Virtual Reality of a Sample Flat using Google Cardboard

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Abstract— In this paper we develop an Application in order to visualize the architecture of flat on development site with the concept of virtual reality. With the help of android phone and Google cardboard we are building a device for developing virtual reality. The effects will be developed in Unity 3D and also using DIVE Software Development Kit. The user of it can only visualize the places or structures those are already built and developed or at development stage. In this paper we will be developing and implementing sensor fusion algorithm for detecting orientations in three dimensions. We will be implementing A* approach for path finding and also Kalman filter is designed to compensate the sensor errors[2]. The app implemented would be suitable on android platform and Google Cardboard will also be used for displaying purpose[1].

Key words: Virtual reality, Sensor fusion algorithm, A* algorithm, stereoscopic rendering, unity 3D

I. INTRODUCTION

The concept of the real and virtual worlds is a challenging topic in the current virtual reality research. Virtual reality has wide range of applications such as games , movies , automation , educational purpose , virtually viewing historical places , virtual mirror , etc .

In this paper we will going to introduce the concept of Virtual reality. Virtual reality in simple terms can relate to life related to computer science where there is physical presence of the user in the environment where the environment is imaginary or real world. The user can feel the imaginary world through using the concept of Virtual reality. Virtual Reality artificially creates environment experiences which include touch, smell, sight and hearing. We are using this virtual reality concept for building virtual view of sample flat. We will have a quick view of what concepts for implementing virtual reality project:

1) Gyroscope: Gyroscope sensor records the rate of rotation based on three dimensions.
2) Accelerometer: Accelerometers are used for measuring the linear accelerations.
3) Sensor fusion: Sensor fusion algorithm is implemented for detecting orientation in three dimensions by the fusion of sensors.
4) Google Cardboard: It is a virtual reality experience used for displaying purpose.
5) Stereoscopic rendering: It is used for calculation of the depth of the image by means of binocular vision.
6) Unity 3D: Unity is a platform for building 3D and 2D images.

II. LITERATURE SURVEY

A sensor fusion algorithm are made for detecting orientation in 3D objects. We can zoom the virtually created view and use it in Google cardboard. Our system is made of gyroscope, accelerometer and a magnetometer[2]. A Kalman filter is used to eradicate the sensors errors by using accelerometer and gyroscope readings. A Kalman filter is implemented to give orientations. Tilt compensation is applied to eradicate the tilt error.The accelerometer signal is utilized to obtain x and y axis. x and y readings are noisy calculations and the algorithm fuses them with the gyroscope signal with the help of a Kalman filter to produce clean and not-noisy x and y data. Also, a tilt compensation unit is designed, which can utilize a magnetometer signal in combination with x and y readings to calculate the challenging z-axis rotation[2].

our proposed system is based on the variety of concepts of virtual reality and those concepts which are used in our project are as follows: Imaginary animal characters are included in the system so that their actions can be programmed and controlled virtually and digitally[8].A sample of our system is implemented, in which a student can copy the motion demonstrated by a virtual teacher projected on the screen[9].A implanted computer that displays information and records video which can be easily displayed on display device[1]. The concepts of Virtual Light and Virtual Shadow is used to achieve a imaginary Environment which focuses on shadows. We divide the concept of Virtual Shadow into four categories, and we can also implement four types of applications: (a) real to virtual shadow , (b) real to virtual shadow , (c) virtual to virtual shadow, and (d) virtual to real shadow. In these paper, we can generate a shadow of a real object in virtual world .Thus we can conclude that using this survey can can minimize cost and save time. With the help of above concepts we can use in many purpose applications.

III. SYSTEM ARCHITECTURE DESCRIPTION

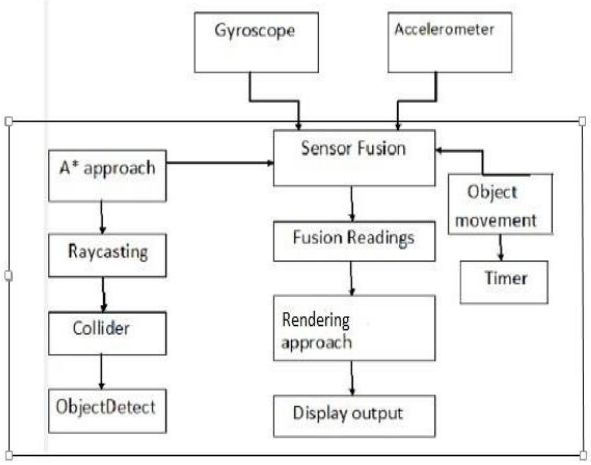

Fig. 1: System Architecture Description

The architecture of system consists the concept of virtual reality such as virtual shadow, sterioscopic rendering and Google Cardboard for displaying purpose. Algorithm such as Sensors fusion algorithm, A* algorithm are used. First of all we will make the blue print of the flat. After creating the blue print for the movement of objects the concept of raycasting, colliders, timers are used. Sensors fusion algorithm in which the algorithm takes the readings of two sensors basically Gy-roscope and Accelerometer.Both the

readings are fused by the algorithm and based on the readings, the input is provided for sterioscopic rendering for displaying the particular view. Side by side parallely the algorithm of A* is executed for finding the shortest path. The concept of collider and raycasting is used for detecting the objects that collide in path. From the camera a ray is casted to find if a object that is collided with the help of collider.

IV. EXTERNAL COMPONENTS

A. Gyroscope

Gyroscope sensor records the rate of rotation based on three dimensions. Gyroscope is not affected by the gravity of earth. It causes the drift in rotation angle. The Coriolis effect on a vibrating mass to measure the rotation of the angle. The gyroscope measures the angular velocity, which is linear to rate of rotation. The rotation is then calculated by trapezoidal integration from the gyroscope readings of signal. The integration signal is less noisy as compared to gyroscope signal but the drifting occurs and hence it gives unaccepted results.

B. Accelerometer

Accelerometers are used for measuring the linear accelerations. But the drawback of accelerometer signal is that it measures acceleration due to earth‘s gravity along with the linear momentum of the device. Therefore we cannot distinguish between the two hence there is a need to filter them. So after filtering approach the accelerometer output can be used for calculating the X-axis and Y-axis rotation. Hence the rotation angle is computed by accelerometer signal and drift is not observed but it is more noisier. In order to measure rotation around Z-axis other sensors need to be incorporated along with accelerometer. Therefore we have seen that accelerometer signal is noisier and gyroscope signal turns noise into drift and neither accelerometer not gyroscope provides accurate readings of orientation alone therefore fusion of sensors is done to overcome the drawback of each sensor by using other sensors.

C. Sterioscopic rendering

Sterioscopic rendering is a mean for calculating the depth of the image by means of binocular vision in this the 2d image are combine in the brain to give the view of 3d image depth. We can view have a 360 degree view. The concept of texture and mesh is used. For applying rendering 2 vectors are used which calculates the vertices of the triangle as the room’s blue print is based of triangle approach.

V. INTERNAL COMPONENTS

A. Google Cardboard

It is a virtual reality (VR) platform developed by Google which is mounted on a mobile phone for displaying purpose. The virtual reality applications are displayed by Google Card-board which is in 3D form.

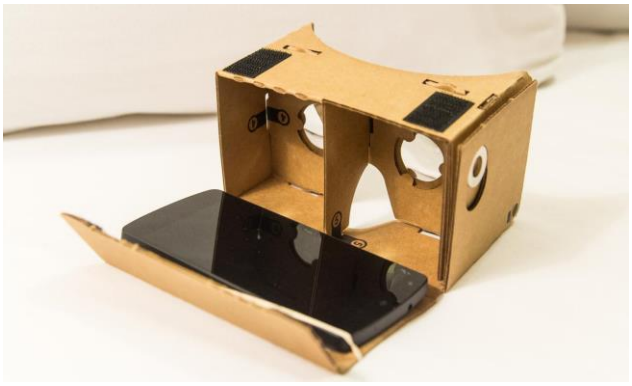

Fig. 2: Google Cardboard

B. Sensor Fusion

Sensor fusion algorithm is implemented here for detecting orientation in three dimensions by the fusion of sensors. This algorithm consists of the raw data of the three sensors i.e. gyroscope , accelerometer, magnetometer when sensors were stationary on desk. This data cannot be used therefore it is passed through calibration unit. The calibration unit consists of scale and bias which represents how far or larger raw data is from real meaningful data[2].

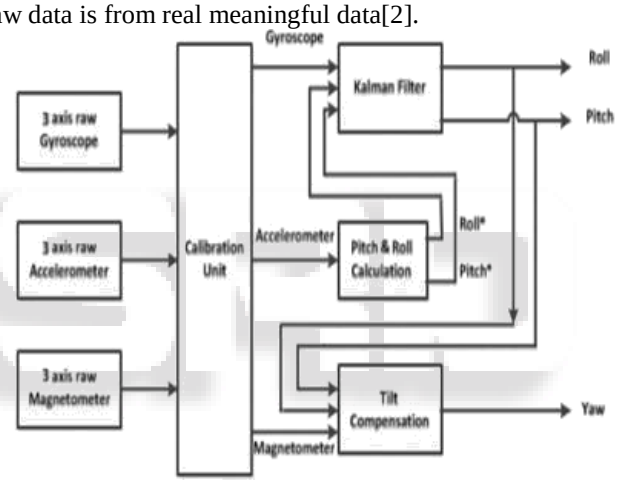

Fig. 3: Sensor Fusion

C. A Approach*

A* approach is an path finding approach which finds a least cost path for reaching the goal node.It uses same approach as used by dijistra’s algorithm. We have to find the cost function where the cost function is f(n)=g(n)+h(n).where g(n) is initial node to current node and h(n) is heuristic function where it is from current node to goal node.

VI. VISUALIZATION

The visualization of the virtual view of the flat can be achieved by Google Cardboard through which the 3D view of the application is achieved[1].By this visualization a lot of money and time can be saved. Here the concept of timer is introduced for the movement of objects.

VII. CONCLUSION AND FUTURE SCOPE

We conclude that using virtual reality we can have virtual view of flat and other applications An efficient algorithm was used to deal with inertial sensorss weakness based on the Kalman filter. Our next step will be expanding the algorithm such that it can measure the position in three

dimensions. Based of virtual reality the concept for sense of feel would be implemented in future for better visualization for the buyer along with sense of feel. Stereoscopic view can be added to make the 3-D objects more real. Nausea feeling can be removed by implementing virtual nose to remove nausea feeling. Thus we can conclude that we can reduce cost and save time.

ACKNOWLEDGMENT

We would like to thank Prof. R.S. Suryawanshi and Prof. Rakhi Bhardwaj for their guidance and valuable suggestions.

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