INTRODUCTION

1. Overview

Graphics provides one of the most natural means of communicating with a computer, since our highly developed 2D and 3D pattern-recognition abilities allow us to perceive and process pictorial data rapidly and efficiently. Interactive computer graphics is the most important means of producing pictures since the invention of photography and television. It has the added advantage that, with the computer, we can make pictures not only of concrete real world objects but also of abstract, synthetic objects, such as mathematical surfaces and of data that have no inherent geometry, such as survey results. Using this editor you can draw and paint using the mouse. It can also perform a host of other functions like drawing lines, circles, polygons and so on. Interactive picture construction techniques such as basic positioning methods, rubber-band methods, dragging and drawing are used. Block operations like cut, copy and paste are supported to edit large areas of the workspace simultaneously. It is user friendly and intuitive to use.

2. Problem Statement

The aim of this project is to show the simulation of Bike using OPENGL which includes transformation operations like Translation, Scaling etc on the objects that are used in creating the bike. The 3-D package designed here provides an interface for the users for handling the display and direction of bike. The mouse and keyboard are the main input devices used.

3. Motivation

I myself, on the other hand, am a passionate rider and some time ago it came to my mind whether such a computer game exists. The search resulted with no great avail, although various implementations can be found. There may be many reasons for this. The first could be attractiveness – most people would find it much more fun racing motorbikes or cars at high speeds. Secondly, bike riding and racing above all reflects the rider's physical abilities and technique, which is not the predominant case in motorsport. Therefore, it is much easier to realistically simulate car driving, when controllers such as steering wheels with pedals are readily available and do not differ

greatly from those found in real cars.

4. Computer Graphics

Computer graphics and multimedia technologies are becoming widely used in educational applications because they facilitate non-linear, self-learning environments that particularly suited to abstract concepts and technical information.

Computer graphics are pictures and films created using computers. Usually, the term refers to computer-generated image data created with help from specialized graphical hardware and software. It is a vast and recent area in computer science. The phrase was coined in 1960, by computer graphics researchers Verne Hudson and William Fetter of Boeing. It is often abbreviated as CG, though sometimes erroneously referred to as CGI. Important topics in computer graphics include user interface design, sprite graphics, vector graphics, 3D modeling, shaders, GPU design, implicit surface visualization with ray tracing, and computer vision, among others.

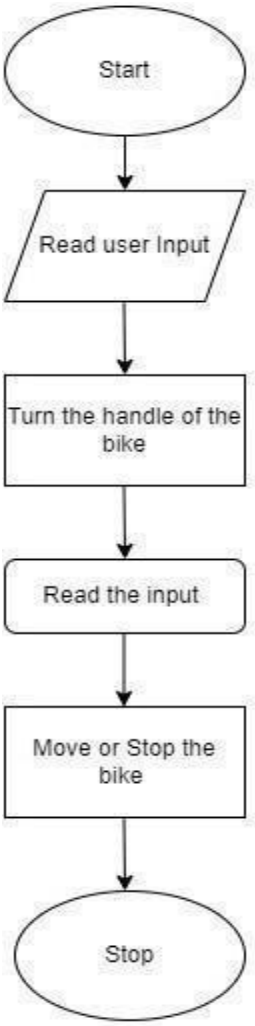
5. OpenGL API

Open Graphics Library (OpenGL) is a cross-language, cross-platform application programming interface (API) for rendering 2D and 3D vector graphics. The API is typically used to interact with a graphics processing unit (GPU), to achieve hardware-accelerated rendering. Silicon Graphics Inc., (SGI) began developing OpenGL in 1991 and released it on June 30, 1992; applications use it extensively in the fields of computer-aided design (CAD), virtual reality, scientific visualization, information visualization, flight simulation, and video games. Since 2006 OpenGL has been managed by the non-profit technology consortium Khronos Group.

The OpenGL specification describes an abstract API for drawing 2D and 3D graphics. Although it is possible for the API to be implemented entirely in software, it is designed to be implemented mostly or entirely in hardware. The API is defined as a set of functions which may be called by the client program, alongside a set of named integer constants. In addition to being language-independent, OpenGL is also cross-platform.

Flowchart

A flowchart is a visual representation of the sequence of steps and decisions needed to perform a process. Each step in the sequence is noted within a diagram shape. Steps are linked by connecting lines and directional arrows.



Flowchart of the Proposed System

Related Work

• Computer Aided Design (CAD):

Most of engineering and Architecture students are concerned with Design. CAD is used to design various structures such as Computers, Aircrafts, Building, in almost all kinds of Industries. Its use in designing electronic systems is known as electronic design automation (EDA). In mechanical design it is known as mechanical design automation (MDA) or computer-aided drafting (CAD), which includes the process of creating a technical drawing with the use of computer software.

• Computer Simulation

Computer simulation is the reproduction of the behavior of a system using a computer to simulate the outcomes of a mathematical model associated with said system. Since they allow to check the reliability of chosen mathematical models, computer simulations have become a useful tool for the mathematical modeling of many natural systems in physics (computational physics), astrophysics, climatology, chemistry, biology and manufacturing, human systems in economics, psychology, social science, health care and engineering. Simulation of a system is represented as the running of the system's model. It can be used to explore and gain new insights into new technology and to estimate the performance of systems too complex for analytical solutions.

• Digital Art

Digital art is an artistic work or practice that uses digital technology as part of the creative or presentation process. Since the 1970s, various names have been used to describe the process, including computer art and multimedia art. Digital art is itself placed under the larger umbrella term new media art. With the rise of social media and the internet, digital art application of computer graphics. After some initial resistance, the impact of digital technology has transformed activities such as painting, drawing, sculpture and music/sound art, while new forms, such as net art, digital installation art, and virtual reality, have become recognized artistic practices. More generally the term digital artist is used to describe an artist who makes use of digital technologies in the production of art. In an expanded sense, "digital art" is contemporary art that uses the methods of mass production or digital media.

• Virtual Reality

Virtual reality (VR) is an experience taking place within a computer-generated reality of immersive environments can be similar to or completely different from the real world. Applications of virtual reality can include entertainment (i.e. gaming) and educational purposes (i.e. medical or military training). Other, distinct types of VR style technology include augmented reality and mixed reality. Currently standard virtual reality systems use either virtual reality headsets or multi-projected environments to generate realistic images, sounds and other sensations that simulate a user's physical presence in a virtual environment. A person using virtual reality equipment is able to look around the artificial world, move around in it, and interact with virtual features or items. The effect is commonly created by VR headsets consisting of a head-mounted display with a small screen in front of the eyes, but can also be created through specially designed rooms with multiple large screens. Virtual reality typically incorporates auditory and video feedback, but may also allow other types of sensory and force feedback through haptic technology.

• Video Games

A video game is an electronic game that involves interaction with a user interface to generate visual feedback on a two- or three-dimensional video display device such as a TV screen, virtual reality headset or computer monitor. Since the 1980s, video games have become an increasingly important part of the entertainment industry, and whether they are also a form of art is a matter of dispute. The electronic systems used to play video games are called platforms. Video games are developed and released for one or several platforms and may not be available on others. Specialized platforms such as arcade games, which present the game in a large, typically coin- operated chassis, were common in the 1980s in video arcades, but declined in popularity as other, more affordable platforms became available. These include dedicated devices such as video game consoles, as well as general-purpose computers like a laptop, desktop or handheld computing devices.

SYSTEM REQUIREMENTS

1. Software Requirements

Software requirements deal with defining software resource requirements and prerequisites that need to be installed on a computer to provide optimal functioning of an application.

The following are the software requirements for the application:

- Operating System: Windows 10
- Compiler: GNU C/C++ Compiler
- Development Environment: Visual Studio 2019 Community Edition
- API: OpenGL API & Win32 API for User Interface and Interaction

2. Hardware Requirements

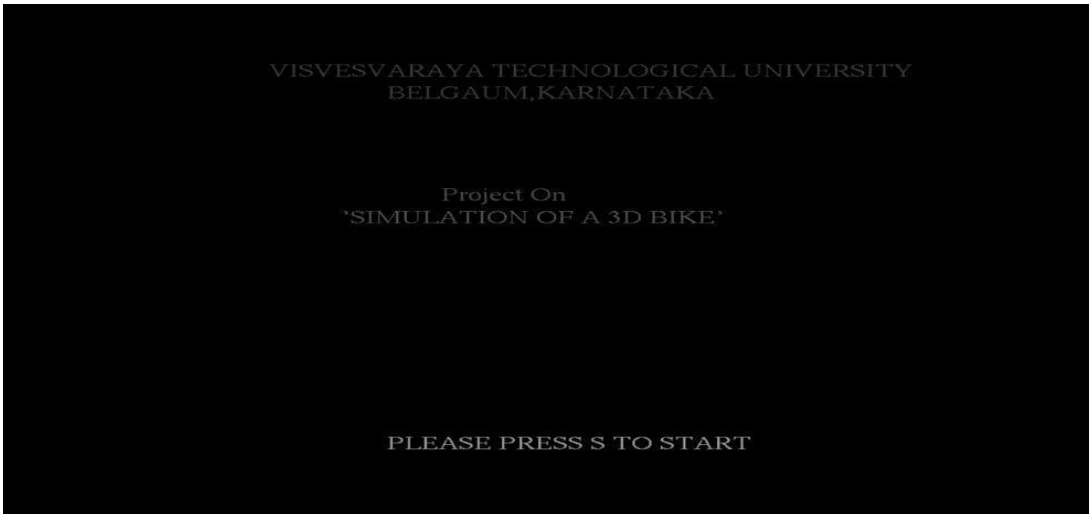
The most common set of requirements defined by any operating system or software application is the physical computer resources, also known as hardware.

- CPU: Intel or AMD processor
- Cores: Dual-Core (Quad-Core recommended)
- RAM: minimum 4GB (>4GB recommended)
- Graphics: Intel Integrated Graphics or AMD Equivalent
- Secondary Storage: 250GB
- Display Resolution: 1366x768 (1920x1080 recommended)

RESULTS

- **Start Page**

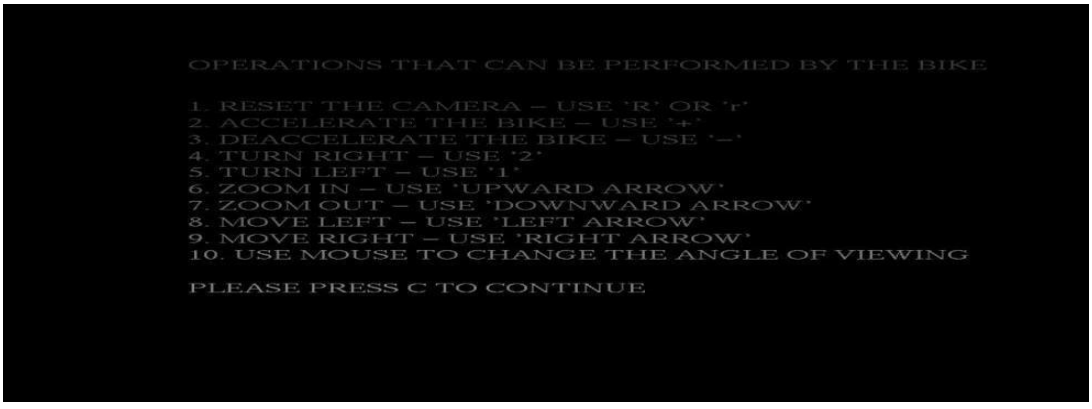
The starting page of the application, gives option to the user to select which page is to be accessed next using keyboard interaction. The name of the University is displayed on the top. The title of the project is displayed. The text are displayed in white color and the background color is black.



Start Page of the Application

- **Instructions Page**

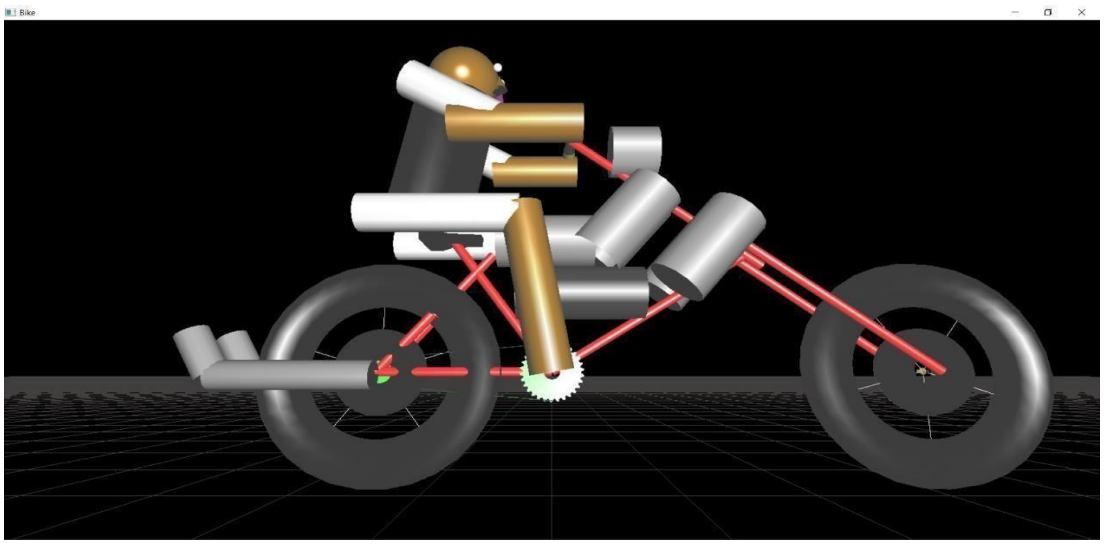
The Instructions page of the application, gives us information about different keys required to operate the bike. It contains 10 different options that can be performed while operating a bike. The options contain resetting the camera, accelerating and de accelerating the bike, turning the bike left and right changing the camera positions.



The Instructions Page of the Application

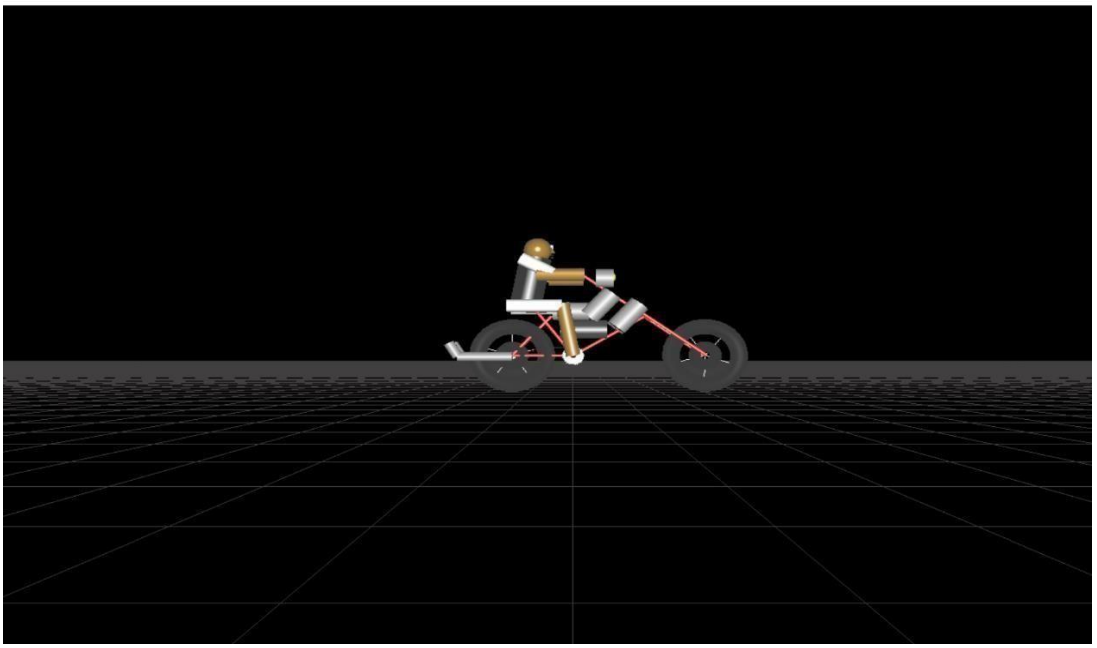
- **Bike Model Page**

1. In this page the user is allowed to see the bike. A man is made to sit on the bike. The user can now operate the bike with the keys which was displayed in previous Instructionwindow. We can observe that the bike contains handle, seat, pair of tyres, chain. The bike is on the land which is created using rectangular mesh.



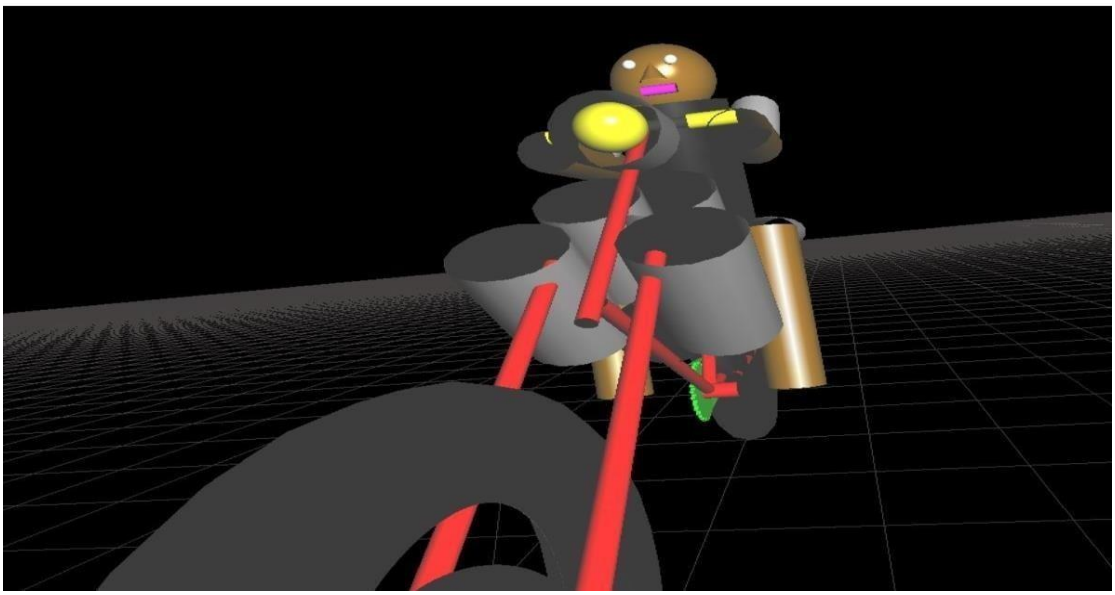
The Bike Model Page

2. Figure 6.4 shows Camera moved away from the Bike. The user has used the keys from the keyboard to zoom out .Here the down arrow is used to zoom out. The below figure show that the camera is moved away from the bike and this happens only when the user presses down arrow.



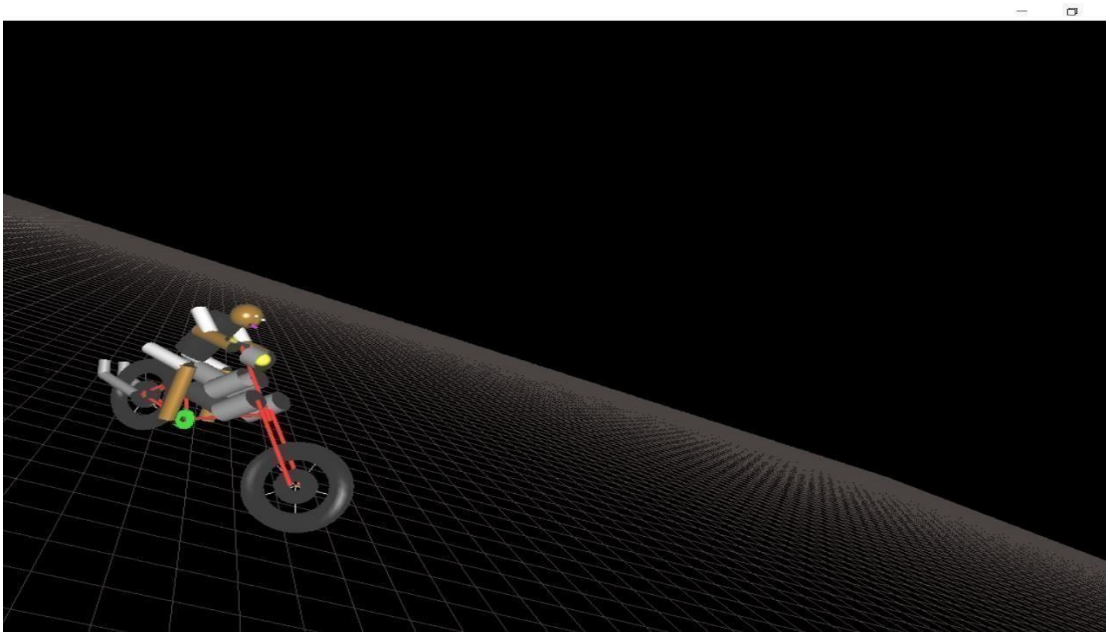
Camera moved away from the Bike

3. Figure 6.5 shows a different view of bike in x-y axis. This is obtained by pressing The mouse button . The user can view any side of the bike by pressing the mouse button. The camera view is being changed when then user presses the mouse and moves its in any x-y direction.



Mouse Orientation towards x-y axis

4. Figure 6.6 shows that the bike is turning to it's left. This can be done by pressing the left arrow key in the keyboard. The user can move the bike or accelerate the bike using the '+' key. Once the bike starts moving the user can change the direction of the bike either to left or right using the left and right arrows.



Bike turning left

CONCLUSION AND FUTURE ENHANCEMENTS

1. CONCLUSION

The 3D Bike Simulation has been tested under Ubuntu 11.10, and has been found to provide ease of use and manipulation to the user. The 3D Bike Simulation created for the Ubuntu 11.10 operating system can be used to draw lines, boxes, circles, ellipses, and polygons. It has a very simple and effective user interface.

Designing and developing this 3D Bike as a very interesting and learning experience. It helped us to learn about computer graphics, design of Graphical User Interfaces, interface to the user, user interaction handling and screen management. The graphics editor provides all and more than the features that have been detailed in the university syllabus.

2. FUTURE ENHANCEMENTS

These are the features that are planned to be supported in the future

* Simulating smoke from exhaust pipe
* Perform wheelie by the rider
* To improve the looks of the rider
* To implement shadow using more built-in functions

3 LIMITATIONS

As with all types of parallel projection, objects drawn with isometric projection do not appear larger or smaller as they extend closer to or away from the viewer. Since lighting has been given from only one side, the light will not be illuminated on the other side. Hence, the left part of the bike is seen as dark. As we have generated cylinders within a cylinder, it so happens that when we move from right to left or vice-versa, the surface of inner cylinder is seen through the outer one.