

IMPLEMENTATION OF VIRTUAL REALITY CYCLING SIMULATOR

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ABSTRACT

During this Covid-19, it's very tough for every person to pop out of their houses. So many human beings are fitness aware as they want to exercise daily. For that we're enforcing digital fact software primarily based totally cycle which may be used inner our houses. Cycling is one of the famous sports within side the international and is a superb exercising for keeping frame fitness. In our venture digital biking simulator is evolved for exercising and enjoyment purpose. It has several benefits in Health. It includes increase fitness, reducing threat of coronary heart attack, dropping weight and lowering stress. The individual could have a actual time revel in whilst biking the use of digital fact software. This venture is primarily based on Hardware and Software. The Hardware additives required for this venture is Bicycle, Bike stand with resistance unit, Sensors and monitoring system, Head mounted display. Software used on this venture is Copper Cube Software, 3-d well suited recreation engine, 3-d fashions and assets, Traffic Simulation.

KEY WORDS: Virtual Reality, Copper cube software, Computer graphics, VR-Headset

I. INTRODUCTION

Now a day's most of the people are becoming fitness freak, more thinking about health. Due to this pandemic covid19, we can't go outside to do physical exercises and in rainy season also we can't go for cycling. Based upon these conditions we are doing this project. Mainly in our project we are using the latest technology VIRTUAL REALITY which is using everywhere now. For this project we designed a cycling game by using COPPERCUBE software. By using this, game is installed in our phone, which is fixed to VR Oculus headset. The game is played through joystick which is fixed to cycle handle connected to phone via Bluetooth. This is the main theme and introduction to our project. This project is mostly helped to old age people and who are most fitness freak. This project people can enjoy environment and nature in home itself. They will get fun, entertainment and good health too.

II. MOTIVATION

Now a day's it's terribly tough to try and do exercise outside thanks to covid-19 pandemic. Most of the general public places like Shopping malls, gyms and fitness centres etc., are closed. The attainable method is to make a virtual bicycle. By exploitation this we will simply do athletics at home.

Virtual reality has been successfully used in many areas of sports and health promotion to encourage different groups of people to exercise. Although stationary bicycles are one of the preferred exercise types for people to exercise in this pandemic

III. LITERATURE SURVEY

There have been several researches in the virtual reality cycling to develop a system that reduces the dependency on the outdoor exercise's and can feel the same by doing it in home itself.

As per Filip Schramka, Stefan Arisona, Michael Joos, Alexander Erath This paper affords a biking simulator carried out the usage of client digital truth hardware and further off-the-shelf sensors. Challenges like actual time movement monitoring in the overall performance necessities of country of the artwork digital truth are effectively mastered. Retrieved statistics from virtual movement processors is despatched over Bluetooth to a render gadget going for walks Unity3D. By processing this statistics, a bicycle is mapped into digital space. Physically accurate conduct is simulated and excessive pleasant property are delivered to create a complete immersive digital truth experience.

As per Judith E Deutsch, PT, PhD, FAPTA1,3, Mary Jane Myslinski, PT, EdD1, Michal Kafri, PT, PhD1, Richard Ranky, PhD2, Mark Sivak, PhD2, Constantinos Mavroidis, PhD2, and Jeffrey A Lewis3 the Virtual Reality (VR) Augmented cycling Kit (VRACK) was developed to solve the problem of motor control and health disorders in chronic stroke patients. In this article, we report the safety, feasibility, and effectiveness of using VRACK for cardiorespiratory fitness training (CR). ...Four patients with chronic stroke (47-65 years old, 3 years or more after stroke) with residual defects in the lower limbs (Fugl Meyer 24-26 / 34), restricted in the clinic (walking speed range) from 0.56 to 1), 1 m/s) participated in this research. Safety is defined as the absence of side effects. Use

attendance, total exercise time, and attendance as measured by the Attendance Questionnaire (PQ) to measure vitality. Evaluate with a submaximal exercise bike test before and after the 8-week exercise program.

As per Carlos Sun and Zhu Qing the United States lags behind many other countries in terms of green cities and sustainable transportation. Over the past decade, the United States has become increasingly interested in sustainable transportation, which has led to the development of several new cycling and walking programs. With the increasing attention to sustainable transportation, the road transportation industry has put forward higher requirements for the design of safe and efficient bicycle transportation facilities; however, unlike the traffic control of the car mode, the research, knowledge and standards of the bicycle mode are relatively less. In the literature survey it has been noted that until now the VR cycling has been only in limited people who can afford it.

III. PROPOSED WORK

The idea of a biking simulation inside a virtual setting isn't new. Multiple researchers have with success enforced prototypes over the years. We tend to be attending to implement our project with Low cost. This cycling simulator will develop by our own with easy tools. For the project improvement we are going to develop power generation through cycling. The ensuing result could be a started that enables you to ride in any range of environments — from midtown Manhattan to a secluded mountain path — permitting you to sweat throughout your biking trip on the streets of Tokyo, whereas ne'er going away your home. The thought of a biking simulation inside a virtual setting isn't new. Multiple researchers with success enforced prototypes over the years. We tend to be attending to implement our project

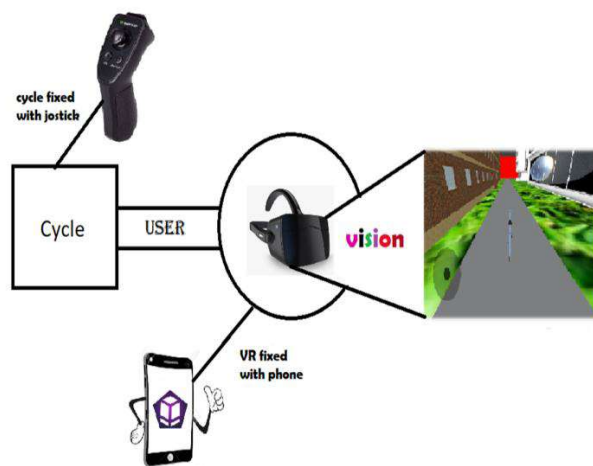
with low cost. This cycling simulator will develop by our own with easy tools.

IV. METHODOLOGY

Methodology is a systematic way of working, a standard process that describes the process in the simplest possible way. The design includes the application of scientific principles, technical information and imagination to realize the reality cycle simulator. Virtual execution of specific functions.

Cycling on a stationary bike is one in every of the simplest kinds of exercise. However, it will get boring. So, firms are victimisation video game technology to relinquish users a practical expertise via immersive surroundings that permits you to attach a stationary bike to a sensory receptor Quest or sensory receptor Go headset. Commercially out their systems employing a stereo cycle increased with VR have each fitness and rehabilitation applications. Most of them target the visual aspects of VR. Systems like Hold, Sports and Mocked are active people to create their fitness additional deeming and enjoyable. Conjointly many rehabilitation applications were created with the stationary cycle as of the system.

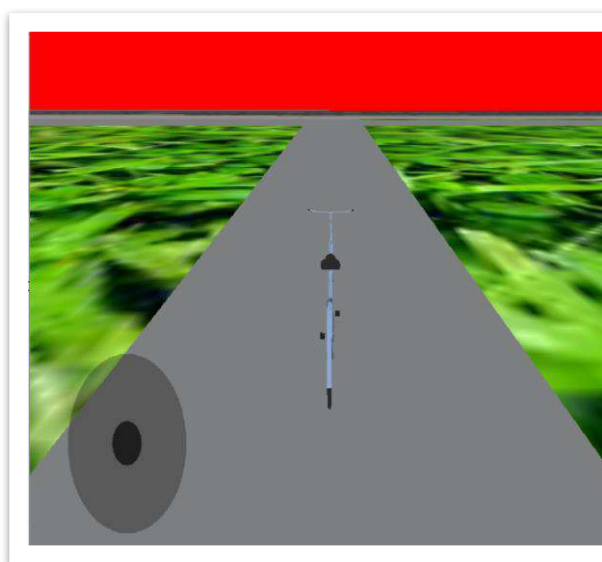
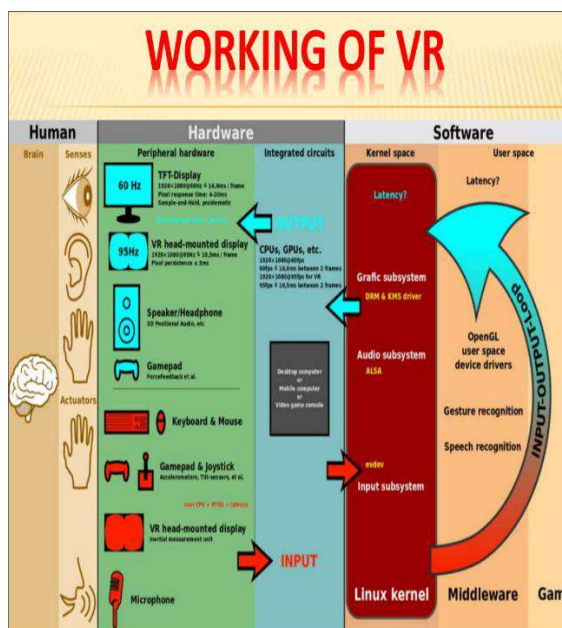
BLOCK DIAGRAM



V. COMPONENT SURVEY

- 1. VR headset:** Virtual reality vice is that the application of a three-dimensional (3-D) artificial setting to laptop games before the event of compact technology, VR gaming used projector rooms or multiple screens. VR gaming management could involve a typical keyboard and mouse, game controllers or motion capture methods.
- 2. Joystick:** A game controller, play controller, or just controller, is a device used with games or recreation systems to supply input to a video game, typically to manage an object or character in the game. Joysticks are typically accustomed control video games, and typically have one or a lot of push-buttons whose state also can be scan by the computer. A preferred variation of the joystick used on fashionable video game consoles is that the analogy stick.
- 3. Cycle:** A bicycle, additionally called a motorbike or cycle, may be a human-powered or motor-powered, pedal driven, single-track vehicle, having 2 wheels hooked up to a frame, one behind the other. A bicycle rider is named a cyclist, or bicyclist. Bicycles were introduced within the nineteenth century in Europe, and by the first twenty first century, over one billion were in existence. These numbers way exceed the quantity of cars, each in total and hierarchic by the number of individual models produced.
- 4. Cycling resistance unit:** Working against an opposing force builds muscle, thus so as to extend your strength capacity, you would like to feature resistance. If your feet are pedaling at quite one hundred ten RPMs or you're bouncing within the saddle, raise the resistance till you're on top of things of your foot strokes and feel a small burn in your muscles.

WORKING V.R.



VII. RESULT

The result of our project is cycling game which is played by user with the help of virtual reality oculus headset to feel the virtual nature in home itself which shown in above figure.

VII. WORKING

The block diagram shows the components used in this project. The copper cube setup is connected to the VR headset. The copper cube setup consists of the Vive handlebar tracking controller, the bike leaning sensor, the wheel rotation sensor, the pedal rotation sensor and the resistance unit.

Copper Cube is a game engine and graphics developed by Ambiera. It is aimed primarily at non-programmers to create 3D applications in drag-and-drop format based on behaviour and action-oriented logic. Additional actions and behaviours can be created in JavaScript.

Virtual Reality (VR) is used to feel the virtual environment everywhere. That is why we use this latest VR technology for our project. We design a game with the Copper Cube software, the designed game is installed on our phone and the phone is connected to our Oculus VR headset. The joystick is attached to the bike handle, which is connected to the phone via Bluetooth. We play the game with the joystick controller.

The simulator calculates the dynamic changes in the virtual environment and renders two scenes at the same time: one scene shows the left-eye environment, and the other scene shows the right-eye environment, projected by two independent projectors. (VR) is used to experience the ubiquitous virtual environment. For this reason, we used the latest VR technology in our project. We use Copper Cube software to develop games, and the developed games are installed on our mobile phones, which are fixed in our virtual reality. The Oculus headset joystick is connected to the ring handle, and the ring handle is connected to the phone via Bluetooth. We use joystick controllers to play games.

The bicycle deck consists of a rear wheel support, a front wheel inspection support, a deck and six springs installed on the underside of the deck. The rear bracket is used to support the bicycle. Support and allow the front wheel of the bicycle to rotate. The spring attached to the underside of the deck allows a slight tilting effect when riding a bicycle.

IX. CONCLUSION AND FUTURE WORK

A virtual bicycle simulator suitable for exercise and entertainment has been developed. The simulator enables cyclists to ride in a virtual environment. We will show you a low-cost way to build a modern bicycle simulator. This is a commercially available device. On the other hand, many functions can be added to our current system.

It is expected that more bicycle elements such as wind and sunlight can be incorporated into the system to improve the practicality of bicycles. In addition, you can enter different game modes, such as training and competition modes. We will also improve the current settings through audio sensors and human body measurements.

X. REFERENCES

- [1] AMD. AMD LiquidVR Technology for Developers. <http://developer.amd.com/tools-and-sdks/graphics-development/liquidvr/>, 2016. Accessed: 2017-01-19.
- [2] Atlantis Games Breda. CYCLESPPACES. <http://atlantisgames.nl/cycle-spaces-breda/>, 2015. Accessed: 2017-01-16.
- [3] S. Bjork and J. Holopainen. Games and design patterns. The game design reader, pages 410–437, 2006.
- [4] EngagingMobility. Engaging Mobility Github repository. <https://github.com/fcl-engaging-mobility/>, 2017. Accessed: 2017-01-19.
- [5] HTC. HTC VIVE Minimal System Requirements. <http://www.vive.com/sg/support/category/howto/841144.html>, 2016. Accessed: 2017-01-03.
- [6] D.D.S.Hurwitz. Bicyclingsimulator. <http://web.engr.oregonstate.edu/~hurwitzd/BikeSim.php>, 2015. Accessed: 2017-01-19.
- [7] J.-H. Kim, N. D. Thang, and T.-S. Kim. 3-d hand motion tracking and gesture recognition using a data glove. In 2009 IEEE International Symposium on Industrial Electronics, pages 1013–1018, 2009.
- [8] J. J. LaViola Jr. A discussion of cybersickness in virtual environments. ACM SIGCHI Bulletin, 32(1):47–56, 2000.
- [9] D. R. Mestre, V. Dagonneau, and C.-S. Mercier. Does virtual reality enhance exercise performance, enjoyment, and dissociation? an exploratory study on a stationary bike apparatus. Presence, 20(1):1–14, 2011.
- [10] NHTV insight. ATLANTIS GAMES PRESENTS: CYCLESPPACES. <https://insight.nhtv.nl/atlantis-games-presents-cyclespaces/>, 2015. Accessed: 2017-01-16.
- [11] NVIDIA. Lens Matched Shading and Unreal Engine 4 Integration Part 1. <https://developer.nvidia.com/lens-matched-shading-and-unreal-engine-4-integration-part-1>, 2016. Accessed: 2017-01-19.
- [12] NVIDIA. Pascal and VRWorks Infuse VR with New Level of Presence. <https://blogs.nvidia.com/blog/2016/05/06/pascal-vrworks/>, 2016. Accessed: 2017-01-19.
- [13] NVIDIA. VirtualRealityTechnology. <http://www.geforce.com/hardware/technology/vr/technology>, 2016. Accessed: 2017-01-19.
- [14] R. Ranky, M. Sivak, J. Lewis, V. Gade, J. E. Deutsch, and C. Mavroidis. Vrackvirtual reality augmented cycling kit: Design and validation. In 2010 IEEE Virtual Reality Conference (VR), pages 135–138, 2010.
- [15] O. Schulzyk, J. Bongartz, T. Bildhauer, U. Hartmann, and R. Herpers. A Real Bicycle Simulator in a Virtual Reality Environment: The FIVIS Project. In J. V. S. et al, editor, Proceedings of the 4th European Conference of the International Federation for Medical and Biological Engineering (IFMBE 08), volume 22 of ECIFMBE-BMT

Conference, pages 2628–2631. Springer, 2008.

[16] K. Shoemake. Animating rotation with quaternion curves. In ACM SIGGRAPH computer graphics, volume 19, pages 245–254. ACM, 1985.

[17] D. M. Simpson. Virtual Reality and Urban Simulation in Planning: A Literature Review and Topical Bibliography. *Journal of Planning Literature*, 15(3):359–376, Feb. 2001.

[18] U. Wissen Hayek, D. Waltisberg, N. Philipp, and A. Grüt-Regamey. Exploring Issues of Immersive Virtual Landscapes for Participatory Spatial Planning Support. *Journal of Digital Landscape Architecture*, 1:100–108, 2016. OCLC: 936774257.