# American International University Bangladesh


## Computer Graphics

## Course Code: CSC4118

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## Project Report

## Modern Urban Vista

**Under the Guidance of**

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## I. Group Member Details

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## II. Table of Contents:

## Introduction:

The "Modern Urban Vista" project is an interactive graphical representation built using OpenGL and GLUT libraries. It creates a vibrant and dynamic scene comprising various elements, including the sun, clouds, hills, trees, buildings, vehicles, human figures, flag, Shaheed Minar, windmills, college building, house, road, ground, and rail line.The project leverages the power of computer graphics to generate visually appealing and immersive landscapes. Through the integration of OpenGL and GLUT, it demonstrates the capabilities of these libraries in rendering diverse objects and scenes in a coherent and interactive manner. The primary focus is on creating a visually engaging environment that showcases the potential of computer graphics technology.Key components of the project include the use of geometric shapes (circles, rectangles, triangles) to represent different objects, along with the incorporation of dynamic movement for certain elements. The inclusion of sound using the PlaySound function enhances the overall user experience, providing an auditory dimension to the visual landscape.In essence, the project serves as both a practical application of computer graphics principles and a visually stimulating experience for users. It aims to demonstrate the versatility of OpenGL and GLUT in constructing graphical scenes and fostering an understanding of fundamental concepts in computer graphics. The project is not only a showcase of technical proficiency but also an opportunity for users to explore and interact with a diverse and lively graphical environment.

## Motivation:

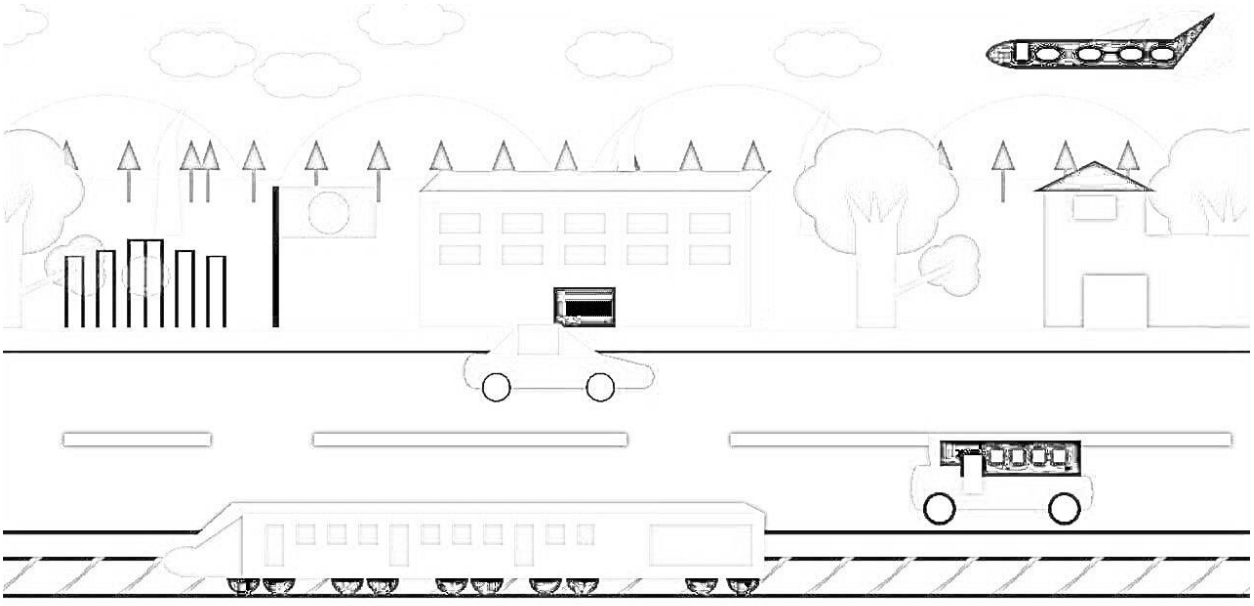
The motivation behind the "Modern Urban Vista" project is multifaceted, driven by a combination of technological enthusiasm, artistic expression, and a desire to create an engaging and immersive experience. Several key motivations underpin the development of this project:

1. Technological Innovation: The project is motivated by a keen interest in exploring and leveraging the capabilities of modern computer graphics technologies, specifically OpenGL and GLUT. It serves as a playground to experiment with advanced rendering techniques, shading, and interactive features.
2. Artistic Expression and Aesthetics:Artistic expression is a central motivator, aiming to merge the technical aspects of computer graphics with a creative vision of a contemporary urban landscape. The project seeks to strike a balance between realism and aesthetics, creating a visually stunning representation of modern city life.
3. Realism and Immersion: Realism is a driving force behind the project, aspiring to create a virtual urban environment that closely mirrors the complexities of real-world cityscapes.

This involves the inclusion of realistic architectural elements, lifelike movement of objects, and attention to details that contribute to a heightened sense of immersion.

4. User Engagement and Exploration: The motivation to engage users actively fuels the incorporation of interactive elements within the urban landscape. Users are encouraged to explore the virtual city, navigate through its streets, and interact with various objects, fostering a sense of participation and discovery.
5. Educational Value: Education serves as a key motivator, as the project aims to provide a practical and hands-on application of computer graphics principles. Through the construction of a complex urban scene, it offers insights into the implementation of geometric primitives, transformations, and rendering techniques in a visually compelling manner.
6. Reflecting Modern Urban Dynamics: The project is motivated by a desire to reflect and encapsulate the dynamics of modern urban life. This includes the representation of skyscrapers, bustling traffic, diverse architectural styles, and the incorporation of elements that capture the vibrancy and diversity of contemporary cities.
7. Innovation in Multimedia Experience: The integration of sound using the PlaySound function adds an innovative dimension to the project. This feature aims to enhance the multimedia experience, creating a more holistic and immersive encounter for users by incorporating auditory elements that complement the visual landscape.

- **Diagram:**



- **List of objects:**

The "Modern Urban Vista" project incorporates a diverse range of objects to construct a rich and visually appealing urban landscape. Each object contributes to the overall realism and complexity of the scene. Here is an explanation of the key objects featured in the project:

1. **Sun**: The sun serves as a prominent celestial object, contributing to the atmospheric aesthetics of the urban vista. Represented as a glowing circle, it adds a dynamic element to the sky.
2. **Clouds:** Clouds are represented as clusters of white circles, creating a dynamic and ever-changing sky. The movement of clouds adds a sense of realism to the environment.
3. **Hills:** Hills are depicted using circular shapes in varying sizes, creating a scenic backdrop. Their inclusion adds topographical diversity to the landscape.
4. **Soil:** The soil is represented as a ground plane, providing a foundation for the urban environment. It is colored in a neutral tone, creating a contrast with other elements.
5. **Ground:** The ground is depicted as a green surface, representing open spaces within the urban setting. It adds a natural and vibrant component to the scene.
6. **Roads:** Roads are represented as grey rectangular areas with white dividers, capturing the infrastructure of an urban environment. The inclusion of dividers adds to the realism of a city street.
7. **Trees:** Trees are represented in two variations. Tree1 features a more stylized representation with circular canopies and a simplified trunk. Tree2 introduces a more detailed depiction with a tree trunk and branches.
8. **Flag:** The flag is composed of a stand and a rectangular area representing the flag itself. The use of patriotic colors adds a symbolic and cultural element to the urban landscape.
9. **Shaheed Minar:** The Shaheed Minar is depicted as a monument with distinctive rectangular and circular components. It adds a cultural and historical dimension to the scene.
10. **College Building:** The college building is represented as a rectangular structure with windows and doors. It contributes to the architectural diversity of the urban setting.
11. **Plane:** The plane is depicted with a circular fuselage and rectangular wings. Its movement across the sky adds a dynamic and modern element to the scene.
12. **Private Car:** The private car is represented with a circular body and rectangular components. Its movement on the road contributes to the overall traffic dynamics.
13. **Bus:** The bus is depicted as a larger rectangular object with distinctive features representing doors and windows. It adds to the vehicular diversity of the scene.
14. **Rail Line:** The rail line is represented as a set of parallel rectangular strips, symbolizing train tracks. It contributes to the transportation infrastructure.
15. **Train:** The train is represented as a combination of circular wheels and a rectangular body on the rail line. Its movement enhances the transportation theme.

16. **Windmills:** Windmills are depicted as tall structures with rotating fan blades. They add a modern and renewable energy aspect to the urban vista.
17. **House:** The house is represented as a rectangular structure with a triangular roof. It contributes to the residential aspect of the urban landscape.
18. **Man:** The man is represented as a figure with distinctive features, contributing to the representation of pedestrians. The child is depicted in a simplified manner, adding diversity to the pedestrian population.

## ▪ Functions to represent the objects:

The "Modern Urban Vista" project employs a variety of functions to accurately represent and render each object within the digital environment. Here's an overview of the functions associated with the key objects:

**1. Sun:**

Function: sun()

Description: Draws a sun object using OpenGL functions. The sun is represented as a circle with a distinct color to simulate its presence in the sky.

**2. Clouds:**

Function: make_cloud(int x, int y)

Description: Creates a cloud by drawing a series of white circles at specified coordinates. The cloud() function incorporates multiple instances of make_cloud() to generate a cloud ensemble.

**3. Hills:**

Function: hill()

Description: Draws hills using the circle() function. Multiple circular shapes are drawn at different positions to create a scenic backdrop.

**4. Soil:**

Function: soil()

Description: Renders the soil or ground by drawing a colored rectangle. The color is chosen to represent the natural terrain.

**5. Ground:**

Function: ground()

Description: Draws the ground surface using a colored rectangle. This function contributes to the overall landscape by providing a base for other elements.

**6. Roads:**

Function: road()

Description: Renders roads using a combination of colored rectangles to represent the road itself and dividers. The dividers are drawn using additional rectangles.

**7. Trees:**

Function: tree() and make_tree2()

Description: Draws trees using circles and rectangles. The tree() function represents a stylized tree, while make_tree2() introduces a more detailed tree with additional geometric shapes.

**8. Flag:**

Function: flag()

Description: Draws the flag by combining rectangles to represent the stand and flag area. Colors are chosen to symbolize the national flag.

**9. Shaheed Minar:**

Function: shaheed_minar()

Description: Draws the Shaheed Minar monument using rectangles and circles. The colors and shapes are chosen to resemble the real-world structure.

**10. College Building:**

Function: college()

Description: Renders the college building using rectangles to represent the body, roof, windows, and additional details. Colors are chosen to mimic a typical college structure.

**11. Plane:**

Function: make_plane()

Description: Draws an airplane using circles and rectangles. The airplane is represented with wings, fuselage, and tail, and it includes additional geometric shapes to simulate its structure.

**12. Private Car:**

Function: makeprivatecar()

Description: Draws a private car using circles and rectangles. The car is depicted with a body, windows, and other distinctive features.

**13. Bus:**

Function: busmake()

Description: Draws a bus using rectangles to represent its body, doors, and windows. Additional shapes are used to depict specific features of a bus.

**14. Rail Line:**

Function: railline()

Description: Renders the rail line using rectangles to create parallel strips, symbolizing train tracks.

**15. Train:**

Function: makerail()

Description: Draws a train on the rail line using circles and rectangles. The train's movement is achieved by adjusting its position through the trainMove() function.

**16. Windmills:**

Function: windmil() and windmail()

Description: Draws windmills using rectangles and a rotating fan created by the spinDisplay_left() function. Multiple windmills are placed in the scene using windmail().

**17. House:**

Function: house()

Description: Renders a house using rectangles and triangles to represent the building's body and roof.

**18. Man:**

Functions: man1(), child1(), child2(), child(), man()

Description: These functions draw human figures, representing a man and a child. Circles and rectangles are utilized to depict various body parts and features. The manmove() function is used to create movement for the man.

- **Output ScreenShot:**

- **Demo Link:**

Project Video.MOV

- **Uniqueness of your Project:**

The uniqueness of the "Modern Urban Vista" project lies in its synthesis of technological innovation and artistic creativity. Key distinctive features include:

**Realistic Urban Representation:** The project strives to create a realistic depiction of a modern urban environment, incorporating details that capture the essence of city life.

**Interactivity:** Interactive elements and dynamic features enhance user engagement, allowing users to navigate through the urban landscape and explore its intricacies.

**Educational Value:** Beyond its visual appeal, the project serves as an educational resource, offering insights into the application of computer graphics in simulating complex environments.

## Conclusion:

The "Modern Urban Vista" project encapsulates a comprehensive and visually captivating representation of an urban landscape through computer graphics. The project successfully achieves its goals of creating an immersive and dynamic environment that incorporates various elements of urban life. The combination of interactive features, attention to detail, educational value, and symbolic elements contributes to the project's uniqueness and effectiveness. Throughout the development of the project, we have explored the capabilities of OpenGL and computer graphics programming to bring to life a diverse range of objects and scenarios. From the natural elements like hills and trees to architectural structures such as buildings and monuments, the project showcases the versatility of graphics techniques in creating a holistic urban scene.

The interactive components, including moving vehicles, animated characters, and sound integration, enhance user engagement and contribute to the project's dynamic nature. The attention to detail in representing objects ensures a visually appealing and realistic portrayal of the urban setting. Furthermore, the project incorporates symbolic elements like the national flag and the Shaheed Minar, adding cultural and historical significance to the visual narrative. This aspect not only enhances the aesthetic value but also provides an opportunity for educational exploration. As a graphics project, "Modern Urban Vista" serves as a testament to creativity, innovation, and technical proficiency. The successful integration of 2D and 3D elements demonstrates the project's adaptability and showcases the possibilities within the realm of computer graphics.

## Future Work:

In future iterations of the "Modern Urban Vista" project, there is substantial potential for growth and refinement. One avenue for enhancement involves delving into advanced interactive features, allowing users greater control over their virtual experience. Additionally, exploring sophisticated graphics techniques like shader programming could elevate visual aesthetics and realism. Expanding the urban environment with more detailed landmarks and diverse city elements promises to create a more comprehensive and engaging digital landscape. Educational modules could be integrated, offering users insightful information about urban planning, historical landmarks, and cultural significance. Implementing a dynamic day-night cycle would introduce variability in lighting conditions, enhancing the immersive quality of the project. Optimizing performance across various hardware configurations, adapting for mobile platforms, and potentially incorporating multiplayer functionalities or collaborative features are also promising directions for future development. These envisioned improvements aim to make the "Modern Urban Vista" project an even more dynamic, educational, and accessible digital experience.

## Reference: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