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VIRTUAL CONCERT HALL MODULE IN AUGMENTED REALITY: HYBRID EDUCATIONAL TECHNOLOGIES IN THE ARTS

Annotation. Scientific research in the field of professional education in the arts field shows rather limited training technologies for adaptation to public stage performance. For the most part, they touch upon the theory and practice of creative psychology, and in the real situation of training are concentrated in individual classroom practice with the absence of an auditorium. The conducted research shows the effectiveness of soft skills development in the situation of public concert performance of an artist on stage with the help of professionally oriented module of audio-visual immersive content for work in AR software. This was made possible by the combination of the situational module of the Virtual Auditorium (VA) Virtual Concert Hall incorporated into the AR technology framework, which provided the maximum necessary auditory learning accessibility, repeatability, variability and, ultimately, the formation of a professionally orientated systematic public concert performance skill of the product user. The study has shown that 1) the application of a simulator-type module of a virtual VA audience (Concert Hall) with the help of augmented reality glasses (AR glasses) contributes to the effective consolidation of stage performance skills, facilitates adaptation to the conditions of real stage practice; 2) the developed dynamic 3D content moves the reference point of the solution of this problem from the field of personality psychology to the immersive audiovisual space of public performance at the educational stage of art programs preparation. The development of this module is aimed at creating an application with new characteristics available for a wide range of devices: computers, smartphones, tablets, VR for use by participants of the educational process of arts direction.

Keywords: augmented reality; AR framework; hybrid education; AR technologies in the arts; 3D model.

Introduction

Artistic adaptation to stage performance is an important process that helps students prepare for a successful performance in front of an audience. Preparation for a stage performance includes: the student's thorough study of the performance program, which consists of the musical works, their scores [2] and supplementary materials to be performed for the public. One of the most important prerequisites for a successful

performance by a professional artist is prior familiarisation and rehearsal of the concert programs at the performance venue, which is usually a concert hall. We conducted a review of published research material in the field of educational technology presented in conjunction with augmented and reality tools and programs. The analysis of the published results of the scientific problem (Palmarini, R., 2018), (Raul Masu, 2020), (BC Biermann, 2018), (Aitamurto, T., 2018), (Kuo-En Chang, 2014) under consideration enabled us to reconsider the solution to the educational task of adapting to public performance. We conducted an experimental study with the use of augmented reality AR software and created content module of a virtual audience in the form of a concert hall.

Back ground

Traditionally, the problem of adaptation to the student's stage performance was conducted in the conditions of a real concert hall in the university and city buildings. This practice had a number of technical and emotional-psychological drawbacks. The main disadvantage of one hall for all students was the limited rehearsal time and the number of appearances on stage, which was minimised. In addition, even in these real conditions it was not possible to fill the hall with real spectators, applause, and all that we call the lively atmosphere of the concert stage and hall. We hypothesised that the use of a new hybrid AR technology and a virtual concert hall auditorium module would be effective if it helped us to develop the skill of student adaptation to a concert performance at the preparatory stage of training in the classroom. The developed 3D module of the Concert Hall, as AR content, reproduces the effect of going out and performing on stage, immersion in the atmosphere of the concert hall through the visualisation of the space with its content components represented in the form of objects surrounding the artist: curtain, piano, auditorium with rows of seats, the effect of the sound of the live presence of the audience, applause during the performance.

Materials and Methods

The published series of scientific papers on the problem of the application of AR technology that we are studying shows the development trends in general education, industry, production, games and show business (Papagiannis, H., 2009), (Narges Ashtari,2020), (Yue Yin,2023), (Hincapie, M., 2021), (Bermejo, B.,2023). In the sphere of higher education, this technology is actively present in the fields of medicine and technical specialities, where we find the research focus not only on learning, but also on teaching. Thus, we can speak of an under-researched segment of the application of immersive AR technologies in relation to artistic specialities in higher education.

Internet connection was used to work with the AR framework. AR functionality is supported by a multilingual package. According to the type of supported content of the program module, we used operations to study the structure of 3D objects of the augmented reality module. This method allows you to interact with the model: zoom, move; use interactive animation, select objects, work through them as a whole and step by step, determine the correctness of actions, at any time you can stop the process completely or pause for more detailed study. The server is used to store the content. The system of caching the contents of the model allows to save user traffic and time of loading the site and objects.

Results

The evaluation of the obtained results was carried out according to two indicators: external (observation, description, analysis, synthesis, statistics) and internal (level of accessibility of the applied technology, level of acquired skills of adaptation to the hall, environmental friendliness of the proposed technology, presence of positive and negative factors). The positive fixed effect of the use of the AR technology was the change of the focus of attention from the distracting stress factors (the student's internal excitement, extraneous movements, visual and sound effects and noises of the auditorium) to the internal focus of the student performer himself, the elimination of the contradictions of the stage performance aimed at the main task of the performance: the disclosure of the expressive means of the concert program. Besides, the participants of the experiment defined the gained experience as useful and the formed skill as professionally necessary. The limiting factor of the proposed technology was the need to allocate the resource of training time for instructing the participants of the experiment, as well as the time of getting used to the device. In our opinion, it is also necessary to take into account the time factor of direct use of the AR glasses with the concert hall module, which does not exceed the time of preliminary instruction and direct stage performance.

The augmented reality module transforms and completes the reality surrounding the audience with the necessary missing objects, creating a qualitatively new mixed reality content in the arts. In the process of such training, a number of creative and emotional-psychological tasks are achieved, including the presence of confidence and comfort in performing the program. During the immersive performance experience using AR, the student navigates the spatial layout, gets used to the acoustic characteristics and visual configuration of the auditorium. The rehearsal process of immersion allows an emotional performance connection to be established with the hall, freedom of movement corrects the management of breathing and associated stage excitement. All this allows the images and meanings inherent in the performance program to be conveyed freely.

Discussion and Conclusion

This study was conducted in the mode of classroom studio sessions in the educational process for students of music and performing arts specialities (Chamber Vocal training), with the physical participation of students and piano concertmaster. We applied the design method of developing a concert hall 3D module, with the inclusion of virtual visual objects of the stage and hall, combined with augmented sound effects of a virtual auditorium. We proposed to combine the immersion method using AR glasses technology and its accompanying computer software with the real sound of the piano accompaniment and the direct performance of the vocal program by the student. Such a combination of the real performance of the vocal program while the student sings with physical and intellectual strain, the real perception of playing the piano physically present in the audience, combined with the technology of the extended module of the concert hall, created a fundamentally new experience of forming the skill of adapting to stage performance.

We carried out measurements during the 8 weeks of the inter-rating period of the academic term, as well as in preparation for stage exams. In order to determine the effectiveness of using AR technology and the corresponding content module, we

proposed to measure the characteristics of the formed professional skill of stage adaptation on a five-point scale, according to the following criteria (Table 1): 1. the level of stiffness of movements (MS); 2. the number of technical errors of the musical text (TE); 3. the degree of emotional excitement (EE); 4. the degree of psychological and muscular tension (PMT). Thus, the following changes were recorded in the mentioned experimental period:

1. the level of movement stiffness decreased from 5 to 0.9;
2. the number of technical errors of the musical text showed reduction from 5 to 1.5;
3. the level of emotional excitement decreased from 5 to 1;
4. the level of psychological and muscular tension decreased from 4.5 to 0.5 points respectively.

Table 1 – Formed professional skills of stage adaptation (communicative)

	criteria	before the experiment	after the experiment
1	MS	5	0.9
2	TE	5	1.5
3	EE	5	1.0
4	PMT	4,5	0.5

At the same time we measured the following characteristics (Table 2): a) the level of comfort and musical-artistic freedom during the performance of the stage program (CMAF); b) the level of creative communication of the artist with the audience (CC); c) the level of immersion (I) in the harmonisation of space in the creative expression of the program (transfer of semantic expressiveness and images). Our measurements show a significant increase in the following characteristics:

a) an increase from 0 to 4.9 on a five-point scale;

b) an intensive index of free communication with the audience during the performance from 2 to 5;

c) a significant increase in the level of immersion in the situation of the concert hall and the effective transfer of images and semantic content of the program, which we evaluate on a scale from 0 to 5.

Table 2 – Formed professional skills of stage adaptation (emotional, psychological)

	characteristics	before the experiment	after the experiment
a	CMAF	0	4.9
b	CC	2	5
c	I	0	5

The positive motivation of the performance was supported by the sound track of the applause of the virtual audience and the silence in the hall during the performance.

In general, we find that the use of the proposed technology to develop and consolidate the professional skill of stage performance achieves a significant learning effect.

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Ворфоломеева О.В.

ТОЛЫҚТЫРЫЛҒАН ШЫНДЫҚ ВИРТУАЛДЫ КОНЦЕРТ ЗАЛЫ МОДУЛІ: ӨНЕРДЕГІ ГИБРИДТІ БІЛІМ БЕРУ ТЕХНОЛОГИЯЛАРЫ

Аңдатпа. Өнер саласындағы кәсіптік білім беру саласындағы ғылыми зерттеулер қоғамдық сахналық қойылымға бейімделуге дайындықтың біршама шектеулі технологияларын көрсетеді. Көбінесе олар шығармашылық психологиясының теориясы мен тәжірибесіне әсер етеді және нақты оқу жағдайында аудитория болмаған кезде жеке аудиториялық тәжірибеде шоғырланады. Жүргізілген зерттеулер AR бағдарламалық жасақтамасында жұмыс істеуге арналған аудиовизуалды иммерсивті контенттің кәсіби бағытталған модулін пайдалана отырып, сахнада әртістің көпшілікке арналған концерттік қойылым жағдайында жұмсақ дағдыларды дамытудың тиімділігін көрсетеді. Бұл AR технологиясының құрылымына кіретін виртуалды концерт залының ситуациялық модулін біріктірудің арқасында мүмкін болды, ол оқытудың максималды қажетті есту қолжетімділігін, қайталанғыштығын, өзгермелілігін және, сайып келгенде, қалыптастыруды қамтамасыз етті. пайдаланушы өнімінде көпшілікке арналған концертті орындаудың кәсіби бағытталған жүйелі дағдысы. Зерттеу көрсеткендей, 1) толықтырылған шындық көзілдіріктерін (AR көзілдірігі) пайдалана отырып, концерттік залдың (Концерт залы) виртуалды аудиториясының симуляциялық модулін пайдалану сахналық орындаушылық дағдыларды тиімді бекітуге ықпал етеді және нақты сахналық тәжірибе жағдайларына бейімделуді жеңілдетеді; 2) әзірленген динамикалық 3D мазмұны осы мәселені шешудің бастапқы нүктесін тұлға психологиясы саласынан көркемдік бағдарламаларды дайындаудың білім беру кезеңінде көпшілік алдында сөйлеудің иммерсивті аудиовизуалды кеңістігіне жылжытады. Бұл модульді әзірлеу көркемдік бағыттағы оқу үдерісіне қатысушылардың пайдалануы үшін құрылғылардың кең ауқымы: компьютерлер, смартфондар, планшеттер, VR үшін қолжетімді жаңа сипаттамалары бар қосымшаны құруға бағытталған.

Кілт сөздер: толықтырылған шындық; AR шеңбері; гибридті білім беру; өнердегі AR технологиялары; 3D модель.

Ворфоломеева О.В.

МОДУЛЬ ВИРТУАЛЬНОГО КОНЦЕРТНОГО ЗАЛА В ДОПОЛНЕННОЙ РЕАЛЬНОСТИ: ГИБРИДНЫЕ ОБРАЗОВАТЕЛЬНЫЕ ТЕХНОЛОГИИ В ИСКУССТВЕ

Аннотация. Научные исследования в области профессионального образования в сфере искусства демонстрируют достаточно ограниченные технологии подготовки к адаптации к публичному сценическому выступлению. В большинстве своем они затрагивают теорию и практику психологии творчества, а в реальной ситуации обучения сосредоточены в индивидуальной аудиторной практике при отсутствии зрительного зала. Проведенное исследование показывает эффективность развития soft skills в ситуации публичного концертного выступления артиста на сцене с помощью профессионально-ориентированного модуля аудиовизуального иммерсивного контента для работы в программном обеспечении AR. Это стало возможным благодаря сочетанию ситуационного модуля виртуального концертного зала Virtual Auditorium (VA), включенного в структуру AR-технологии, что обеспечило максимально необходимую аудиальную доступность обучения, повторяемость, вариативность и, в конечном итоге, формирование профессионально ориентированного систематического навыка публичного концертного выступления у пользователя продукта. Исследование показало, что 1) применение модуля симуляционного типа виртуальной аудитории ВА (Концертного зала) с помощью очков дополненной реальности (AR-очков) способствует эффективному закреплению навыков сценического выступления, облегчает адаптацию к условиям реальной сценической практики; 2) разработанный динамический 3D-контент переносит точку отсчета решения данной задачи из области психологии личности в иммерсивное аудиовизуальное пространство публичного выступления на образовательном этапе подготовки художественных программ. Разработка данного модуля направлена на создание приложения с новыми характеристиками, доступного для широкого спектра устройств: компьютеров, смартфонов, планшетов, VR для использования участниками образовательного процесса художественного направления.

Ключевые слова: дополненная реальность; AR-фреймворк; гибридное образование; AR-технологии в искусстве; 3D-модель.