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SURVEY REPORT

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RESEARCH OF GAME DEVELOPMENTBASED ON VIRTUAL REALITY

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Abstract -Virtual reality technologies dramatically change the game experience when compared to most popular console games. In this paper, we explore the flow of a story driven game based on the Butterfly Effect. While performing everyday interactions, we often incidentally touch and move objects in subtle ways. These objects are not necessarilydirectly related to the task at hand, but the slight movements may result into something relevant in a latter situation; this is the Butterfly effect. We are trying to use this concept to depict experiences of the people suffering from various anxiety related disorders into a story driven game.

Keywords- Virtual Reality; Butterfly Effect; Blender; Unity Engine; Serious Games;

I. INTRODUCTION

With the dynamic development of virtual reality and digital media technologies, computer games have become part of our culture.

VR systems may provide a higher user involvement due to the possibility of stereo visualization, human-body interaction, large playing space, etc

The Butterfly Effect is the phenomenon whereby a minute localized change in a complex system can have large effects elsewhere.

The most important thing of the virtual reality game isimmersion. Virtual reality has a property called 'transparentimmediacy' [1] which allows users to forget the existence of

media and believe that they are in the virtual world. This property used with the ButterflyEffect can help build a platform for interactive storytelling.

The system based on the Butterfly Effect is also known as Chaotic System. Chaos theory is a part of mathematics which looks at a certain system that are very sensitive and a slight change may lead to completely different result. For example, in the game very small change in the starting position in the chaotic system makes a big difference after a while.

Mental illness can be a tough battle for anyone to fight, and the social stigma that often accompanies mental illness can make someone's struggle even more challenging. One of the hardest things about depression is getting a non-depressed person to understand what you're going through. It can be exhausting to explain why you can't just "cheer up" and that what you're feeling is more than just "the blues". Games that operate as actual representations of depression can not only help you better explain what you're going through more effectively, but seeing your struggle recreated by someone you've never even met can help you feel less alone and better understood [2].

VR games can help cope with psychological issues, such as, anxiety. Hence, in this game, we are trying to inculcate these concepts in a story revolving around the protagonist's life and their struggle with an anxiety disorder, and how it affects their decision making, which in turn will provide an insight into such disorders and cause awareness.

We are using Unity Engine and Blender software to develop the characters and environment for the game.

II. LITERATURE SURVEY

A. The Design and Implementation of the 3D Educational Game Based on VR Headsets[3]

This paper demonstrates how VR Gear can be used in an educational manner. The 3D educational game of a garbage classification is designed and implemented to cultivate students' green habits. This game promotes development in VR industry, provides educational resources and also supports students' autonomous learning.

The world of the game is set on a beautiful tropical island. Game storyline is increased along with the tourism and residents, and the island's environment is damaged as the garbage disposal is not properly handled by tourists and residents. The game players take action on environmental protection in the first visual angle. Players have to collect garbageand make garbage classification correctly on the island within the specified time, making island's environment better. Collecting a quantity of garbage, classifying garbage correctly and no timeout, players could hold the key to go in the room, and be rewarded.It selects the standard of Chinese garbage classification "The classification signs for municipal solid waste GBT 19095 -2008" as teaching content, so that users can get the knowledge of garbage classification.

According to Xiangyuan Fang (2015), TVR TIME MACHINE VR COMPANY VR headsets are the kind of VR display devices that is based on the computer or mobile phone showing 3D content, usually embarking with lens box or plastic shell [4]. After wearing VR headsets display equipment, users could appreciate 3D content. The computer or mobile phone in VR headsets is the monitor and the combination of lens and box or plastic shell produces 3D effect.

Education and entertainment is the main feature of educational games. Entertainment is the key factor to make the game more attractive. But the focus of educational games is, it must ensure the physical and mental health of a game player. In the game to enjoy the joy of the process, players must absorb some of the educational knowledge, so that physical and psychological wholesomenesscan be harvested.

B. Creating 3D Avatars from Artistic Drawing for VR and Games Applications [5]

In this paper, development has started with an original drawing, and Blender 2.72 is used to bring the imagination to life in 3D. Blender is an open source 3D modeling suite that includes features in modeling, rigging, animation, simulation, rendering, compositing, and video game creation. The focus is on the use of blender as a tool to create a 3D Model from the artistic rendering on paper. Blender provides the tool to create this transformation from 2D paper to 3D Model.

The work-flow of this project started with some preliminary design concept. From there a simple base mesh was created as Blender makes use of meshes which are composed of vertices, edges, and faces. A face (polygon) is a collection of four or more edges. A set of polygons allows for a 3D model to be translated to 2D space, and then it can be textured. A single vertex can be extruded to form an edge, and four vertices can be combined to make a face. Many faces act as a solid surface, and can be used to form a model.

Blender needs to translate 3D space to 2D space using face polygons, this allows for texturing and painting. UV Mapping refers to the process of unwrapping the faces in order to have flat 2D plane to paint on. To do this we need Seams, which are edges which will be split in order to unwrap the mesh.

In texturing, Seams can be apparent, so Seams should be placed in less visible areas. New geometry was added where necessary. To increase detail and decrease processing time, a Multiresolution Modifier was used to generate a Normal Map. In addition to the Normal Map, Gimp was used to create other textures to add color, texture and minute details to the model.

After texturing the model, lighting was added. A rendering created a high quality snapshot of the created 3D model resembling the 2D drawing.

The inspiration for this, came from looking at bone textures to create desired effect. The bone has cracking, dry texture which is very interesting. They have imagined a humanoid creature whose face is mostly bone. Some of the textures used in this projectare available online.

C. Social inclusion through Games and VR (Use of games and virtual worlds to strengthen the personal 'real life' social network of people who are challenged in that area.)[6]

The paper is partly based on an article/ chapter from 2013, called Social inclusion through virtual worlds. The intentions of this paper about the possibilities of social inclusion through virtual worlds, Virtual Reality (VR) and serious games

In the Netherlands a virtual world called VayaV Metaverse is developed, based on the Open Sim platform. Also they have a demonstration build in Second Life called 'Nederland'. In these virtual worlds people will be able to 'play' according to rules and regulations they themselves decide upon, to have fun together and to learn and gain expertise and perspective for a better future.

The key goal of our projects is to reach people who don't have to like 'computers' but are challenged in their efforts to build and maintain a strong social network in real life. They have started several local communities in 'real' life where people meet and experience and share the VayaV Metaverse, aiming at fun, gain, perspective and by doing so find new friends. People who are challenged to be socially included are invited through trusted parties to participate. Those trusted parties are people who they know and trust either through professional relationships or through informal contacts.

D. A VR-Based Serious Game for Studying Emotional Regulation in Adolescents[7]

In this paper, a system is designed and developed called the GameTeen System (GT-System), an interactive virtual reality (VR) serious game (SG) based system for training and evaluation of ER strategies.

The goal is to train and evaluate users' abilities to tolerate and/or cope with unwanted emotions through the use of ER strategies. The GT-System consists of two steps: a Frustration Induction Game in which the GT-System induces frustration in the user and a training phase during which adaptive ER strategies can be taught.

The first version of the GT-System was developed (for both the player and therapist versions) to be played using a mouse and keyboard. Both applications can monitor the recorded ECG signal and estimate the patient's heart rate in real time. Unity3D can read ECG values by using the System.IO.Ports library. This process is controlled by the therapist's application.

The goal of the GT-System is to integrate the player and therapist applications. A wireless ECG is connected to the therapist's PC via a Bluetooth wireless connection. The GT-System is programmed in C# and Unity3D as the development environment. Unity3D is a cross-platform game engine with a built-in IDE developed by Unity Technologies that is used to develop video games for Web plug-ins, desktop platforms, consoles, and mobile devices.

E. Serious Games for Interactive Stories about Emotionally Challenging Heritage [8]

In this paper, a serious game for the emotionally challenging subject of the Holocaust is designed and made, specifically with refugees escaping Nazi persecution across Europe. The game relates the story of a Holocaust survivor, who was a young girl at the time, as she fled with her Jewish family from the Nazi invasion of Poland. There are mini-game elements that illustrate particular episodes of the story and make the game more interactive and varied. For special authenticity, the narrator speaks with the voice of the main character, now that she is an elderly woman. We describe the design of the game, and evaluate it as a serious game for the digital heritage of difficult subject matter.

The game is web-based with a simple graphical user interface (GUI) using only the few arrow keys on the keyboard, and the mouse to click buttons in the dialog. It is a mixture of 2D and 3D elements, in the main gameand the

mini-games within that. The main game is to carry the story, while the mini-games illustrate certain points within it.

A survivor story from the archive [9] that offered opportunities to make an entertaining game is selected. The main character is Marion, who is now an elderly lady recounting her experiences when she was a young girl. Her story was of her family's flight across Poland, before the advancing German army and Luftwaffe, involving internment in concentration camps, train journeys in freight cars across Siberia to other camps, escaping down a river on a wooden raft, and more. To register the progress of the story, the game shows Marion as a young girl, traveling across the map of central Euroasia. Her vocal descriptions are recorded as audio files in the archive.

It is more like an interactive story, as there are decisions to be made, but the consequences are only described and not played through, so that the player does not divert from the original story.

III. CONCLUSION

This paper surveys various Virtual Reality game systems. It is observed that various technologies can be used to develop a game in VR. We also observe that VR can be used as a powerful tool in learning and depicting various serious scenarios.

The survey shows how it is possible to make a serious game for an emotionally difficult subject that many would fear to tackle. Moreover, this can be achieved in a way that is suitable even for schoolchildren.

The tables below summarize the surveyed papers-

Table I. Comparison of technologies used in different surveyed Papers

Reference No.	Technologies Used				
	Unity 5.3	***VR Gear (Samsung)***	***Blender***	***Wireless Electrocardiogram (ECG)***	***C#***
[3]	Yes	Yes	NA	NA	Yes
[5]	NA	NA	Yes	NA	NA
[6]	NA	Yes	NA	NA	NA
[7]	NA	NA	NA	Yes	Yes

Table II. Comparison of advantages provided in different surveyed Papers

Reference No.	Advantages				
	AI navmesh generation	***UV mapping***	***Social inclusion***	***Sculpting /Painting***	***Environmental Education***
[3]	No	No	No	No	Yes
[5]	No	Yes	No	Yes	No
[6]	No	No	Yes	No	No
[7]	Yes	No	No	No	No

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