American International University of Bangladesh (AIUB)

Faculty of Science and Engineering

Course Name: Computer Graphics [E]
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Project Title: Moon Quest.

Group Details:

Serial No.	Name	ID	Contribution%
01	ZANNATUS SURIYA SUCY	21-45443-3	20%
02	APON KUMAR DAS	21-45726-3	20%
03	AL-NAFI	21-45744-3	20%
04	SUMAIYA SULTANA TARIN	21-45745-3	20%
05	MST. UMMAY FATEMA MIM	21-45818-3	20%

Feature:

1. MIM (Cover)
2. NAFI (AIUB Field view)
3. TARIN (Sky view)
4. APON & MIM (Galaxy view)
5. SUCY (Moon view)

Introduction:

Welcome to Moon Quest, a visionary project that ventures beyond the realms of the ordinary and into the infinite expanse of space. Using the powerful code capabilities of OpenGL software, we invite you to experience a captivating journey through four mesmerizing views.

In View 1, behold the splendor of our campus, where soaring buildings, lush fields, and the mighty rocket await. As we launch the rocket, brace yourself for View 2—the ethereal sky view—where the rocket pierces through clouds, leaving Earth behind.

View 3 beckons you to the cosmic abyss as the rocket delves into the galaxy, encountering celestial wonders like planets, stars, and even UFOs. Finally, in View 4, witness an extraordinary lunar landing, where two brave explorers proudly raise flags of our nation and university on the Moon.

This thrilling expedition is fueled by our passion for research and knowledge. Embark with us on Moon Quest, and together, we'll reach for the stars and push the boundaries of human exploration!

Literature review:

OpenGL:

The Moon Quest project we created is a kind of OpenGL project. OpenGL is a graphics rendering API (Application Programming Interface) that has been widely used in computer graphics development. It allows developers to create 2D and 3D graphics applications. It provides a set of functions and tools that allow developers to communicate with the graphics hardware of a computer, enabling the creation of complex visual displays and interactive graphics applications.

Windows.h library :

Windows.h is a header file in the Windows API (Application Programming Interface) for Microsoft Windows operating systems. The Windows API provides a set of functions, structures, and constants that are used to create Windows applications and interact with the Windows operating system.

The Windows.h header file contains declarations for various functions and data types that are used to interact with the Windows operating system, including functions for creating and

managing windows, handling messages, and accessing system information. It also includes data types for representing Windows-specific data, such as handles, messages, and pointers.

GL/glut.h:

GL/glut.h is a header file in the OpenGL utility toolkit (GLUT) library. The GLUT library is a set of tools and functions that make it easier to create graphical user interfaces and handle user input in OpenGL applications. It provides a simplified interface to the lower-level OpenGL API, making it easier for developers to create cross-platform OpenGL applications.

The GL/glut.h header file contains declarations for various functions, data types, and constants that are used in OpenGL applications built using the GLUT library. These include functions for creating and managing windows, handling input events, rendering text, and more.

Math.h:

math.h is a header file in the C Standard Library that provides various mathematical functions and constants. It is used in C and C++ programming to perform mathematical calculations and manipulate numbers.

The math.h header file includes many mathematical functions, such as trigonometric functions (e.g. sin, cos, tan), exponential functions (e.g. exp, log, pow), and rounding functions (e.g. ceil, floor, round). These functions can be used to perform complex mathematical operations in C and C++ programs.

The math.h header file also provides many mathematical constants, such as pi (π), e (the base of the natural logarithm), and infinity. These constants can be used in mathematical calculations and expressions in C and C++ programs.

GL/gl.h:

GL/gl.h is a header file in the OpenGL (Open Graphics Library) API that provides declarations for functions, data types, and constants used in OpenGL applications. OpenGL is a cross-platform graphics API used to render 2D and 3D graphics in computer applications.

The GL/gl.h header file contains the core OpenGL API declarations, including functions for initializing and configuring the OpenGL context, drawing geometric shapes and images, and manipulating the projection and model view matrices.

glPushMatrix():

In computer graphics, "push matrix" is a command used to save the current state of the transformation matrix onto a stack. The transformation matrix is used to apply various transformations, such as scaling, rotation, and translation, to the vertices of a 3D object to position and orient it in the scene.

When a "push matrix" command is issued, the current state of the transformation matrix is saved onto a stack. This allows subsequent transformations to be applied without affecting the original state of the matrix. This is useful, for example, when you want to apply a transformation to only a

portion of an object while preserving the original position and orientation of the rest of the object.

glPopMatrix():

In computer graphics, "pop matrix" is a command used to retrieve the previous state of the transformation matrix from a stack. The transformation matrix is used to apply various transformations, such as scaling, rotation, and translation, to the vertices of a 3D object in order to position and orient it in the scene.

When a "pop matrix" command is issued, the previous state of the transformation matrix is retrieved from the stack and becomes the current state. This allows you to restore the original state of the matrix after applying one or more transformations using "push matrix" commands.

Objective of Moon Quest:

The objective of Moon Quest is to create an engaging and educational OpenGL-based project that takes users on a captivating journey through four views: showcasing our campus, launching a rocket through the sky, exploring the galaxy, and landing on the Moon. By combining stunning visuals with informative content, we aim to inspire curiosity, promote STEM fields, and instill a sense of national pride in the pursuit of knowledge and space exploration.

Methodology for Moon Quest:

1. Visualization Planning: Define the project's objectives to showcase the campus, launch a rocket, explore the galaxy, and land on the Moon. Plan the overall storyline and transitions between views.

2. Asset Creation: Develop 3D models of the campus, rocket, celestial objects, and flags. Implement texture mapping and lighting techniques.

3. Scene Setup: Create scenes for each view (campus, sky, galaxy, and Moon). Implement camera controls and animations for smooth transitions.

4. Rocket Launch: Design a realistic rocket launch animation with particle effects and smoke trails.

5. Galactic Environment: Create an immersive galaxy backdrop and animate celestial objects for an engaging experience.

6. Lunar Landing: Develop a landing animation on the Moon's surface and animate the flag placement.

7. User Interface: Create an intuitive interface for navigation and interaction with informative tooltips.

8. <u>Testing and Optimization:</u> Thoroughly test and optimize the project for smooth performance.

9. <u>Documentation and Delivery:</u> Prepare comprehensive documentation and package the project for delivery to the audience.

<u>Significance of Moon Quest:</u>

Moon Quest holds great significance as a cutting-edge project that combines creativity, technology, and education to take users on a thrilling and informative journey through space exploration. The project's impact lies in several key aspects:

1. <u>Educational Engagement:</u> By immersing users in a visually stunning and interactive environment, Moon Quest becomes an effective educational tool. Viewers can explore the campus and experience a rocket launch, fostering curiosity and interest in science, technology, and space exploration.

2. <u>STEM Promotion:</u> The project serves as a catalyst for promoting STEM fields (Science, Technology, Engineering, and Mathematics). It inspires viewers to delve into the wonders of coding, 3D modeling, and animation, encouraging them to pursue careers in STEM-related disciplines.

3. <u>National Pride:</u> The depiction of the lunar landing with the raising of the Bangladesh flag and the university flag represents a moment of immense national pride. It showcases our country's potential in space research and exploration, inspiring a sense of unity and aspiration among the viewers.

4. <u>Artistic Expression:</u> Moon Quest is not only a technical achievement but also an artistic expression of the beauty and complexity of the universe. The stunning visuals and meticulous attention to detail captivate audiences, leaving a lasting impression of creativity and innovation.

5. <u>Imagination and Wonder:</u> Through its portrayal of the galaxy's vastness and the grandeur of space, Moon Quest ignites the imagination and evokes a sense of wonder in viewers. It encourages them to ponder the mysteries of the cosmos and our place within it.

6. <u>Cultural and Scientific Representation:</u> By showcasing the campus, cultural landmarks, and the potential for space exploration, Moon Quest represents a fusion of culture and scientific advancement. It reflects the pursuit of knowledge and exploration that defines the essence of human progress.

7. <u>Inspiration for Future Endeavors:</u> Moon Quest serves as a stepping stone for future projects and advancements in educational and interactive media. Its success paves the way for more innovative and immersive experiences in the fields of technology and education.

In conclusion, Moon Quest's significance lies in its ability to combine art, technology, and education to create an engaging and enlightening experience. By fueling curiosity, promoting

STEM fields, and instilling a sense of national pride, the project leaves an indelible mark on its viewers and inspires them to reach for the stars—both literally and figuratively.

Conclusion of Moon Quest:

Moon Quest has taken us on an extraordinary journey, transcending the boundaries of the ordinary and venturing into the far reaches of space. Through the captivating power of code and OpenGL software, we embarked on a visually stunning and educational expedition through four mesmerizing views.
From the familiar landscapes of our university campus to the awe-inspiring galactic wonders and the triumphant lunar landing, Moon Quest has left an indelible mark on our hearts and minds. It has inspired us to dream, to explore, and to reach for the stars.

This project's significance lies not only in its technical prowess but also in its ability to ignite curiosity, promote STEM fields, and instill a sense of national pride. It has become a beacon of creativity and innovation, fostering a profound appreciation for the beauty and complexity of our universe.
As we bid farewell to Moon Quest, its impact will continue to resonate, serving as a reminder that knowledge knows no bounds. The quest for understanding, propelled by the wonders of code and technology, will forever be etched in our memories and aspirations.

Let Moon Quest be a testament to the human spirit—an unwavering desire to explore, learn, and achieve. May it inspire future endeavors and pave the way for more extraordinary projects that push the boundaries of human ingenuity.

With hearts filled with wonder and minds enriched with knowledge, we conclude this momentous expedition. Farewell, Moon Quest, and may your legacy of inspiration and exploration endure for generations to come.

Reference:
1. https://www.opengl.org

Links of the project:

1. GitHub Link: https://github.com/Tarin10/CG_PROJECT-CODE_E
2. YouTube Link: https://www.youtube.com/watch?v=c0WMaGYZFtg

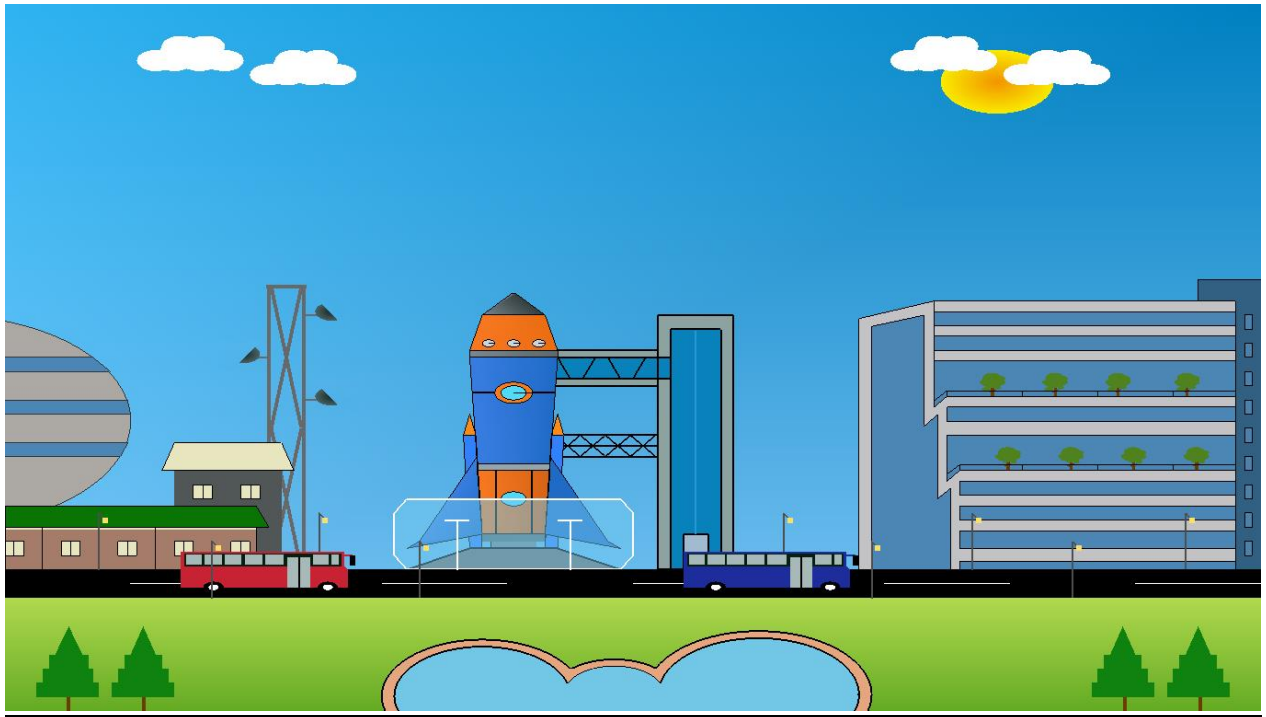# Screenshot of this Project:

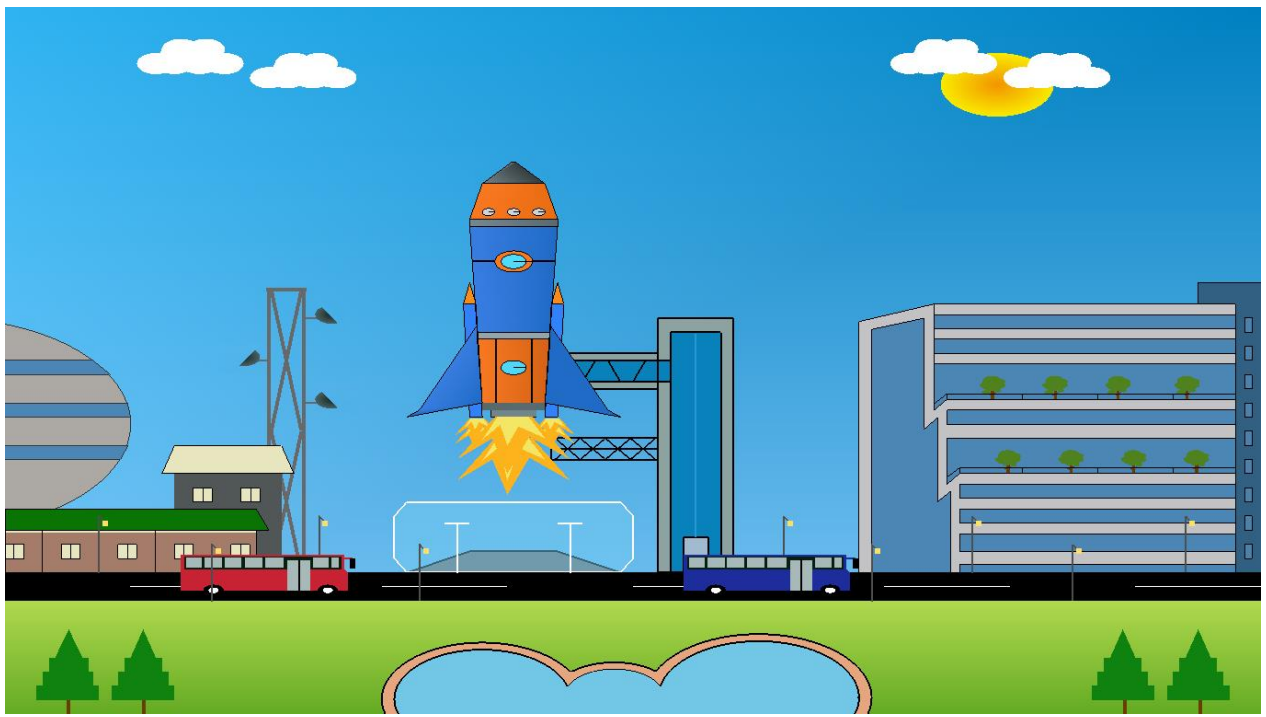## MIM (Cover View 1)

MIM (Cover View 2)

NAFI (AIUB Field View 1)

Picture 1

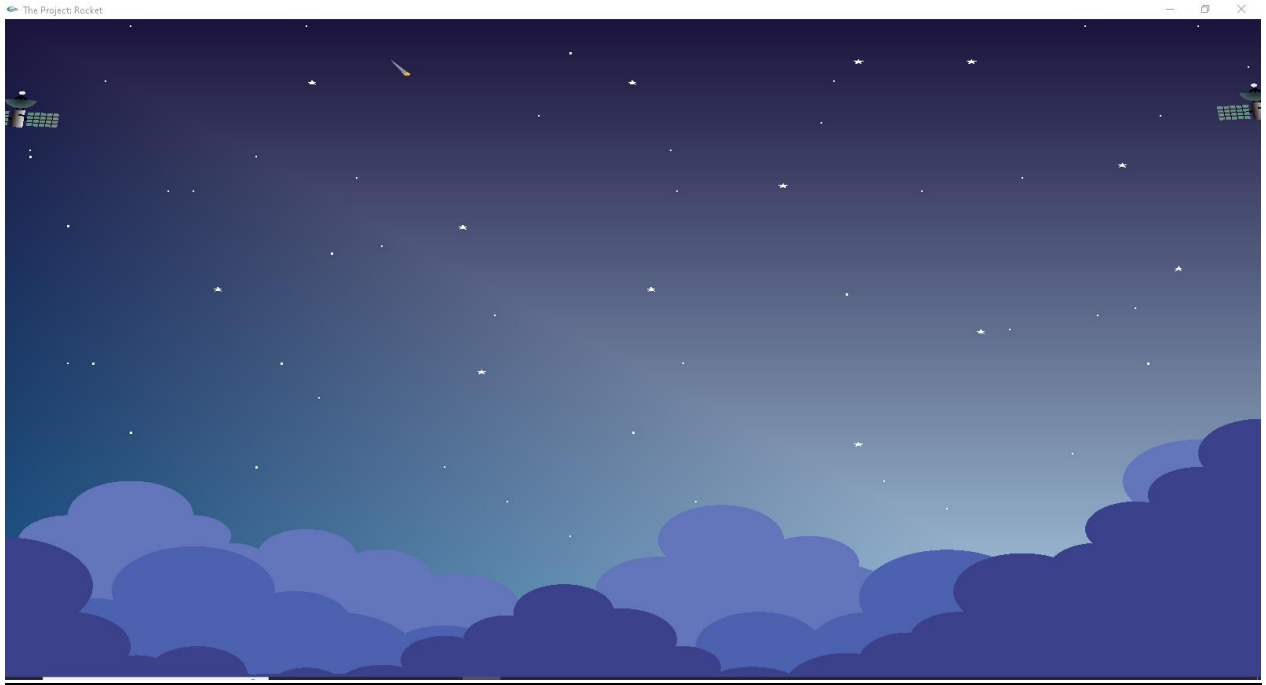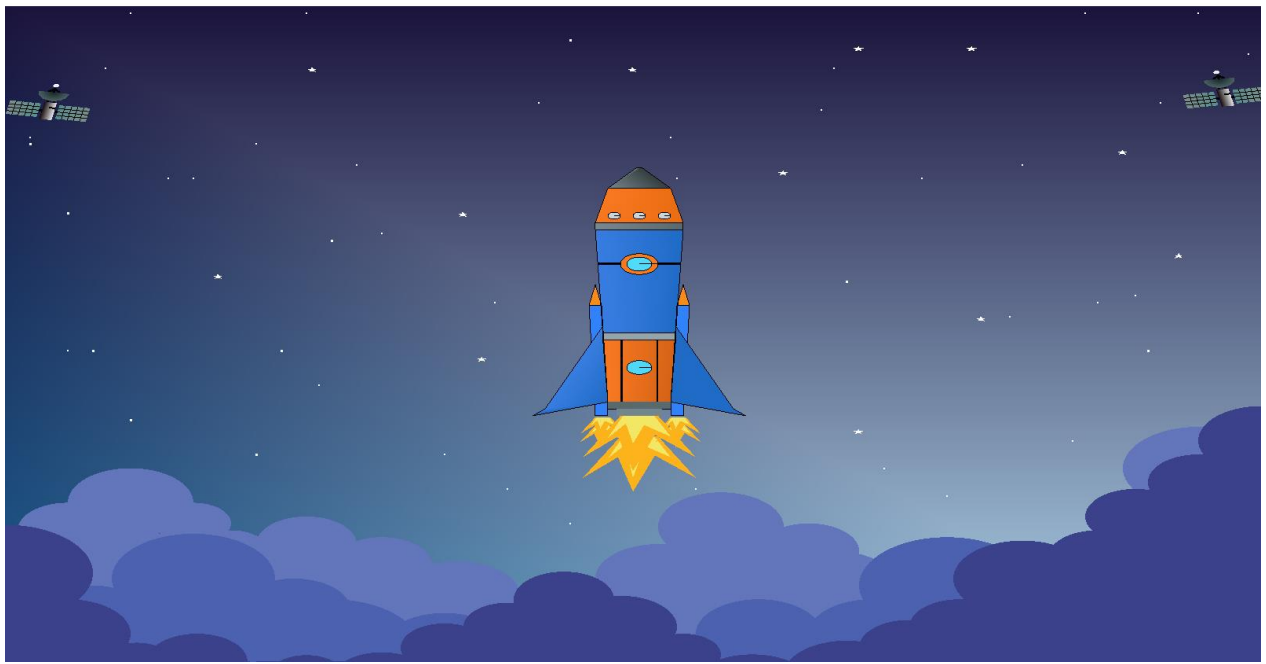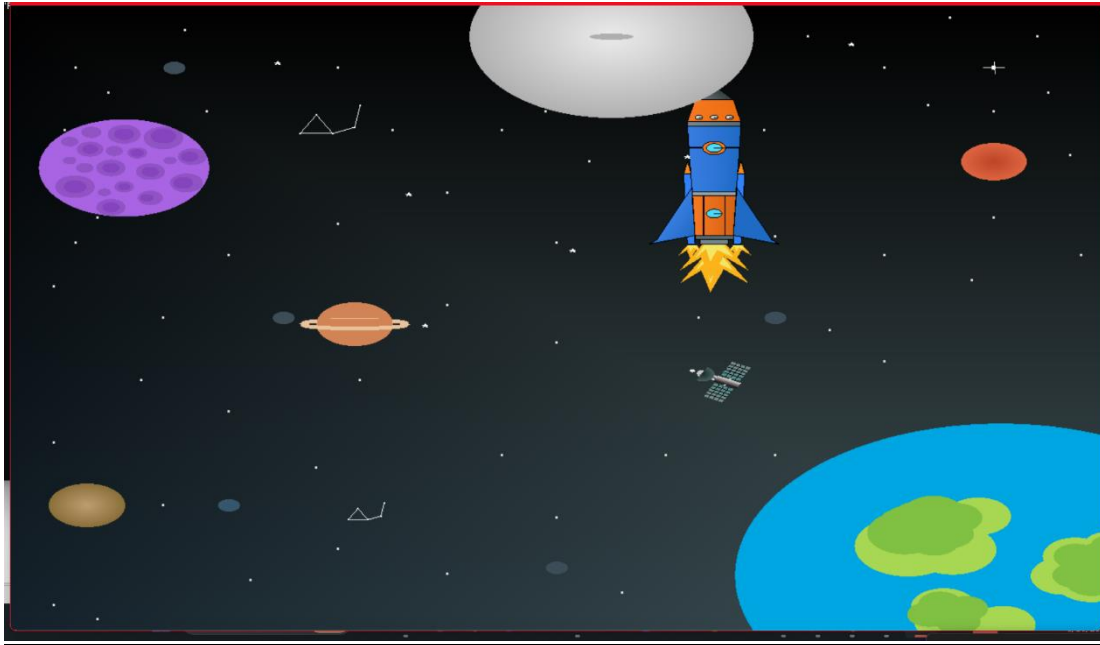## Picture 2

TARIN (Sky view 2)
Picture 1

Picture 2
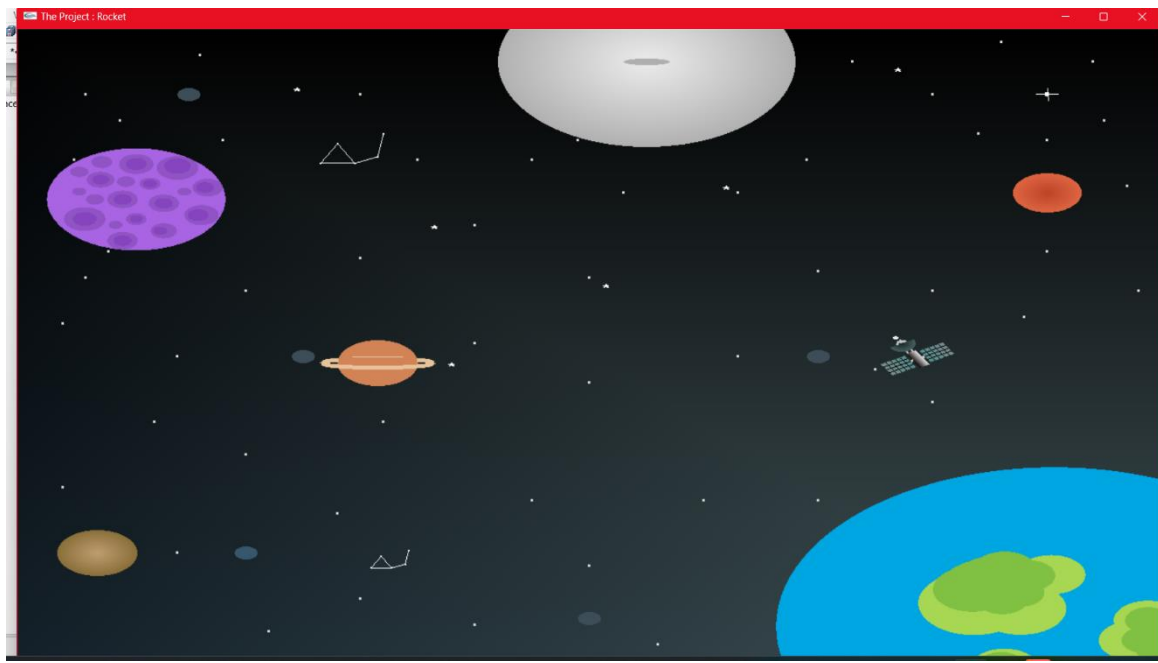
APON & MIM (Galaxy view 3)
Picture 1

Picture 2

SUCY (Moon view 4)
Picture 1

Picture 2