AUGMENTED REALITY TECHNOLOGY FOR MOTORSPORT PILOTING TRAINING

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Abstract. The article is devoted to the study of the application of augmented reality technology in the conditions of piloting training in motorsport. The general possibilities, prospects and situations of effective application of augmented reality technologies are described. It is clarified that augmented reality makes it possible to fully cover possible scenarios unfolding in the professional arena during the training period – this provides a comprehensive pilot training for the real conditions of professional sports.

Keywords: augmented reality, motorsport, racing, piloting, the use of augmented reality in training, drift.

At the present stage, in the context of a complex systemically significant transformation of educational practice due to the integration of modern technologies into its processes, research involving the description of the place and role, prospects and opportunities for the use of individual technologies in the context of their impact on learning outcomes is of particular relevance and practical importance. Focusing on augmented reality technology in matters of piloting training in motorsport, we note that augmented reality in general, along with special simulators, is one of the most effective and widespread means of training drivers both in ordinary driving schools and in special sports clubs dedicated to motorsport. This is largely determined by extensive opportunities and reduced health risks, which is especially effective when training novice athletes with low experience.

The relevance of the research topic of augmented reality technology for piloting training in motorsport is also due to the fact that today these issues as a whole remain poorly understood. A number of authors have indeed investigated the category of training using augmented reality technologies, but rarely do such studies cover the processes of training athletes and, in particular, motorsport as a separate area of use of augmented reality technologies. Moreover, the scenarios of using augmented reality technologies in piloting training in motorsport remain unexplored, which requires additional analysis.

The purpose of the study is to describe the possibilities and prospects, scenarios for the use of augmented reality technologies in training motorsport pilots.

Information technologies occupy an important place and role in modern education, leading to the transfer of the educational paradigm towards digital transformation and the active use of digitalization products in teaching practice. Thus, the issues of the use of augmented reality technologies for the needs of education are becoming relevant [6].

We agree with the opinion of A.S. Rodionov and co-authors who believe that modern augmented reality technologies are a real effective learning tool that allows accumulating the principles of visibility, real immersion, mastering practical actions and conditions. The authors' research clearly shows how the use of augmented reality technologies affects educational practice; in particular, the

authors identify the following areas of influence on educational outcomes [5]:

• the growth of indicators of inclusion, involvement and immersion in the learning process;

• reduction of time and costs required for memorization and subsequent mastering of the broadcast material;

• significant consolidation of theoretical knowledge due to high-level and effective visualization, formation of conditions for understanding space, orientation in it;

• significant simplification of verification procedures, especially in the field of real actions;

• establishment of complex interrelations of theory and practice, in which practical skills are mastered in parallel with theoretical training.

I.V. Bykova, E.S. Zyablova and E.V. Udovenko correctly note that the modern practice of using augmented reality technologies determines the prospects for the development of forms and methods of virtual presence of students in the processes associated with real work practice. The authors believe that augmented reality technologies make it possible to recreate the conditions necessary in the context of training, are characterized by a high level of flexibility, situational application, and as a result, demonstrate an increased result of training [1].

Z.I. Ivanova also adheres to the position that the use of augmented reality elements significantly affects the efficiency of mastering the material, and, moreover, in some cases it can replace expensive equipment [3]. In fact, augmented reality technologies make it possible to exclude the linking of training to specific simulator models, since complex and competent systems make available various versions of simulators on which training is carried out.

With regard to the issues of piloting training in motorsport, augmented reality technologies demonstrate almost unlimited potential, since they allow:

Firstly, to create the variability of training; variability in this case is a multifaceted, multidimensional and multifaceted concept that reveals: the variability of the choice of models and brands of cars, their settings from the position of parameters and additional elements, the choice of trails, coatings, weather conditions, as well as other situations that characterize possible changes in the state of the track during competitions. This allows, on the one hand, to fully cover possible scenarios unfolding in the professional arena during the training period, and on the other, significantly reduce training due to the absence of the need to wait or artificially create such conditions, and also leads to a reduction in the cost of training. implementation of learning processes.

Secondly, to determine the conditions of real immersion; immersion in this case becomes possible only when the simulator and augmented reality effectively harmonize, forming a single learning environment.

Thirdly, to reproduce the critical and most difficult situations from the practice of a professional in the field of motorsport; this allows you to prepare a future athlete for various variants of events, develop reaction speed and the ability to find optimal solutions to the problem in the shortest possible time.

Scenarity, variability, visibility, programmability and the possibility of multiple reproduction – these and many other qualities that characterize the process of pilot training in motorsport determine the prospects for the use of augmented reality technologies in modern conditions. A.D. Voronin and co-authors, in the context of the above, adhere to the position that augmented reality leads to the formation of components that determine the success of future sports professional activities [2]. However, technology is becoming a learning tool that allows you to work out purely general skills – real immersion and driving a real car becomes the main way to master the skills of a pilot in motorsport.

The advantage of augmented reality is the possibility of integration, including in the conditions of

real training on motor vehicles, when the pilot–trainee wears a special helmet that simulates objects and instructions during piloting. This is shown in the complex in Figure 1:

Figure 1. An example of using an augmented reality helmet when training a pilot in motorsport [7]

In motorsport, manufacturers, teams and racers use simulators to promote their intensive development programs on the track. This work is key, as drivers spend about 100 hours in the simulator for every hour spent on the track.

Accumulating virtual miles allows teams to introduce riders to any unforeseen circumstances they may encounter in a race, ensuring that they are prepared for all consequences, no matter how unforeseen they may be.

At the same time, the training conditions that define the dive can be adjusted so that they correspond to the real world, for example, with temperature, track surface and vibrations as in a specific car model — all these are variables that clarify the prospects of an athlete's immersion. All this together gives drivers a clear idea of how the car will feel and what it will show in specific conditions. So, the input of the steering wheel, the feeling of the gas and brake pedal, the movement of the car in its physics and tire modeling are as close to reality as possible, which positively affects the learning outcomes [4].

Thus, the conducted research clearly demonstrates the positive impact of both extensive prospects and the possibilities of using augmented reality technologies in the training of drivers in motorsport. Augmented reality is a tool of modernity, a key trend in the training of specialists, which allows specialists to familiarize themselves with future conditions and determines the acceleration of the processes of preparation for real competitions.

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