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Virtual Environment for Treating Anxiety Disorder using GVR Algorithm with Artificial Intelligence

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ABSTRACT: A phobic mental issue is an Associate in nursing nonsensical worry of one thing that is probably not going to cause harm. The word itself originates from the Greek word Phobos, which infers concern or ghastliness. Here we are creating a virtual scenario with help of Artificial Intelligence for treating people with different phobia and monitoring the health condition of the user. Different scenarios are developed for each phobia, which are considered to be Claustrophobia, Cynophobia, Nyctophobia, Pyrophobia and Astraphobia.

I. INTRODUCTION

Anxiety Disorder is the irrational trauma caused by particular incidents, learned responses picked up in past situations or as a genetic disorder. The traumas can be minimized by the use of modern technology Virtual Reality. Virtual Reality (VR) is the automated simulation that runs for a desired time which gives a real time scenario without causing any real time damage. When these traumas are experienced in real life scenarios it will cause a serious damage. And by using VR the damage can be completely avoided and the subject's individual analysis can be noted for better treatment. The simulation can be built using game development engines Unity and Unreal. These platforms are used to create simulated scenarios of particular situations. And the traumas are developed on these platforms. Google VR algorithm is used to provide a 360 degree view to ordinary first person view on a camera. This algorithm is also used to provide ray-cast for user interface benefits.

II. VIRTUAL REALITY

GVR algorithm is also to provide the six degree of freedom (surge, heave, sway, yaw, pitch and roll). A* algorithm is used in the scenario for finding the shortest path between the objects in the scenario through Artificial Intelligence. The audio effects in the environment help in providing a real time environment of the trauma to the subject. The simulation scenario is the trauma of the subject. When the subject is implied in this continuous simulation it will constantly remove the anxiety of the subject. The intensity of the scenario changes based on the continuous change in the subjects vital reactions (heart rate). A report is generated on each session. A graph is also designed to represent the improvement of the subject during the sessions. Based on the graph and report the subject is further monitored. And thus the Anxiety Disorder is rectified.

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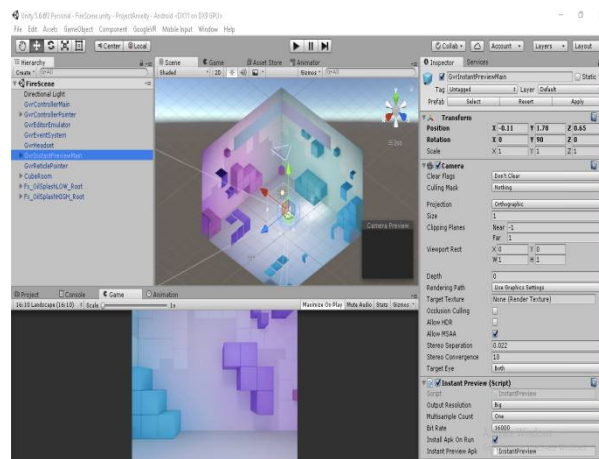
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Graphic designing:

III. CREATION OF ENVIRONMENT

The model consist of 3D object which create virtual environment that are developed by using Unity 3D and unreal engine. the environment will provide a real-time experience to the user which could provide a live action scenario to the user. the designing plays a major role in this module as every individual objects could make a big change in the vital signs of the human subject. the Unreal engine and Unity 3D develop a that the user control. the different anxiety major subject can be treated by using different scenarios in the 3D environment. the Blender software play major role in creating the three dimensional object that could be used in the unity and Unreal engine software. the prefab which are used in unity software can be created by using Blender software.



IV. 3D MODELING

The three dimensional object are created by using blender and Unity. the 3D modeling consists of different prefab that are applied with natural texture. The shader depth is applied to each object in order to give more natural texture. The prefabs are imported from the blender which are created in .obj format. The object are created with different shapes which are placed in the right position and axis in order to develop a environment. The game objects are the different model that are developed with a blender which make the environment a whole scenario. Each prefab can be designed with different shapes and graphic image.

V. UV MAPPING

The UV mapping is the process of creating a shader depth to each game object. The game object can show the depth in each side of the dimension. The UV mapping can be processed by using the blender. It provides different

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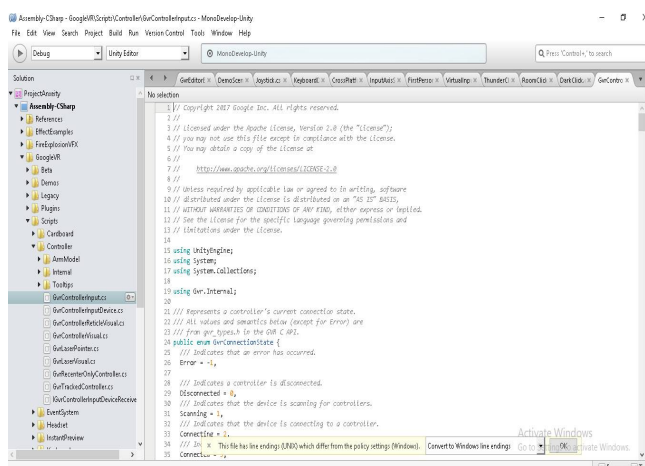
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The other media support which is audio and video plays a vital role. The audio effects are used to create a great support for the natural environment. The audio are crafted in such a way that it sync with the situation and provide a perfect scenario for making subject feel like in a real situation. The designing and audio can create the environment into gameplay.

The ray tracing can be applied to the reflecting surface to provide more depth in the environment. The shades can be applied with blender software to create a realistic game object used in the scenario. The .obj formats can be directly imported in the unity and unreal engine.

VIII. ALGORITHM

The algorithm which is used in the project is gvr algorithm. The gvr can be expanded as the Google Virtual Reality. This algorithm is written by using the C# language. The algorithm consists of many classes which inherited for the base class gvrcontrollermain. The C# language is used for the easy compatibility with the unity3d. The gvrcontrollermain consist of the game object Camera which could provide the six degree of freedom.



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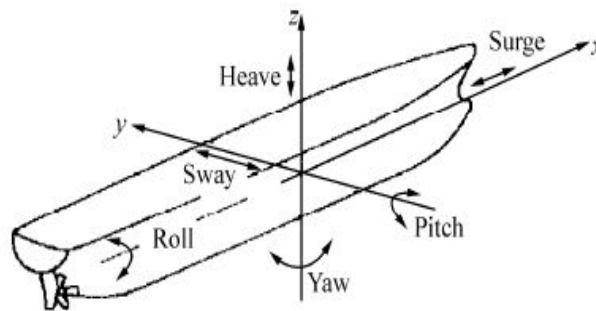
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The six degree of freedom surge, sway, roll, pitch, heave, and yaw can be defined as the view axis in the environment. The six degree view up, down, front, back, right and left are named. This six degree can be achieved through the Google VR algorithm. The gvr can also provide a cardboard view for android mobile platform.

IX. USER INTERFACE

The UI/UX has been designed with the Unity and Unreal engine. The UI is developed in such a way that it can be easy and more attractive to use. The Ray cast is used in the VR so the options can be chosen by gaze. The ray casting is written in the gvraycast algorithm. The UI consist of different menus which provide different scenarios for phobias.



X. CONTROLLER SCRIPTING

The gameplay consist of a first person which could be controlled by user. The controller script is written under the name FPController in C# that gets the vertical and horizontal axis of the environment and updates the position of the person in that axis. The FPController script is inherited with the gvrcontroller so that the camera of first person is controlled with FPController. The controlling can be used for the character to move as well as the game objects to interact with other objects. The C++ is used in unreal engine for scripting. The scripting is not only used for the controlling and also for animation rigging.

XI. CONDITION DEFINITION

In the module the different conditions are applied in each scenario. The conditions are written by using JavaScript. The JavaScript can be used for provide certain condition in an environment that the user should follow so that the gameplay could run in a timeline. The controller of the first person is also providing with certain conditions so that each movement of the user is been pre-defined.

XII. ANIMATION RIGGING

The animation rigging can be done for every game object by applying bone to every joint. The animation plays a major role as the scenarios based on a timeline of each process. Each timeline are used for playing a proper order of screening. The animation will play on different condition as the decisions are made.

Artificial Intelligence:

XIII. GAMEOBJECT ASSIGN

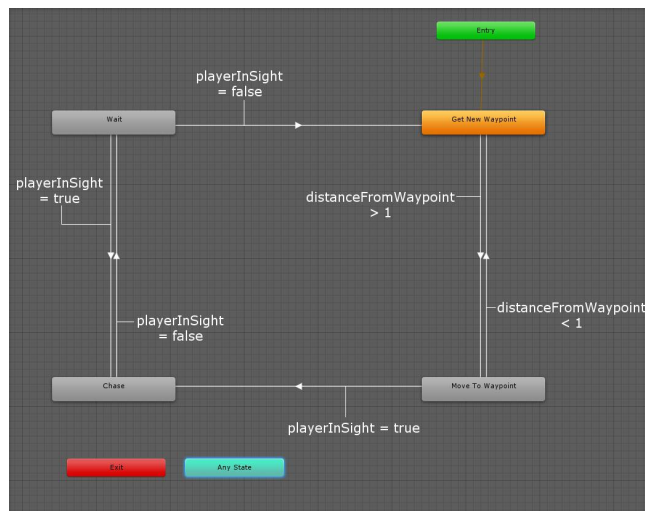
The Artificial Intelligence feature is added as a module so that the machine can learn itself of some decision making. The real-time decision making can be useful in main scenarios that make the game more interesting. The Artificial Intelligence is used with different algorithm that could be implemented in the script. The coding is written using C# that could easily adjust with the Unity3d software.

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XIV. DECISION TREE

The major process of the Artificial Intelligence is to develop a decision tree with different way of execution for each frame. The tree is updated for every move that the user has made. The real-time changes in the tree could help in making the player to choose a desire path to play the simulation. The decision tree is built on the preference of previous data and also the real-time calculation of the machine. The learning of machine from the previous experience could be more useful for the tree creation.

XV. A* ALGORITHM

The Artificial Intelligence algorithm is used in the module with different conditions. The A* search algorithm is one of the AI algorithm used in the module. The A* search algorithm is used in the module to calculate the real-time shortest path of a plane for a game object to reach its destination. The shortest path should be real-time as the player is controlled by user and cannot determine the exact position of the user. The A* algorithm helps in providing a gizmos on the plane in order to differentiate between the obstacles. The decision tree is formed for the path from the algorithm. This tree is used to move the object is that particular path without hitting the obstacles. The algorithm runs the script for the first time and finds all the fails which is used for learning. The script successfully runs after few attempts.

XVI. GIZMOS PLANNING

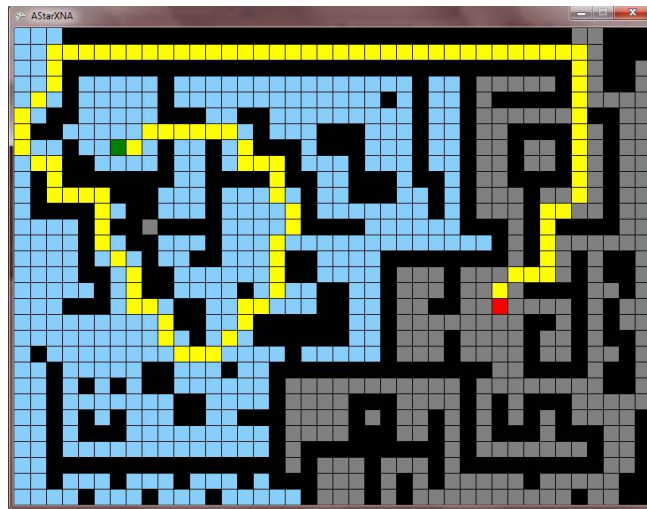
The AI will develop a gizmos map for each plane. The plane is divided into individual pixels and each consists of a color. The pixels are colored depending upon the walk able and non-walk able areas. The artificial intelligence will develop the shortest path only for the walk able areas. These pixels with colors are called as gizmos. The gizmos is must in every A* search algorithm as it as differential between different obstacles.

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XVII. ML AGENTS

The ML agents are used in the unity in order to provide an automatic decision making. The machine learning is applied in each scenario in order to process the fastest way of decision tree from the previous data and experience. These agents are applied as prefabs that could provide an easy way of providing a real-time experience as the scenario can be changed every time.

Monitoring and analysis:

I. HUMAN CONDITION

The study is done on the human being with certain phobia. The phobia can be caused due to the certain experience that happened in the past days. The phobia can be monitor by analysis the heartbeat of the user. The raise in the heartbeat will indicates that the subject is being feared by the environment. The discomfort provide from the situation will automatically changes the body vital conditions. The heartbeat and pressure raise in the body will be the major changes. The phobia could occur in the brain as it is fixed that the object could hurt the subject. In order to break the fear the subject has to be involved with the situation. That situation can be created virtually. The virtual environment can provide real-time occurrences of the subjects fear. This could eventually change the body condition. The heartbeat will rise gradually. The user has to be involved with the environment.

II. DATA COLLECTION

The subjects are undergone different situation which could make them fear. The situation will be built on the phobia that the user is being feared. This environment will play as a game that consists of certain mission. The gameplay will also provide with the feared object. The subject is made to play and monitor the heartbeat. The heartbeat is noted for few sessions. After a few reading the data is collected and stored. This data is used for the analysis. Each data of different user are taken under different conditions such as temperature and body conditions. The user should be in good condition on health as the readings are done.

III. ANXIETY RATIO:

The data which are collected from different session are taken. The ratio of the data readings is calculated. The reading is seen to be raised for few sessions and then lowered after some days. This shows that the subject is being feared of the environment at first bust after few days the user ids get used to the situation and his fear is being lowered. The ratio is taken in order to find how mush level of anxiety has been reduced in the user. This ratio value is calculated from the average which can be used for providing the anxiety level of the user. This value is tabularized and also stored in the database. This data value is calculated for certain period of time. The anxiety ratio is calculated from the below formula. The formula is used to calculate the average value of every data.

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Stage	Heart Rate Target	Heart Rate Actual	Lactate mmol/l
1	120	123	1.4
2	130	130	1.5
3	140	137	1.6
4	150	152	1.9
5	160	159	2.4
6	165	165	3.0
7	170	171	4.5
8	175	175	6.1
	Exhaustion	181	8.5

Sum of total heartbeat readings

Anxiety Ratio=-----

Total number of days

IV. STORING DATA

The data which are collected from different reading are stored in the database. These readings could be used for future references. The database consists of every session reading of the heartbeat. The database is updated with more information. The Google firebase is used for storing the data. The stored data can be accessed for cloud to any device. These data can also use in analyst for report generating.

Report generation

I. GRAPH PLOT

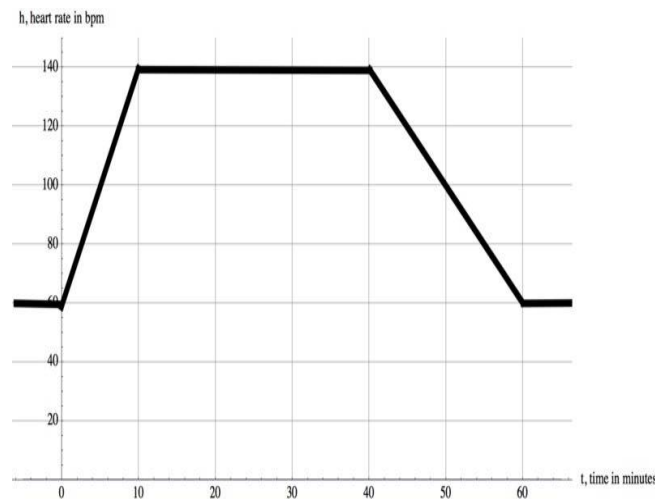
The readings of heartbeat of subject have been noted and the anxiety ratio is found. The readings are stored in the database. The reading can be used for plotting the graph with heartbeat rate in one axis and number of tests in another axis. This will provide a curve that indicates that the test subject has been feared for first few test and the get used to the situation with a drop in the graph.

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The graph generated with x-axis and y-axis. The heartbeat which are measured from the user in the x-axis. These user heartbeat data are point in each lines of axis. The time for which the experiment is done is noted in the y-axis. The point is noted and the line is drawn. The line which is drawn is seen to be rising at first period of time and then the line seen to be lower. The line forms a curve which denotes that the fear level of the user is raised at first part of the time. But as the experiment is processed the user gets used with the process and the fear level eventually lowers and as the several times of readings are taken the curve attends the zero.

RESULT

Thus the user is the starting of the architecture who is made to play the suitable scenario for they phobia in the virtual reality. The user will be made to play the scenario for a series of timing. The duration between each test can be vary as the health and body condition of the user has to be counted. The heartbeat and pressure value of the user is noted as the subject is made to play the scenario. These values are noted and also stored in the database. The value is tabularized as per each period of time. Then after a period of series test the ratio value is found from every value. This ratio value will account the anxiety level of the user.

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