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VR SOFTWARE FOR AUTOMATED CONTROL SYSTEMS

Abstract. Nowadays, we can not imagine our life without a smartphones, tablets and computer.They help us in getting information, communicating with friends and spend time with benefits.Heads of companies producing smartphones, tablets and computers are leading the list of most influential people on the planet. Since XXI century - the century of information technology. And training using these technologies is the most common way.A virtual reality is gaining more popularity in this field. But very little training and software applications associated with virtual reality. This article discusses the 3D training program for employees of APCS (automatic technical production management system) in the VR format. With this program, employees, new employees, and ordinary users can get to know the system and the process control sensors and how they work.

Key words: VR, 3D, Unity 3D, Scada, WinCC,Android, iOS, WEB, learning system, 3D system. VR glass.

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Аңдатпа. Қазіргі кезде біз өмірімізді смартфонсыз, планшетсіз және компьютерсіз елестете алмаймыз. Олар бізге жақындарымызбен сөйлесуге, керекті мәліметті кітапханаға бармай ақ табуға, уақытты пайдалы өткізуге көмектеседі. Осы технологияларды өндіретін компниялардың басшысы дүние жүзіндегі ең әйгілі және бай адамдардың бірі болып саналады.Бұл технологиясыз өмірімізді елестете алмаймыз. Ал осы технологиялар көмегімен оқыту қазіргі кезде ең қолайлы және жиі кездесетін процесс болып табылады. Ал VR болса, қазіргі уақытта көп сұранысқа ие. Бірақ та, бұл салада, VR технологиясын пайдаланыпоқытуға арналған бағдарламалар өте аз. Бұл мақалада автоматтандырылған басқару жүйесіне арналған 3D VR форматында әзірленген оқыту бағдарламасы қарасытырылады. Бұл бағдарлама арқылы жұмысшылар, жаңа жұмысшылар немесе қарапайым қолданушылар АБЖ сенсоролерімен және олардың жұмыс істеу принципімен таныса алады.

Кілт сөздер: VR, 3D, Unity 3D, Scada, WinCC,Android, iOS, WEB, оқыту бағдарламасы, АБЖ сенсорлары, VR көзілдірігі.

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Аннотация. В настоящее время мы не представляем свою жизнь без смартфона, планшета и компьютера. Они нам помогают в получении

информации, в общении с близкими и проводить время с пользой. Главы компании, производящих смартфоны, планшеты и компьютеры лидируют в списке самых влиятельных людей на планете, так как XXI век – это век информационных технологий. Мы не представляем жизнь без этих технологий и процесс обучения с применением данных технологий сегодня является самым распространенным способом. Виртуальная реальность набирает большую популярность в данной сфере, но пока недостаточно обучающих приложений и программных обеспечений, связанных с виртуальной реальностью. В данной статье рассматривается обучающая 3D-программа для работников АСУТП (автоматическая система управления технического производства) в формате VR. С помощью этой программы, сотрудники, новые работники и простые пользователи могут познакомиться с системой и датчиками АСУТП и принципами их работы.

Ключевые слова: VR, 3D, Андроит, обучающая программа, АСУТП, датчики, VRочки.

I. INTRODUCTION

Since last five years a lot of changes happened, generally in technology. As technology is moving only forward, new inventions are happening in software development and mobile invention [1]. As mentioned, mobile inventions concerning mobile devices, which are becoming necessary in everybody's life. They are easily carried and used. At the same time, more people use smartphones. It means that every new invention regarding mobile phones can be used by dozens of people. The idea that users learn best by trying something by themselves alongside others has a rich history in educational research and theory. Broadly speaking, notion of "learning-as-constructing knowledge" [2] emphasizes how "user development" takes place through participation in a social world and interaction with people, events and objects. An increasing amount of research publications indicates a wide research interest in exploring how mobile applications can be designed and used to support a wide range of learning activities. Researchers and educators are looking at how to incorporate some of this new literacy into education.

Virtual reality (VR) offers the enticing premise of a rich sensory experience. For years, proponents have heralded the limitless potential of VR to surpass predecessor interactive technologies. Those who have tried to communicate its potential, however, have generally leveraged static text, which often reduces what is supposed to be a stimulating, multimodal encounter to a one-dimensional exercise that underwhelms at best. Burdea and Coiffet's innovative multimedia presentation, with its enticing videos, abundant illustrations, and VRML and Java 3D-based interactive laboratory activities, is a novel and fresh approach to the presentation of large volumes of technical information. Based on my own experience in teaching and researching VR-

related subject matter. We believe this format is highly appropriate for the treatment of VR issues, which often rely heavily on visual and auditory modalities. Just as VR application have expanded far beyond what was originally envisioned due to the creative use of this multifaceted technology. Brdea and Coiffet have expanded the possibilities for understanding the complex, intertwined issues associated with VR technology through their vibrant format [3].

VR application is an example of modern inventions, which gives user ability to see and work with automated system sensors, oil storage tank and places in virtual reality. Main idea of application is to explain and learn to work with automated control system sensors and to understand of them working principle. This application can be used by anyone who is interested in oil industry and sensors

Also, direction of this software can be used in any industry. In 2001 was developed the first learning VR training system for live-line workers [4]. But system has used additional devices as: sense gloves, HMD, and spatial tracking system. But our application does not require any additional devices. It is enough smartphone and VR glass [5]. Also, our application has friendly design for any users and uni-platform. It is mean that application can be used in iPhone, Android, Windows, Ubuntu, Mac OS, iOS and even in PlayStation.

II. APPLICATION GUI DESIGN

In Android platform “Virtual Reality” application does not have any menu. When opening the application, there is the logo of the partner program. In our case KazTransOil and SDU (Suleyman Demirel University). Then there is the logo of the application itself. After there is the application (Figure 1). There we can see flow meter and automatic valve. They are connected to pipes whichwhich is attached to the oil storage tank. Ultrasonic flow meters measure the difference of the transit time of ultrasonic pulses propagating in and against flow direction. This time difference is a measure for the average velocity of the fluid along the path of the ultrasonic beam. By using the absolute transit times both the averaged fluid velocity and the speed of sound can be calculated [6].

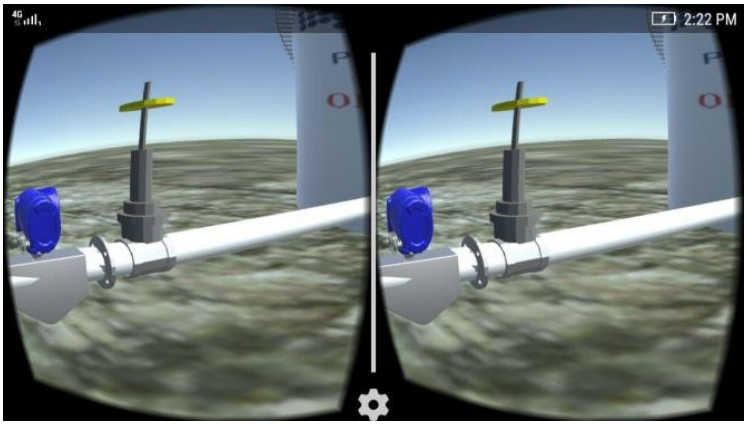

Figure 1. Main view of the application

III. IMPLEMENTATION

Unity 3D game engine used to develop “Virtual-Reality” application. Unity 3D [7] provides multi-platform development for famous Operating Systems like: iOS, Android, Microsoft Windows and Linux. Also Unity 3D integrated with WEB platform in case when plugin “Unity player” is installed to Web browser. Quality of web based Unity 3D depends on resources of RAM memory and Video Card.

Statistics in period of one week in September 2016, showed Android 4.4 version is active on 30% of all devices that accessed to Google Play [8]. According to the statistics Android applications have to be developed for versions 4.1 or above. “Virtual Reality” application developed for Android version 4.2, it is compatible with most of Android based devices. C# and JavaScript used as programming languages, Unity 3D editor used to build user interface of application. Test of application done by Unity Play mode, then by Lenovo K5 Vibe[9] smartphone (figure 2).

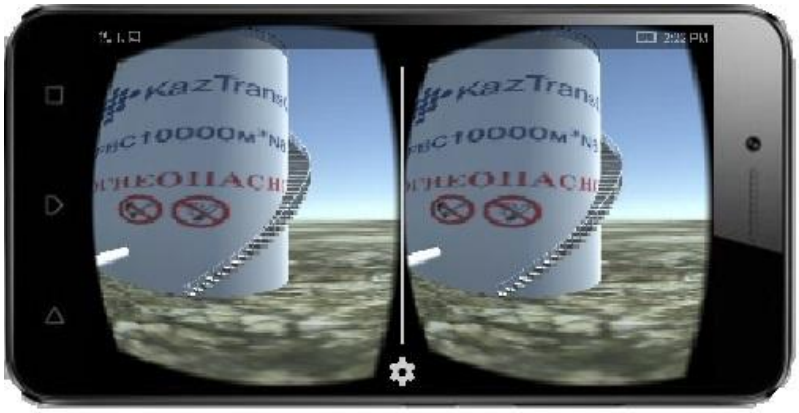

Figure 2. View in Lenovo K5 Vibe.

There are oil storage tank, which work in company “KazTransOil” Atyrau city [https://en.wikipedia.org/wiki/KazTransOil]. There we can see flow meter and automatic valve. They are connected to pipes which which is attached to the oil storage tank. When we see through flow meter, we can see little information about this sensor (figure 3).

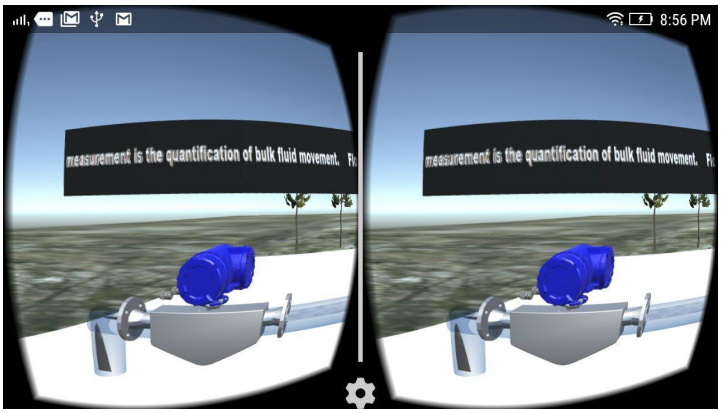

Figure 3. Information about sensors

IV. TESTING

When the application starts, main interface loads as shown on Figure 1. This view only for VR glasses like Oculus Rift, Google Cardboard and VR Box and other VR glasses. As soon as we put VR headsets, we plunge into another world, virtual world – world of oil plant. We can turn the head, thereby observe this virtual world.

Application tested in smartphone Lenovo K5 Vibe with specifications: Android 5.1 Lollipop, Octa-core 2 GHz, 2GB RAM and Samsung Galaxy S7 Edge: Android 6.0 Marshmallow, Quad-core 1.6 and Octa-core 1.6, 4 GB RAM. In both smartphones app works without errors (figure 5).

Figure 5.Testing on Lenovo K5 Vibe.

V. FUTURE WORK

In future will made research on optimization. For more realistic, will use technologies like Leap Motion. Leap Motion give to everybody feel every objects and models with hands. Also, will release the application to the platform iOS for iPhone, iPad and iPod.

VI. CONCLUSION

This is a portable learning tool for everyone who wants to learn sensors of automated system controls and how it works as virtual reality. Thisapplication is currently used in Microlearning Research Center at SuleymanDemirel University and in learning department in oil company KazTransOil. This application, Android operating system and can be supported by IOS and Windows operating systems.

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