



# AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)

Dept. of Computer Science  
Faculty of Science and Technology

Course: Computer Graphics

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Section: G

Group No: H

## Project Report On

*Topic: "Riverside Scene: Nature Meets City Life"*

Supervised By

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## **1. Introduction:**

The "Riverside Scene: Nature Meets City Life" project is a computer graphics-based project developed using OpenGL. The main goal is to show how nature and urban life can exist together in a single environment. This project creates a detailed and interactive riverside scene that includes natural elements like water, trees, and grass, along with urban structures such as buildings, roads, and bridges.

This project provides a realistic experience by adding animated components like moving boats, and flowing water. These features make the scene feel more dynamic and immersive. The use of different computer graphics techniques, including lighting effects, and object transformations, helps bring the scene to life.

By working on this project, we aim to apply our knowledge of computer graphics, learn how to manage complex scene and improve our understanding of OpenGL functions. Additionally, this project serves as a demonstration of how technology can be used to create visually appealing and interactive virtual environments. Ultimately, "A Riverside Scene: Nature Meets City Life" represents a harmonious blend of nature and modern development, making it both an educational and creative endeavor.

## **2. Problem Statement:**

As cities continue to grow, natural environments often suffer. Many urban areas replace forests, rivers, and green spaces with buildings, roads, and industries. This rapid urbanization impacts the balance between nature and human development, leading to concerns about environmental sustainability and quality of life.

This project aims to visualize the peaceful coexistence of nature and city life through a detailed computer-generated riverside scene. Using OpenGL, we create a world where natural elements like trees, water exist alongside buildings, roads, and human activity. By doing so, we highlight the importance of sustainable urban development and the need to preserve nature within modern cities.

Several studies and computer graphics applications have explored cityscapes and natural landscapes separately. However, fewer works have attempted to merge both elements in a single interactive environment. Our project builds upon these ideas by integrating urban and natural features using advanced rendering techniques such as texture mapping, shading, and animation.

By presenting a visually engaging and interactive simulation, this project encourages viewers to reflect on how urbanization and nature can coexist. It serves as both a learning tool for computer graphics and a reminder of the significance of preserving the environment in urban planning.

### 3. Objective of the Project :

The main goal of this project is to create a beautiful and interactive riverside scene that brings together nature and city life. To achieve this, we have set the following objectives:

- To design a visually attractive environment where natural elements like rivers, trees, and wildlife exist alongside buildings, roads, and bridges.
- To use OpenGL for rendering high-quality graphics and smooth animations, making the scene more dynamic and realistic.
- To apply important computer graphics techniques such as object transformations, texture mapping, and lighting effects to enhance the overall visual quality.
- To add animated components like moving boats, flowing water, and flying birds, making the scene lively and engaging.
- To provide an interactive experience where users can explore and appreciate how nature and urban development can coexist.
- To gain hands-on experience in OpenGL programming, improving our understanding of graphics rendering and scene creation.

By achieving these objectives, this project serves as both a creative representation of a balanced urban-natural environment and a valuable learning experience in computer graphics.

### 4. System Implementation Method :

The project follows a structured approach for implementation:

- **Tools & Technologies:** OpenGL with C++, GLUT, and freeGLUT, GeoGebra.
- **Scene Design:** The scene consists of a river, trees, grass, buildings, roads, bridges, and animated components like moving boats, and flowing water.

#### List of Objects:

SL#	Object ID	Object Name
1	Wf	Waterfall
2	Windmill_1	Windmill 1 (left)
3	Windmill_2	Windmill 2 (right)
4	House_1	House 1 (left)
5	modifiedTree	modifiedTree( )
6	building	building
7	Tree_2	Tree 2 (right)
8	Sun	Sun
9	Moon	Moon

10	MountainRange	Mountain range
11	Train	Train
12	car_1	Car 1
13	car_2	Car 2
14	car_3	Car 3
15	car_4	Car 4
16	car_5	Car 5
17	road_over bridge	Road
18	Rail_line	Rail Line
19	Building_1	drawBuilding(buildingWidth, buildingHeight, buildingPositionX, buildingPositionY, r, g, b)
20	Building_2	drawBuilding(20.0f, 80.0f, -28.0f, 125.0f, 236, 112, 99)
21	Building_3	drawBuilding(30.0f, 100.0f, -128.0f, 140.0f, 27, 38, 49)
22	Building_4	drawBuilding(25.0f, 100.0f, -54.0f, 0.0f, 46, 64, 83)
23	Building_5	drawBuilding(20.0f, 100.0f, -67.0f, 140.0f, 46, 64, 83)
24	Building_6	drawBuilding(20.0f, 70.0f, -75.0f, 120.0f, 243, 156, 18)
25	Building_7	building(30.0f, 100.0f, -40.0f, 140.0f, 175, 122, 197)
26	Building_8	building(30.0f, 80.0f, -155.0f, 125.0f, 46, 134, 193)
27	Building_9	building1(30.0f, 80.0f, -95.0f, 130.0f, 229, 152, 102)
28	Tower_1	drawTower(40.0f, 100.0f, 15.0f, 100.0f, 23, 32, 42)
29	Hospital_1	drawHospital(30.0f, 110.0f, -188.0f, 140.0f, 255, 255, 255)
30	Bank_1	drawBank(30.0f, 80.0f, -115.0f, 90.0f, 82, 190, 128)
31	Road_1	drawRoad()
32	Car_1	drawCar(carXPos1, 108.0f, 240, 243, 244, 0.5f)
33	Car_2	drawCar(carXPos2, 98.0f, 240, 243, 244, 0.6f)
34	Tree_1	drawTree(100.0f, 40.0f, -80.f, 92.0f, 0.15f)
35	Tree_2	drawTree(100.0f, 40.0f, -35.f, 92.0f, 0.15f)
36	Tree_3	drawTree(100.0f, 40.0f, -160.f, 92.0f, 0.15f);
37	Tree_4	drawTree(100.0f, 40.0f, -200.f, 92.0f, 0.15f)
38	Tree_5	drawTree(100.0f, 40.0f, -75.f, 70.0f, 0.2f)
39	Tree_6	drawTree(100.0f, 40.0f, -30.f, 70.0f, 0.2f)
40	Tree_7	drawTree(100.0f, 40.0f, -155.f, 70.0f, 0.2f)
41	Tree_8	drawTree(100.0f, 40.0f, -195.f, 70.0f, 0.2f)
42	bridgeBottom	Bridge Bottom
43	bottomWater	Bottom Water
44	Dam	Dam
45	DamSideBoat	Dam Side Boat
46	DamSideBoat1	Dam Side Boat 1
47	Hill	Hill
48	damWaterfall	Dam Waterfall

48	Agriculture field	Agriculture field ( )
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- **Rendering Techniques:** The project implements transformations, shading, texture mapping, and lighting effects.

- **Animation Function :**

SL#	Animation Function ID	Animation Function	Object/Scene
1	Waterfall_animation	waves(), waveUpdate(int)	Waterfall
2	Windmill_1_animation	rotate_1 (int)	Windmill 1 (left)
3	Windmill_2_animation	rotate_2 (int)	Windmill 2 (right)
4	Sun_animation	sunUpdateRise (int)	Sun
5	Moon_animtaion	moonUpdateRise(int)	Moon
6	C1_update	update1	Car 1
7	C2_update	update2	Car 2
8	C3_update	update3	Car 3
9	C4_update	update4	Car 4
10	C5_update	update5	Car 5
11	Train_update	update6	Train
12	CarUpdate_7	Update7(int value)	Car moving right to left
13	CarUpdate_8	Update8(int value)	Car moving left to right
14	DamSideBoatAnimation	DamSideBoatAnimation()	DamSideBoat & DamSideBoat1 movement
15	updateWaterfall	updateWaterfall(int value)	Waterfall movement
16	damWaterfall	damWaterfall()	Waterfall movement included
17	handleMouse	handleMouse(int button, int state, int x, int y)	DamSideBoat & DamSideBoat1 Speed Control

18	handleKeypress	handleKeypress(unsigned char key, int x, int y)	Dam waterfall close and open, Car and train speed control,  Rain, Day, Night Control .
19	Rain Animation	updateRain(int value)	Drop rain

## 5. Significance of the Project :

This project is important for both learning and creativity. It helps us understand how computer graphics work while also creating a visually pleasing scene. Here are some key reasons why this project is significant:

- **Educational Value:** The project allows us to apply various computer graphics techniques such as texture mapping, lighting, and animation, helping us understand OpenGL better.
- **Practical Learning:** By working on this project, we gain hands-on experience in creating and managing 3D environments, which is useful for future applications in gaming, simulations, and virtual reality.
- **Visual Representation:** It provides a beautiful and interactive way to showcase how nature and city life can exist together in harmony.
- **Future Development:** This project can be expanded with more advanced features, such as user interactions, weather effects, and AI-driven elements, making it even more immersive.
- **Environmental Awareness:** By illustrating a balance between urbanization and nature, the project highlights the importance of sustainable city planning.

Overall, this project is not just about coding—it also shows how technology can be used to create meaningful and engaging visual experiences.

## 6. Conclusion :

The "Riverside Scene: Nature Meets City Life" project successfully integrates natural and urban elements into a cohesive and visually appealing graphical environment. By leveraging OpenGL techniques, the project showcases a dynamic scene that highlights the coexistence of nature and modern development. Future enhancements could include advanced lighting effects, more detailed textures, and interactive user controls.

## 7. Referencing :

### [1].Riverside scenario OpenGL project

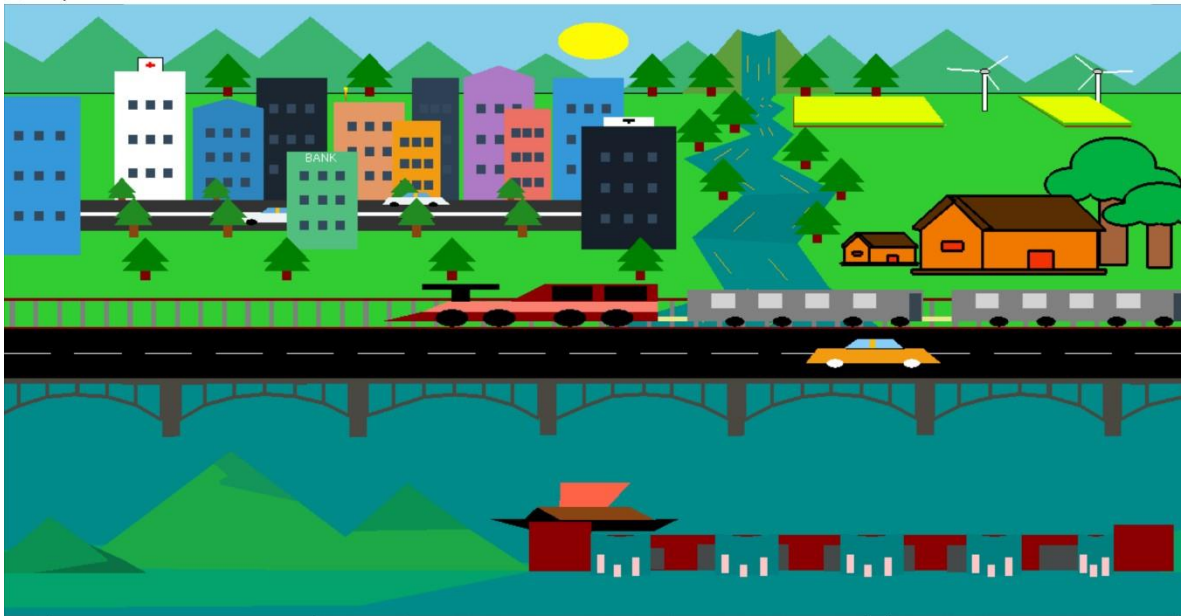
<https://youtu.be/ybJSQR6ENhc?si=2TXilJ1Ns-2vkDWk>

### [2]. City view OpenGL project

<https://youtu.be/eCbjHB1D48o?si=moa-LOfkTsrhavvD>

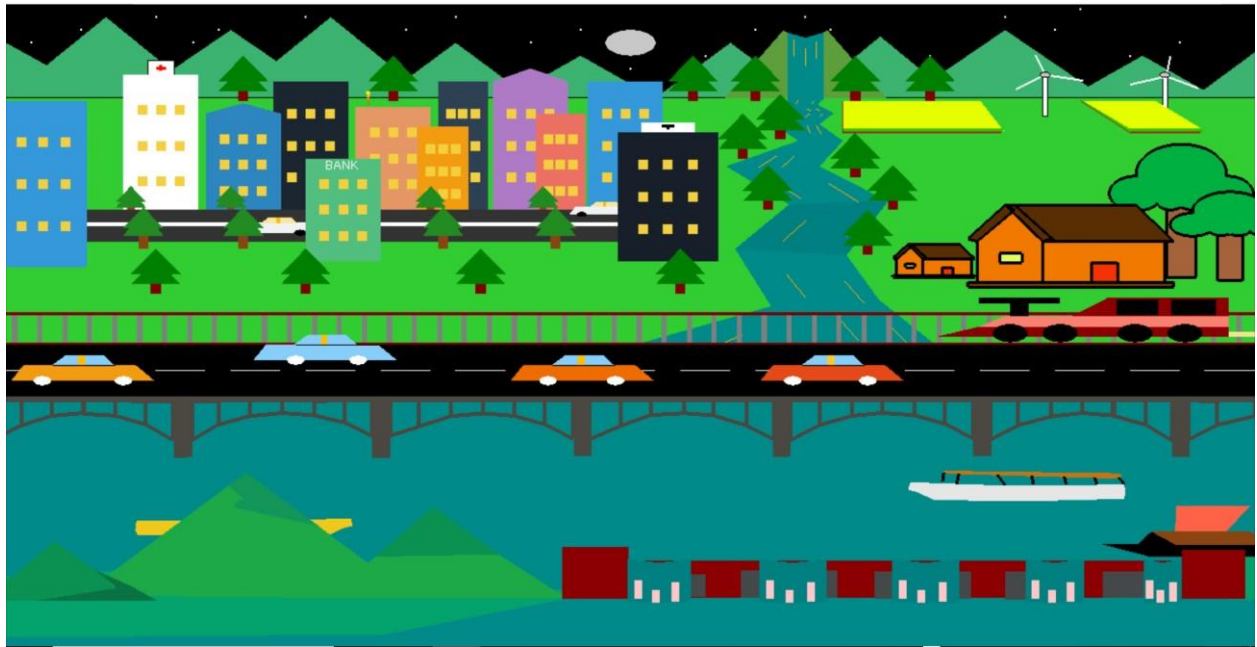
## 8. Screenshot of the System:

Day view:





Night view:



Rain view:

