AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH

Assignment Title:	Computer Graphics Project Report			
Course Title:	Computer Graphics			
Section:	B			
Semester:	Fall	2025-26	Course Teacher:	Aneem Al Ahsan Rupai

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1	MD Mazharul Islam Nabil	23-50025-1	CSE	Nabil
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	Total Marks	

1. **Title: 2D Animated Dynamic Coastal City with Weather Transitions**
2. **Introduction :**

Metropolitan Coastline & Industrial Hub

Description: A comprehensive view of a modern coastal city where industry meets urban life. The scene is divided into four distinct horizontal zones: a mountainous background with functional wind turbines, a dense urban skyline with a functioning railway, a multi-lane highway, and a ocean.

Core Objects

- Environment: Sky, triple-peak mountain range, and six animated wind turbines.
- Urban Structures: Six unique architectural buildings (residential and commercial), a digital billboard, and multiple tree varieties .
- Transportation:
    - Rail: Multi-carriage passenger train on a detailed timber-and-rail track.
    - Road: Red car, Green car, Yellow car, Transit Bus, Cargo Truck, and a Small delivery truck.
    - Maritime: Luxury yacht, Cruise ship, heavy Cargo ship, and two sailing boats.
- Utilities: Four functional streetlights with dynamic night-time illumination.

Animation & Physics

- Mechanical Motion: Rotational animation for wind turbine blades.
- Parallax-Style Movement: Varying speeds for clouds, vehicles, and maritime vessels to create a sense of depth.
- Maritime Dynamics: Oscillating wave patterns with shifting horizontal offsets.
- Weather System: Vertically accelerating raindrops and expanding ripple circles (ripples) in the ocean.

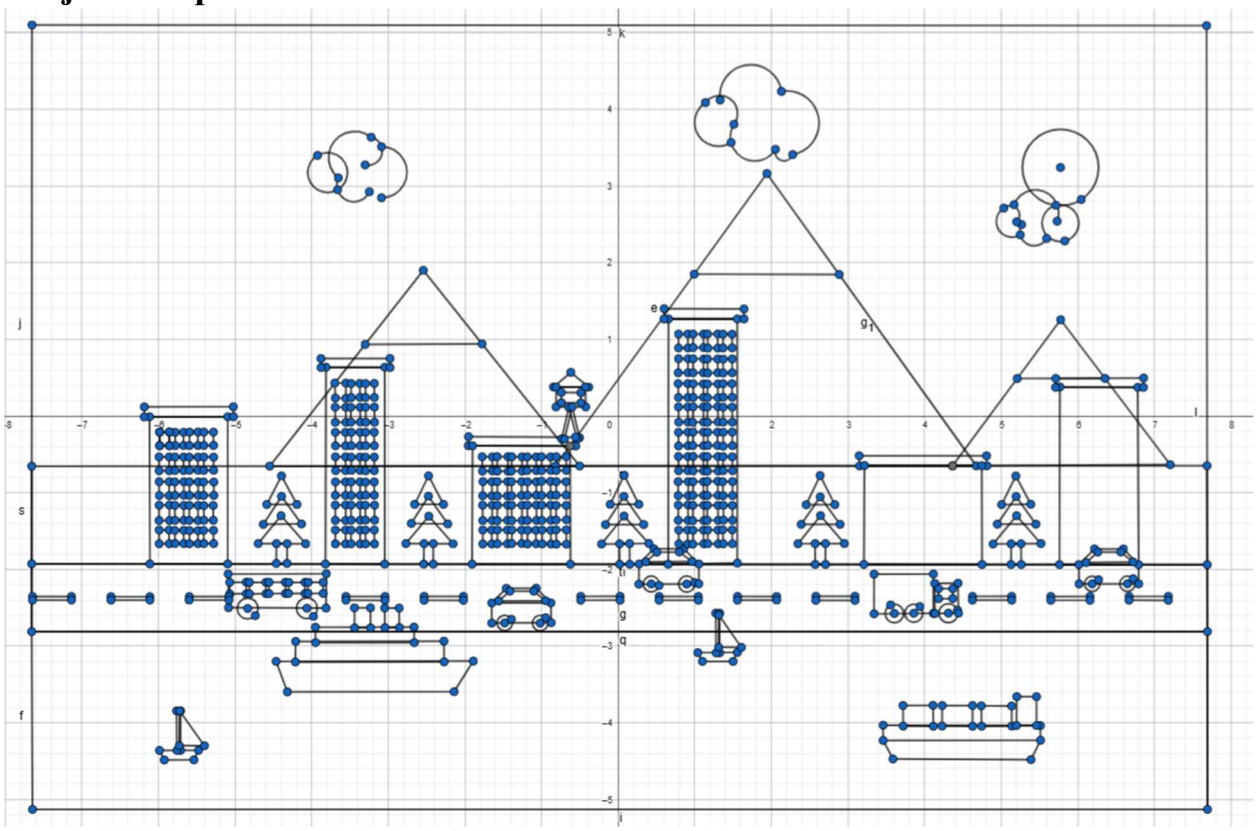
Interactions

- Mouse Controls:
    - Left Click: Resumes all animations
    - Right Click: Freezes all motion and stops weather effects.
- Keyboard Controls:
    - Key '1': Manually triggers Day Mode.
    - Key '2': Manually triggers Night Mode (Dark sky, stars, glowing windows, and streetlights).
    - Key '3': Toggles the Rain System on/off with associated sky color.

Transitions

- Day/Night Cycle: The sun and moon follow a vertical trajectory, when the sun dips below the horizon, the scene automatically toggles to Night mode, triggering the appearance of stars and the Night Overlay.

3. Project Graph :



4. List of objects:

SL#	Object ID	Object Name
1	OBJ_01	Sky Background
2	OBJ_02	Sun
3	OBJ_03	Moon
4	OBJ_04	Stars
5	OBJ_05	Cloud 1
6	OBJ_06	Cloud 2
7	OBJ_07	Cloud 3
8	OBJ_08	Cloud 4
9	OBJ_09	Watch Tower 1
10	OBJ_10	Watch Tower 2
11	OBJ_11	Mountain 1
12	OBJ_12	Mountain 2
13	OBJ_13	Mountain 3
14	OBJ_14	Wind Turbine 1
15	OBJ_15	Wind Turbine 2
16	OBJ_16	Wind Turbine 3
17	OBJ_17	Wind Turbine 4
18	OBJ_18	Wind Turbine 5
19	OBJ_19	Wind Turbine 6

20	OBJ_20	Green Land/Park Base
21	OBJ_21	Building 1 (Clock Tower)
22	OBJ_22	Building 2 (Skyscraper)
23	OBJ_23	Building 3 (House)
24	OBJ_24	Building 4 (Modern Glass)
25	OBJ_25	Building 5 (Office)
26	OBJ_26	Building 6 (Brick)
27	OBJ_27	Billboard
28	OBJ_28	Tree 1 (Round)
29	OBJ_29	Tree 2 (Pine)
30	OBJ_30	Tree 3 (Round)
31	OBJ_31	Tree 4 (Pine)
32	OBJ_32	Railway Track
33	OBJ_33	Train (Engine & Wagons)
34	OBJ_34	Road Base
35	OBJ_35	Road Divider/Fence
36	OBJ_36	Street Light 1 (with Beam)
37	OBJ_37	Street Light 2 (with Beam)
38	OBJ_38	Street Light 3 (with Beam)
39	OBJ_39	Street Light 4 (with Beam)
40	OBJ_40	Bus
41	OBJ_41	Red Car
42	OBJ_42	Green Car
43	OBJ_43	Yellow Car
44	OBJ_44	Cargo Truck
45	OBJ_45	Small Truck
46	OBJ_46	Ocean Background
47	OBJ_47	Ocean Waves
48	OBJ_48	Small Boat 1
49	OBJ_49	Small Boat 2
50	OBJ_50	Cruise Ship
51	OBJ_51	Cargo Ship
52	OBJ_52	Luxury Yacht
53	OBJ_53	Raindrops
54	OBJ_54	Rain Ripples/Bubbles

5. List of Functions To Represent Objects-

SL#	Function Name	Object_ID
1	DrawSky()	OBJ_01, OBJ_02, OBJ_03
2	DrawStars()	OBJ_04
3	DrawCloud1()	OBJ_05
4	DrawCloud2()	OBJ_06
5	DrawCloud3()	OBJ_07
6	DrawCloud4()	OBJ_08
7	WatchTower1()	OBJ_09
8	WatchTower2()	OBJ_10

9	DrawMountain1()	OBJ_11
10	DrawMountain2()	OBJ_12
11	DrawMountain3()	OBJ_13
12	WindTurbine1()	OBJ_14
13	WindTurbine2()	OBJ_15
14	WindTurbine3()	OBJ_16
15	WindTurbine4()	OBJ_17
16	WindTurbine5()	OBJ_18
17	WindTurbine6()	OBJ_19
18	Building1()	OBJ_21
19	Building2()	OBJ_22
20	Building3()	OBJ_23
21	Building4()	OBJ_24
22	Building5()	OBJ_25
23	Building6()	OBJ_26
24	Billboard()	OBJ_27
25	Tree1()	OBJ_28
26	Tree2()	OBJ_29
27	Tree3()	OBJ_30
28	Tree4()	OBJ_31
29	RailwayTrack()	OBJ_32
30	Train()	OBJ_33
31	RoadDivider()	OBJ_35
32	StreetLight1()	OBJ_36
33	StreetLight2()	OBJ_37
34	StreetLight3()	OBJ_38
35	StreetLight4()	OBJ_39
36	Bus()	OBJ_40
37	CarRed()	OBJ_41
38	CarGreen()	OBJ_42
39	CarYellow()	OBJ_43
40	CargoTruck()	OBJ_44
41	SmallTruck()	OBJ_45
42	Ocean()	OBJ_46, OBJ_47
43	CruiseShip()	OBJ_50
44	CargoShip()	OBJ_51
45	LuxuryYacht()	OBJ_52
46	SmallBoat1()	OBJ_48
47	SmallBoat2()	OBJ_49
48	drawRaindrops()	OBJ_53
49	DrawRipples()	OBJ_54

6. List of Animation Functions with ID –

SL#	Animation Function	Animation Function ID

1	UpdateSun()	ANIM_01
2	UpdateCloud()	ANIM_02
3	UpdateTurbine()	ANIM_03
4	UpdateTrain()	ANIM_04
5	UpdateBus()	ANIM_05
6	UpdateCarRed()	ANIM_06
7	UpdateCarGreen()	ANIM_07
8	UpdateCarYellow()	ANIM_08
9	UpdateTruckCargo()	ANIM_09
10	UpdateTruckSmall()	ANIM_10
11	UpdateCruiseShip()	ANIM_11
12	UpdateCargoShip()	ANIM_12
13	UpdateYacht()	ANIM_13
14	UpdateSmallBoat1()	ANIM_14
15	UpdateSmallBoat2()	ANIM_15
16	UpdateWaves()	ANIM_16
17	updateRain()	ANIM_17
18	handleMouse()	ANIM_18
19	handleKeypress()	ANIM_19

7. Contribution –

Member Name	Implemented Functions	Implemented Animation Functions	Percentage of Contribution
MD Mazharul Islam Nabil	DrawSky	UpdateSun	100%
	DrawStars	UpdateCloud	
	DrawCloud1	UpdateTurbine	
	DrawCloud2	UpdateTrain	
	DrawCloud3	UpdateBus	
	DrawCloud4	UpdateCarRed	
	WatchTower1	UpdateCarGreen	
	WatchTower2	UpdateCarYellow	
	DrawMountain1	UpdateTruckCargo	
	DrawMountain2	UpdateTruckSmall	
	DrawMountain3	UpdateCruiseShip	
	WindTurbine1	UpdateCargoShip	
	WindTurbine2	UpdateYacht	
	WindTurbine3	UpdateSmallBoat1	
	WindTurbine4	UpdateSmallBoat2	
	WindTurbine5	UpdateWaves	
	WindTurbine6	updateRain	
	Building1	handleMouse	
	Building2	handleKeypress	

	Building3		
	Building4		
	Building5		
	Building6		
	Billboard		
	Tree1		
	Tree2		
	Tree3		
	Tree4		
	RailwayTrack		
	Train		
	RoadDivider		
	StreetLight1		
	StreetLight2		
	StreetLight3		
	StreetLight4		
	Bus		
	CarRed		
	CarGreen		
	CarYellow		
	CargoTruck		
	SmallTruck		
	Ocean		
	CruiseShip		
	CargoShip		
	LuxuryYacht		
	SmallBoat1		
	SmallBoat2		
	drawRaindrops		
	DrawRipples		

8. Conclusion

This project demonstrates the effective use of OpenGL to create a complex, multi-layered interactive scene. Through the implementation of multiple independent animation timers, smooth transitions between environmental states were achieved. The organization of objects into individual functions and the use of orthographic projection allowed for precise control over the visual composition.