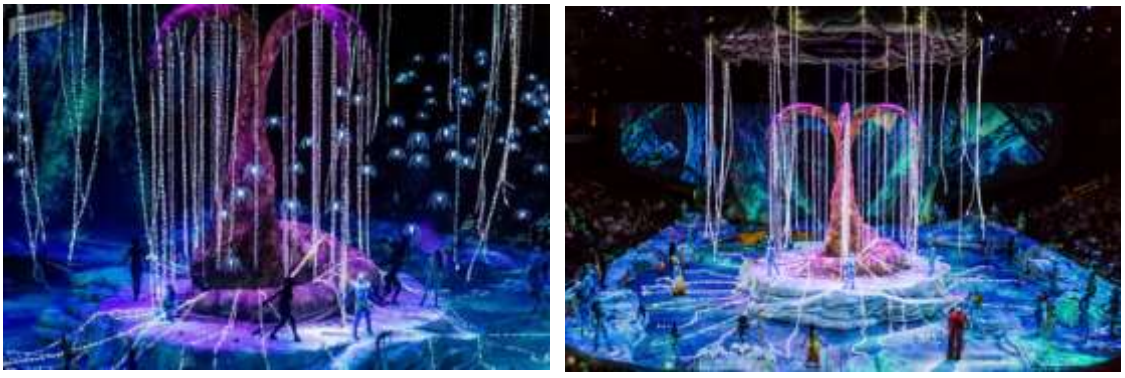

Fig 3 Performing "Sun Circus" in Paris using optical laser and hologram systems (www.Worlds-Avatar dancer holding the miniature avatar of aerial hoop performer)

Thus, the mere existence of virtual reality challenges our conception of space and the world and implements the basic idea and premise of this art, i.e. "being phenomenal" and "commenting on a space"(Eversmann, 2011). As argued by Peter Wible, the media including cinema, video, and finally computer do all concern lack of location, while classic art is solely concerned with location and locating (Glusker, 2006). Another problem to be discussed concerning the design of virtual

worlds is how much they must be real and how much their architecture to be affected by the physical architecture. This architecture must be different from the physical world, on the one hand, to make use of its potentials in the best possible manner and to revitalize the user's imagination through that (Rebelo et al., 2011: 383).

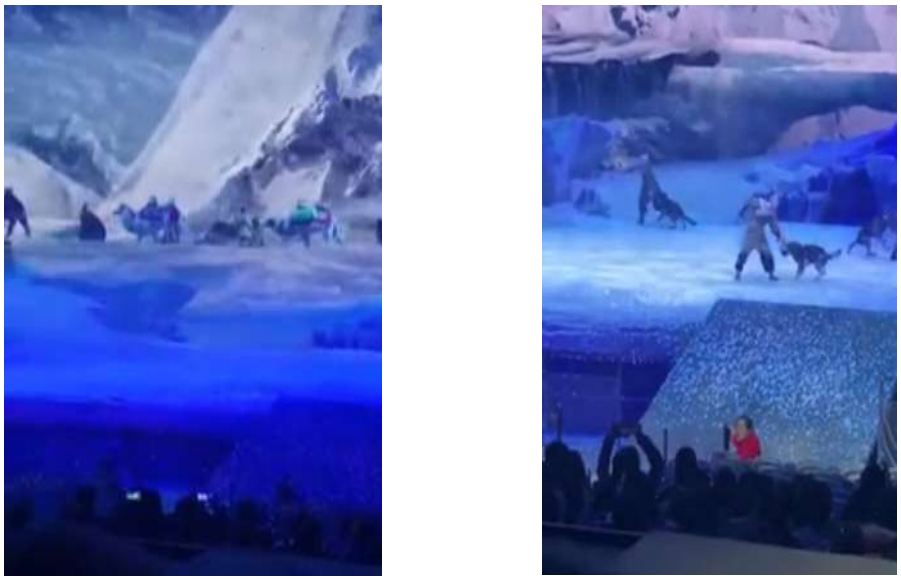

Fig 4 Theater performance with artificial intelligence (www.Picture from Terranova by CREW_Eric Joris (© courtesy of Stefan Dewickere)

Theatre occurs within the constraints of time ad space on the scene, a statute is built in the space, just like an architectural work. However, from the 1840s on, since the emergence of the telegraph, it has been made possible to dissociate the message from its sender. Modern aesthetics concerns a lack of location. Messages are dispatched from a locus to another (Grau, 2003).

Interestingly, virtual reality theatre occurs both in real locations and a new one due to recurrent transfer of the theatrical experience. It undertakes an artistic task. The audience is capable of playing a different role, as part of artistic work and through a location change. The audience will observe a phenomenon in the short run that has a clear beginning, middle, and end (Holloway, 2010).

2.3. Virtual Scenery

The computerized tools and instruments are extensively used in scenery design. The design instruments are all under rapid development and use at the moment (Joff, 2009). For years, the scene designers made use of scene studios which applied technical design function for their architecture; however, nowadays they use 3-D modeling software to create scene models. This 3-D software and applications are used to transform simple designs into realistic designs with an unbelievably high number of details (Milgram and Kishino, 1994).

During the history of theatre, technological innovations incurred different kinds of transformations on scene design, just like stage lighting science has moved from normal lights to electronic ones and developed toward combining lights along with more complex control systems. Lighting and its nature have undergone many changes over time (Lovell, 2000). The spontaneous

and precise changes in lighting quality helped the designers to increase the number of lighting sources and the complexity of control commands. The ease of implementation will allow the lighting scenarios to reflect precise variations including lighting variations throughout the day, roles' psychology, or even the scenery. The most advanced lighting facilities will allow a unified tool to vary the intensity, color, sound, and motion to a new focal point which endows the designers with full flexibility (Masura, 2007).

Fig 5 Performing a theater scene with a hologram system (www.Worlds - Avatar dancer holding the miniature avatar of aerial hoop performer)

Using the new media, one can prepare scenes, in which we'll be capable of changing location and position, just lie the cinema. Accordingly, we can move from a particular time to another and create supernatural spaces that are compatible with the physical rules of the world around us (Onyesolu and Eze, 2011). We'd be able to develop fluid and variable environments displaying the expressionist works of art and combining the character's thoughts. This ode of scenery would exactly transfer the playwright's intentions and mindset to the scenery. Besides, we can intend different locations and realistic for each scene and not producing and performing plays in the same environment (Ogawa, 2001).

2.4. Austin Wang Virtual Scenery

This Thai scene designer has been awarded Cloud Gate as the best artistic achievement through three decades of artistic endeavor in creating extraordinary patterns. Wong was enthusiastic about scene design. He moved to the USA to study in scene design and lighting at South California's School of Performing Arts. He suggests that "a good location can help people with its good performance to appreciate art and culture and it's regarded as an important criterion for the development of each society.

He designs the scene in the "dance of cloud" theatre in the form of a magical room which reiterated its poem. He reproduced an unbelievably artistic scene using virtual technology and the traditional tools for dancing of clouds (Kelly, 2015).

Some moments before the theatre just starts, space will gain a deep light and all the audience will remain silent. The audiences who are waiting for real space will enter another world. In Wong's viewpoint, this is a real play, a symbol of a particular time or space, with both temporal and spatial features being included in the virtual reality and the purpose is to create an integrated outlook and sensation to produce a play. A particular scene design must reflect the scenario's flavor and taste at the same time it interprets the play itself (Packer, 1999).

Fig 6 A scene designed by Wang for drama performances (right); Austin Wang's stage design based on Jimmy Liao illustrated "Sound of Colors" (left) (https://taiwantoday.tw/news.php?unit=20&post=26520)

One of the significant characteristics of Wang was his capability in transferring self-design philosophy and encouraging others to follow its competencies. Che Ko Chien, Wong's colleague argues that "working with Wong is challenging because his designs don't allow me to use conventional lighting styles and overcoming technical problems will deprive me of creativity when a director doesn't like his design concepts, most of the scene designers want to ask "So, what do you want?" but, Wong won't discard his ideas and will justify the scene director about creating a proper atmosphere and feeling for film production." Innovation and his clever use of a rotation stage which will make changes in the scene are always beyond the audience's expectations. He can transfer the audience to a world that is going to be portrayed by the play (Reaney, 2000).

3. Research Background

In his MA dissertation entitled "The Use of Digital Technology in Theatre", Hashemi (2011) studied the use of computerized and digital technologies in theatre. It has been argued in this study that theatre will grow using such instruments as well and will provide a definition of theater in the digital world. Another step taken in this study is the introduction of various theatrical groups being active in digital theatre. Then, the interaction between theatre and technology is investigated and the impacts of technology on scenarios as well as stage design will be elaborated upon. The results illustrated that nowadays the use of digital technologies in theatre will be a continued affair, through which the mentality and emotions will find a better place in the work of art (Hashemi, 2011).

In his MA dissertation entitled "An Investigation of Function and Aesthetics of Animation in Digital Theatre: Practical Implications for the game", Rahimi (2014) investigated the use of animation in digital theatre. To his end, at first, the historical-theatrical evolutions which resulted in the late 20th and early 21st century transformations have been clarified. To clarify animation evolution in this new medium, animation history has been investigated as well. The author

attempted to clarify the boundary between animation and technology by using theatre. By conducting a review of samples of digital theatre as well as performance arts, the author tries to elaborate upon the use of animation in theatre and other similar works of art. The results showed that most of the animation effects used in digital theatre have been previously implemented using optical and mechanical tools and animation developed such effects and made them more influential through the exertion of higher control. The most significant capability of technology and animation for the digital theatre is the possibility of interacting with mise en scène and digitally integrating features of other arts (Rahimi, 2014).

In his MA dissertation entitled "An Investigation of Functions of Digital Media in Performance Arts based on Steve Dixon Theories", Seydi (2018) studies the intended performance form based on Steve Dixon's theories using a descriptive-analytical approach and after a discussion on the definition of digital theatre. The results showed that digital theatre must be capable of being digitized from the beginning. It can't be considered as a digital performance without the existence of digital devices and instruments. Digital performances must be vibrant and lively. Without the presence of any live actor and events in the time dimension, we can hardly be able to discuss it as a kind of performance. Digital theatre must contain verbal elements, without which will turn to dance or musical performance. The use of multimedia technologies provides numerous opportunities for the scene (Seidi, 2017).

In his MA dissertation entitled "Introduction of a Digital Marketing Model in Art Marketing with Emphasis on theatre and Cinema and Investigating its Antecedents and precedents", Akhavan (2019) studied the process of introducing an indigenous digital marketing model in Arts. The main purpose was to study the precedents and antecedents of this model and identifying factors influencing digital marketing in art marketing. The method used in this study was a consecutive mixed one and consists of two qualitative sections at first and a quantitative section follows. In the qualitative section, digital marketing for Arts is presented in the qualitative part using grounded theory and the quantitative part includes the use of a survey and uses descriptive-correlational statistics. This topic has been generalized to society from a statistical viewpoint. The data collection instruments include an in-depth interview and questionnaire. The sample for this study consisted of quality executives of digital marketing organizations and companies, faculty members, and distinguished specialists in different domains of theatre, cinema, and their directors, producers, and audiences. The results showed that two variables have been identified in the causal and grounded circumstances section (including celebrities and development of digital tools) and a variable related to arts marketing has been identified as the focal phenomenon, campaigns have been identified as moderating variable and in practical and interaction section, two variables including content management and social media marketing have been identified which finally resulted in higher satisfaction and loyalty of the audience (Akhavan, 2019).

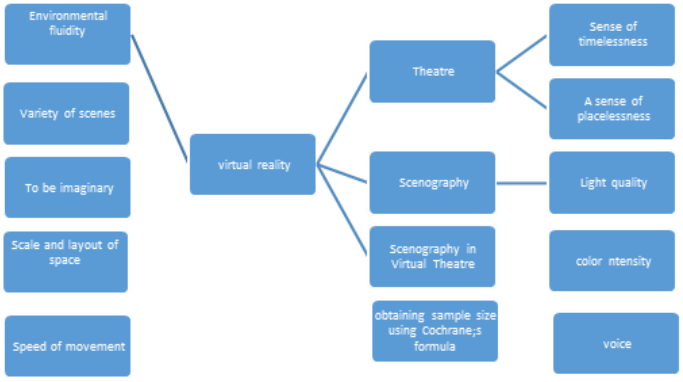

Fig 7 Conceptual model of research

4. Research Method

This study is applied in terms of its purpose. To assess factors influencing virtual theatre, a correlational research method has been used. To this end, the Kolmogorov-Smirnov test has been used to identify the normal distribution of data and linear regression statistical tests, and Pearson Correlation tests have been used to determine the relation and intensity and direction of the relationship between dependent and independent variables (Khaki, 1990: 335). Multivariate regression is a method used to analyze the holistic and individual cooperation within one or more (x) independent variables and in (y) dependent variable. Besides, the coefficient of determination (R^2) or determination correlation coefficient, or the amount of variance explained and variations of the dependent variable through the set of independent variables are displayed as well (Habibpour and Safari, 2009: 48).

After extracting the influential variables from theoretical foundations and conducting a review on related literature, a questionnaire has been prepared and has been used on a sample to study the significance of sing virtual design for theatre scene. Therefore, considering significant study variables including gender, education, socioeconomic status, cultural and political orientation, and the purpose of watching the theatre, participants' responses have been analyzed. Cochrane's formula (with an error coefficient of 0.05 and confidence interval or error percentage of 1.96) has been used to determine the sample size. 151 people participated in this study (male=38%; female=61%).

Fig 8 A schematic representation of the research method

Considering the dimensions and components of the virtual theatre and the discussed indices, 33 items have been designed and presented to the researchers and experts. The number of items reduced to 26 and the questionnaire's validity and reliability has been verified then. Cronbach's alpha has been used to ensure the questionnaire's reliability (r=0.87). The results of reliability coefficients for each study variable are included in Table 1.

Table 1 Reliability coefficient for study variables

Variable	Type of variable	Number of items	Cronbach's alpha
A sense of timelessness	Independent	2	0.873
A sense of placelessness	Independent	5	0.870
Lighting quality	Independent	2	0.868
Color intensity	Independent	3	0.875
Sound	Independent	3	0.863
Environmental fluidity	Independent	4	0.866
Variety of scenes	Independent	3	0.858
Imagination	Independent	2	0.872
Space decoration and measures	Independent	4	0.868
Speed of motion	Independent	1	0.877
Virtual theatre	dependent	4	0.849

Considering Chronbach's alpha value for each of the items, it can be concluded that the internal correlation of the items is high, i.e. project instruments are highly reliable.

5. Study Setting

Tehran's Theatre Complex which is known as Khavaran Theatre is the largest setting of professional theatre around the country which is located in Southeast of Tehran and the vicinity of Khavaran Cultural Center. Khavaran Theatre is the most professional entrance of the theatre in Iran which is built near to Khavarn Cultural Center. It's a cultural-art center which is used as the setting to host different international performance festivals. Khavaran theater has a capacity of 1000 people and it is also capable of holding musical theater, traditional theatre, performing symphonic orchestrates, and musical concerts. Khavarn Theatre includes an open amphitheater space in an area of 3500 square meters which has been included for religious and traditional plays. This theatrical complex has been selected because it's equipped with professional black boxes.

Fig 9 Tehran Theater Campus

6. Research Findings

The questionnaires first enquired individual participants regarding their familiarity with theatre. As evident from the following figures, it measures the number of times one has visited a theatre, their age, and their experience regarding virtual reality. There wasn't any significant difference between male and female participants in terms of their familiarity with theatre; however, as individuals get older, their familiarity with the internet and virtual reality will be lower. Therefore, aged participants preferred simpler and more eligible environments.

The results of the present study illustrated that virtual scenery design, as a modern area that has its particular audiences, and is more suitable for the lower-aged population because the audience can consider the scene as real and will be afflicted with shock and any other relevant problems.

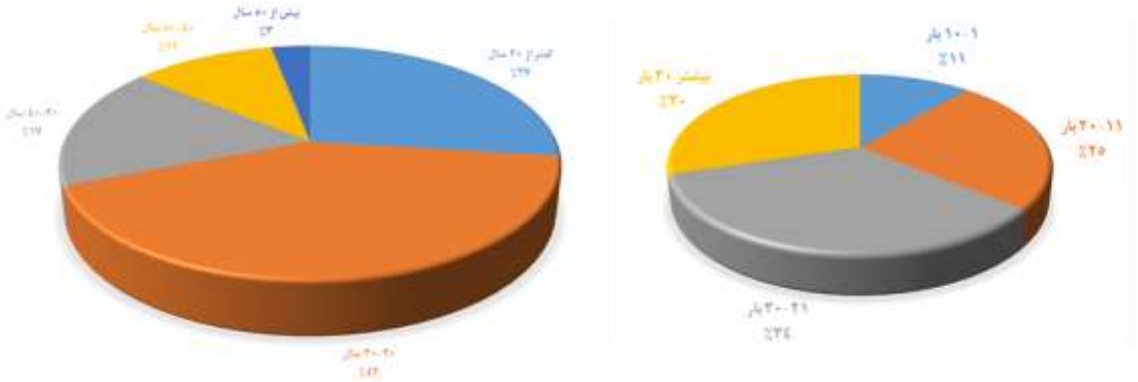

Fig 10 Distribution of the number of times individuals went to theatre concerning age variable

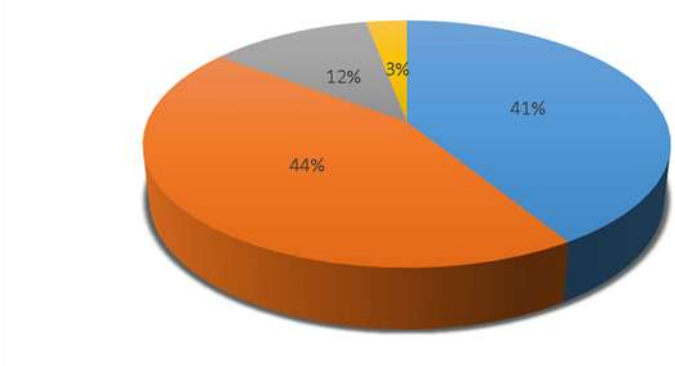

Fig 11 Distribution of participants' experiences in virtual reality theater

In this section, at first, the distribution of collected data must be identified, such that proper hypotheses and tests would be selected. To this end, the Kolmogorov-Smirnov test has been used. The formed hypotheses are as follows:

- H0= data distribution is normal
- H1=data distribution is not normal

Considering the above calculations regarding decision criteria, the values below 0.05 are significant and therefore the distributions are normal in a 0.95 confidence interval. Therefore,

considering the normality of data distribution as well as their measure which is continuous and interval, multiple linear regression and Pearson Correlation Coefficient tests are used to find out the relationships between dependent and independent variables, as well as the intensity and direction of such relation.

The following table (i.e. Table 2) displays the fit-related statistics including correlation coefficient, determination coefficient, moderated determination coefficient, and Errors' deviance. Considering the R-value of 0.928, one can argue that there's a strong correlation between study variables and there's no need to add another independent variable due to the possibility of predicting dependent variable through the same set of variables. Besides, the determination coefficient has been obtained as 0.861 which defines the variance explanation of the dependent variable. The moderated coefficient also states that all 10 variables obtained in this model seem to be appropriate for assessing the study's dependent variable.

Table 2 Summary of statistics for model fitness

Model	Z Kolmogorov-Smirnov	Determination coefficient	Moderated determination coefficient	Standard error of estimation
Study settings	0.928	0.861	0.833	0.23260

To define the model's significance variance analysis and F statistic is used. As it's evident from Table 3, the significance level of variance analysis is lower than 0.05; therefore, F is significant. Thus, independent variables enjoy a linear and independent combination of the dependent variable.

Table 3 Regression model's variance analysis

Significance level	F	Mean squares	Degree of freedom	Sum of squares	Model	
0.000	30.379	1.644	10	16.436	Regression	Scope of the study
		0.540	49	2.651	Residual	
			59	19.088	Total	

In this phase of the study, the Pearson Correlation Coefficient is used to study the relationship between independent variables through the data extracted from study participants. The correlation coefficient is a statistical instrument to find out the relationship between two variables and their intensity. The correlation coefficient displays both the direction of the relationship (either positive or negative) and its intensity (strong/weak). This coefficient is a number between (-1, 1) and equals zero in case there isn't any relationship between study variables.

Table 4 Correlation of independent variables

	A sense of timelessness	A sense of placelessness	Lighting quality	Color intensity	Sound	Environment fluidity	Variety of scenes	Imagination	Environment measures & decoration	Motion speed
A sense of timelessness	1									
A sense of placelessness	0.714	1								
Lighting quality	0.621	0.626	1							
Color intensity	0.412	0.453	0.421	1						
Sound	0.224	0.421	0.214	0.358	1					
Environment fluidity	0.625	0.568	0.721	0.325	**0.589	1				
Variety of scenes	0.306	0.215	0.210	0.112	0.545	0.056	1			

Imagination	0.307	0.112	0.214	0.245	0.216	0.215	*0.369	1		
Space measures & decoration	*0.605	0.118	0.245	**0.895	0.215	0.206	0.352	*0.568	1	
Motion speed	*0.152	0.214	0.157	0.278	0.235	*0.540	0.341	0.114	0.385	1

*P<0.05 and **P<0.01

The results displayed in Table 4 suggest that the highest correlation exists between a sense of placelessness and other components and after that, environment fluidity had the highest impact in improving that after other variables.

Table 5 Regression impact coefficients of independent variables on dependent variables

Significance level	**T**	Standardized coefficients		Non-standardized coefficients		Variable
		Hypothesis results	**Beta**	Standard error	**B**	
0.000	2.983	-	-	0.239	0.713	Constant value
0.000	4.562	yes	0.274	0.037	0.167	A sense of timelessness
0.000	3.761	yes	0.631	0.079	0.783	A sense of placelessness
0.000	7.395	yes	0.407	0.052	0.383	Lighting quality
0.002	0.048	yes	0.502	0.061	0.674	Color intensity
0.000	8.945	yes	0.317	0.029	0.374	Sound
0.000	9.480	yes	0.554	0.063	0.598	Environment fluidity
0.000	5.597	yes	0.436	0.072	0.493	Variety of scenes
0.002	1.948	yes	0.369	0.036	0.508	Imagination
0.000	2.983	yes	0.463	0.239	0.713	Space decoration
0.000	4.562	yes	0.274	0.037	0.167	Motion speed

The significance level and Pearson values for all variables displayed in Table 5 suggest that there's a significant correlation between independent and dependent variables. In other words, an increase in the independent variable will cause an increase in the dependent variable as well. Thus, it can be argued that H0 and H1 hypotheses will be confirmed and rejected respectively within 95% confidence interval.

"A sense of timelessness" variable with a beta coefficient of 0.63 has the highest impact in the virtualization of theatre scenery. In other words, a unit increase in a sense of timelessness variable will result in a 0.63 increase in the virtual theatre scenery variable. The second priority is specified to the independent variable of "environment fluidity' with a beta coefficient of 0.55 and the "color intensity" variable in the third place with a beta coefficient of 0.52 have the highest impact on virtual theatre's scenery. Besides, variables including "space decoration and measures" with a beta coefficient of 0.463, "variety in scenes" variable with a beta coefficient of 0.436, "lighting quality" with a beta coefficient of 0.407, "imagination" with a beta coefficient of 0.369, "Sound" with a beta coefficient of 0.317, "motion speed" with a beta coefficient of 0.274, populate 4th-10th priorities for virtualization of theatre scenery.

According to non-standardized regression coefficients of independent variables, the virtualization equation for theatre scenery are as follows:

+0.713 for Virtualization of theatre scenery (0.167) for a sense of timelessness+0.783for a sense of placelessness, +0.38 for lighting quality, +0.674 for color intensity, +0.374 for sound,+0.598 for environment fluidity, +0.493 for variety of scenes, +0.508 for imagination,0.541 for space decoration and measures +0.261 for motion speed.

7. Conclusion

Formal transformations of the art at the beginning of the century have taken place using materials higher than the scope of paint and canvas and it resulted in complete freedom of the artists from the constraints of previous contracts and made them move toward new media and facilities of artistic creation, especially, digital art. The combination of two distinct phenomena including performance arts and digital technology, with distinct growth paths, must be studied further.

Theatre artists are just like other artists and attempted to contain their mentalities and feelings in the form of a work of art. Theatre has shown that it always exploits its contemporary technology and is accompanied by modern aesthetical achievements besides wonderful technical facilities. Accordingly, all the stages involved in theatre production including the content of the play to pre-production stages including producing sound, music, and different sound qualities and the possibility of using video images in the scene, light adjustment, scenery decoration, costume design, and finally the possibility of using virtual actor (i.e. robot or motion capture) transformed theatre. Moreover, this digital option can provide different choices as well as regular planning for performance.

Whenever we use virtual reality, abstract theatrical principles including scenery (especially digital scenery design), lighting, and use of multimedia will be embodied and the audience can observe the whole set of director's thoughts and pictures, playwright, actors, etc. at once and therefore, all the activity domain of all theatre cast would be more extended concerning displaying abstract concepts, complex emotions, and metaphysical perceptions

It has been attempted in this study t study factors influencing scenery in virtual theatre and whether digital technology is better for performing arts or not. 151 questionnaires have been distributed randomly among study participants and as it has been noted, there isn’t any significant difference between male and female participants in terms of their familiarity with theatre. The older people get, they will be less familiar with the internet and virtual reality and therefore older participants prefer simpler and more eligible environments.

Then, a multivariate regression model has been used to study the factors and variables influencing the scenery of virtual theatre. The results showed that "a sense of timelessness" variable is the variable with the highest impact on the scenery of virtual theatre. The second and third priorities with the highest impact on virtual theatre scenery are occupied by environment fluidity and color intensity. Finally, variables including space decoration, variety of scenes, lighting quality, imagination, sound, motion speed, and a sense of placelessness occupy 4th-10th priorities concerning the virtualization of theatre scenery.

In case we'd be fully familiar with the impact of various factors on the scenery of virtual theater, we can increase mental and emotional embodiment in the form of an artifact. It has been found that the use of digital technology and virtual reality in the theater is a continuous process and the contemporary audience would welcome the particular technology of his/her own time; however, concerning limited resources and infrastructure within our country, the following recommendations are made:

1. Because theatrical performance is live, there must be a shared space with audiences in Iran's theatres.

2. There must be the possibility of installing digital facilities within theatres.

3. Performance includes limited stages and characteristics from the interaction and contrast between technology and computer.

4. The performance content including scenario, music, décor, and performance must be developed with the help of artists and solely to be performed for the audiences.

5. The performance must include one language and one text; such that scenario will make it progress toward the end and the scenario will be in distinction with dance, music, and other kinds of art.

References

Akhavan, N. (2019). *Presenting a digital marketing model in art marketing with emphasis on the theater and cinema industry and examining its antecedents and consequences*. Master Thesis, Islamic Azad University, Central Tehran Branch, Faculty of Management.

Alan, B. C., William, R. Sh., & Jeffrey, D. W. (2009). *Developing virtual reality applications: foundations of effective design*. Morgan Kaufmann.

C. Eisenhower, George. (2009). *Technology in Theater* (Kianmehr, B. Trans.). Drama Magazine, No. 121-122.

Carrol, J., Anderson, M., & Cameron, D. (2006). *Real Players? Drama, Technology and Education*. Trentham Books.

Cavallo, A., & Couch, A. (2004). Virtual Forum Theater: a CSCL for underprivileged children. *XXXI SEMISH - Integrated Seminar of Software and Hardware*. Salvador, Brazil.

Changhoon, P., Sang Chu, I. A., Yong-Moo, K., Hyoung-Gon, K., & Heedong, K. (2003). *Gyeongju VR Theater: A Journey into the Breath of Sorabol*. Massachusetts Institute of Technology.

Childs, M. (2009). *THEATRON Final Report*. London: King's College London.

Coates, G. (1992). Program from Invisible Site—a virtual sho, a multimedia performance work presented by George Coates Performance Works. *San Francisco, CA*.

Darroch, M. (2008). Digital Multivocality and Embodied Language in Theatrical Space. *Intermédialités: histoire et théorie des arts, des lettres et des techniques/Intermediality: History and Theory of the Arts, Literature and Technologies*, (12), 95-114.

Dixon, S. (2006). A history of virtual reality in performance. *International Journal of Performance Arts & Digital Media*, *2*(1).

Eaket, C. (2010). *Theatre-Outside-of-Theatres: Spaces of Digital Performance* (Doctoral dissertation, Carleton University).

Eversmann, P. G. (2011). The Theatron Module Guide to Good Practice. Didaskalia: Ancient Theatre Today, 6.

Glusker, A. (2006). The Best Seats for this Play Are Moving Fast. *New York Times, 17*.

Grau, O. (2003). *Virtual Art: from Illusion to Immersion*. MIT press.

Habibpour, K., & Safari, R. (2009). *Comprehensive guide to the use of SPSS in survey research*. Loya Motafkeran Publications, Tehran.

Hashemi, S. H. (2011). *How to use digital technology in theater*. Master Thesis, Islamic Azad University, Central Tehran Branch, Faculty of Art and Architecture.

Holten, O. (2005). *Introduction to Nature Mirror Theater*. Mahboubeh Mohajer, Third Edition, Tehran, Soroush Publications.

Holloway, J. (2010). *Illustrated theatre production guide*. Taylor & Francis.

Kelly, H. (2015). *Magician of the theat*er. Retrieved from: http://www.taiwantoday.tw

Khaki, Gh. (1999). *Research Method (with an approach to dissertation writing)*. Tehran: Ministry of Culture and Higher Education, Scientific Research Center: Tact Publishing Cultural Center.

Lincoln, Y. S., & Guba, E. G. (1985). Establishing trustworthiness. *Naturalistic inquiry*, *289*(331), 289-327.

Lovell, R. E. (2000). Computer Intelligence in the Theater. Retrieved from Intelligent Stage@ Silicon Atelier: http://www.siliconatelier.com/intelligentstage/publications/cit/cit.html

Masura, N. (2007). *Digital Theatre: A "Live" And Mediated Art Form Expanding Perceptions of Body, Place, and Community* (Doctoral Dissertation), Faculty of the Graduate School of the University of Maryland, College Park. Retrieved from: http://www.nadjaart.com/about/Nadja%20Masura%20Resume%20Events.pdf.

McEvilley, T. (2005). *The triumph of anti-art: conceptual and performance art in the formation of post-modernism*. McPherson and Company, with assistance from the New York State Council on the Arts, Kingston, NY.

Milgram, P. & Kishino, F. (1994). A Taxonomy of Mixed Reality Visual Displays. *IEICE Transactions on Information and Systems*, *77*(12), 1321-1329.

Nadel, S. F. (2013). *The theory of social structure* (Vol. 8). Routledge.

Ogawa, T. (2001). *Theatre engineering and stage machinery, consultancy series*. Entertainment Technology Press.

Onyesolu, M. O., & Eze, F. U. (2011). Understanding Virtual Reality Technology: Advances and Applications. *Advances in Computer Science and Engineering*, 53-70.

Off, C. (2009). 'Introduction' in the Pedagogical final report of the THEATRON project. Retrieved December 02, 2011, http://www.english.heacademy.ac.uk/explore/projects/archive/technology/tech23.php

Packer, R. (1999). Multimedia: History, Theory and Practice. Retrieved from Zakros Interarts: http://www.zakros.com/ucb/histS99/Notes/Class6/Class6.html

Pantley, E. (2002). *Modern stage theory, an introduction to theater and modern drama*, by the efforts of Yadollah Agha Abbasi, Kerman, Fanoos.

Rajabi, M. (2011). *Investigating the position of technology in postmodern theater*. Master Thesis, Tehran University of Arts.

Rahimi, A. (2014). *A study of the function and aesthetics of animation in digital theater; Practical section: acting*, Master's thesis, Tehran University of Arts, Faculty of Cinema and Theater.

Reaney, M. (2000). Art in Real-Time: Theatre and Virtual Reality. *Séminaire CIREN, Université Paris*, *8*.

Rebelo, F., Duarte, E., Noriega, P., & Soares, M. M. (2011). 24 Virtual Reality in Consumer Product Design: Methods and Applications. Human Factors and Ergonomics in Consumer Product Design: Methods and Techniques, 381. CRC Press.

Schechner, R. (2007). *Performance theory* (Nasrollahzadeh, M. Trans.). First edition, Tehran, Samat Publications.

Seidi, P. (2017). *A Study of the Application of Digital Media in Performing Arts Based on the Theories of Steve Dixon*. Master's Thesis, Tehran University of Arts, Farabi International Campus.

Sutton, P. (2005). *The Dramatic Property: a New Paradigm of Applied Theatre Practice for a Globalised Media Culture* (Doctoral dissertation, University of Kent).

Szilas, N. (2005, November). The Future of Interactive Drama. In *ACM International Conference Proceeding Series* (Vol. 123, pp. 193-199).

Szilas, N., Barles, J., & Kavakli, M. (2007). An implementation of real-time 3D interactive drama. *Computers in Entertainment (CIE)*, *5*(1), 5-es.

Zellner, D. (2009). *Digital Media and Stage Design* (Yilagh Beigi, S. Trans.). Show Magazine, 121-122.