



American International University- Bangladesh (AIUB)
Faculty of Science and Technology (FST)

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| Faculty Name: | Aneem Al Ahsan Rupai | | |

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| Project Title: | Urban Symphony: An Interactive City Experience (Mohakhali Bus Terminal Design) |
| Group: | 03 |

SUBMITTED BY

| | | | |
|-------------------|---------------------|------------|-------------------|
| Student ID | Student Name | #SL | Department |
| 22-48386-3 | S. M AHSAN HABIB | 04 | CSE |

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INTRODUCTION

This project takes us on a journey through various regions of the city. Each location demonstrates how the city was designed to let people live and travel safely. Cities are rapidly expanding and impacting our daily lives. This project, titled “**Urban Symphony: An Interactive City Experience**,” demonstrates how many locations, such as bus stations, metro stations, parks, homes, and roadways, collaborate to improve lifestyle. It provides a simple explanation of how everything is interconnected and helps individuals every day.

Scene 4: This scenario is the simulation of **Mohakhali Bus Terminal**, one of the busiest transport hubs in Dhaka, Bangladesh. Multiple bus counters are displayed with signboards for popular transport services (e.g., Hanif, Ena, National Travels, Shohag, Green Line, Grameen). Buses of different companies are parked at their respective counters. Waiting sheds and the main terminal building labeled “Mohakhali Bus Terminal” are included. Animated city buses picking up and dropping passengers. Trucks, private cars, buses, and CNGs moving along the highway in front of the terminal. Wheels rotate while vehicles move, providing a realistic motion effect. A train runs on the railway track at the bottom of the screen. An airplane flies in the sky.

Environment Design

Natural elements such as the sun, moon, clouds, and trees(rare view) are used to create a lively background.

List of Objects:

1. Bus (18)
2. Train (1)
3. Plane (1)
4. Car (2)
5. Truck (2)
6. CNG (2)
7. Sun (1)
8. Moon (1)
9. Cloud (2 for day, evening, night, foggy, snow fall time and 5 for rainy and cloudy weather)
10. Tree (2 at the side of coffee shop and rare view)
11. Building (4)
12. Terminal Building (2)
13. Bus counter (8)
14. Gas Station (1)
15. Bus Stop (4)
16. Lamp Post (5)
17. Tea Stall (4)
18. Food Stall (1)
19. Ice-cream stall (1)
20. Fruit Shop (1)
21. Coffee Shop (1)

22. Bench (7)

Animations:

1. Bus moving on the road (Desh Travles moving right to left)
2. Red car moving (Right to left)
3. Yellow Car moving (Right to Left)
4. Yellow Truck moving (Right to Left)
5. Truck (cream) moving (left to right)
6. CNG moving (left to right)
7. Train moving (left to right)
8. BRTC bus moving (left to right. It will stand in front of the bus stand for 3 seconds and resume again).
9. Plain movement (depends on keypress)

Mouse Interaction:

SR Plus bus will mode with the mouse click.

> Left Click (single finger click on touchpad) Bus move left

< Right Click (Double finger click on touchpad) Bus move right

Keyboard Instructions: (Small/Capital)

| SL | Key | Description |
|----|-----|----------------------------------|
| 1 | s | Plain moving start Right to Left |
| 2 | f | Plain moving stop |
| 3 | + | Train Movement Start |
| 4 | - | Train Movement End |

Transition [Keyboard Instructions]:

| SL | Key | Description |
|----|-----|--|
| 1 | d | Day mode (default) |
| 2 | n | Night mode |
| 3 | e | Evening mode |
| 4 | c | Cloudy mode |
| 5 | 1 | Clear Sky mode |
| 6 | 2 | Snow fall mode |
| 7 | 3 | Rainy mode (This button is a toggle button for rain start and end. If rain starts key 1, 2, and 4 will not work. Rain should have to be stopped for working those buttons. Key d, n, and e will still work). |
| 8 | 4 | Foggy mode (Day, Night, Evening, and cloudy mode will appear but still foggy mode will appear but if key 1 and 3 pressed, the foggy mode will disappear. |

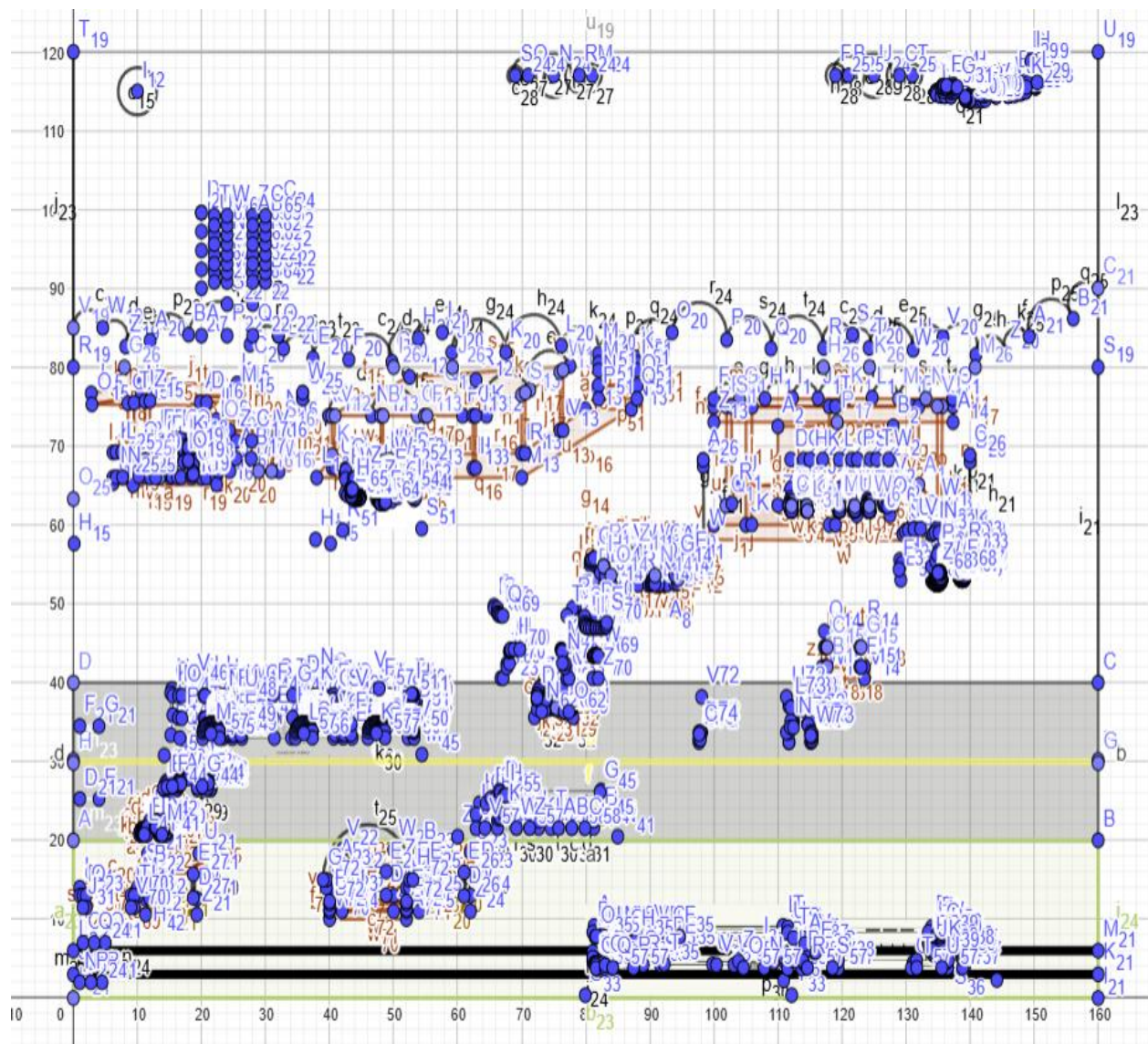
Change of scene:

| SL | Key | Description |
|----|----------|--------------|
| 5 | spacebar | Scene Change |

Technologies used:

The entire project was created with OpenGL. Several OpenGL elements, such as lines, polygons, circle drawings, moving animations, and rotating animation, were employed. We graphed the entire task using the internet graphing application Geogebra. In order to find vectors and designs, we used assistance from Google.

Project Graph:



List of objects assigning an object ID:

| SL# | Object ID | Object Name |
|-----|-----------|------------------------------|
| 1 | AH401 | Sun & Moon |
| 2 | AH402 | Cloud |
| 3 | AH403 | Sky |
| 4 | AH404 | Rare view of trees |
| 5 | AH405 | Main road + main road extern |
| 6 | AH406 | Bench 1 |
| 7 | AH407 | Bench 2 |
| 8 | AH408 | Bench 3 |
| 9 | AH409 | Bench 4 |
| 10 | AH410 | Terminal Building 1 |
| 11 | AH411 | Terminal Building 2 |
| 12 | AH412 | GasStation |
| 13 | AH413 | plane |
| 14 | AH414 | Train Area |
| 15 | AH415 | Train Line |
| 16 | AH416 | Train head |
| 17 | AH417 | train_Compartment1 |
| 18 | AH418 | train_Compartment2 |
| 19 | AH419 | Bus Counter National |
| 20 | AH420 | Bus Counter Nabil |
| 21 | AH421 | Bus Counter Hanif |
| 22 | AH422 | Bus Counter Ena |
| 23 | AH423 | Bus Counter Shohag |
| 24 | AH424 | Bus Counter Green Line |
| 25 | AH425 | Bus Counter Desh |
| 26 | AH426 | Bus Counter Grameen |
| 27 | AH427 | Bus BRTC |
| 28 | AH428 | truck1 |
| 29 | AH429 | truck2 |
| 30 | AH430 | Red Car |
| 31 | AH431 | Yellow Car |
| 32 | AH432 | CNG in Road |
| 33 | AH433 | CNG in Gas Station |
| 34 | AH434 | Bus Stop 1 |
| 35 | AH435 | Bus Stop 2 |
| 36 | AH436 | Bus Stop 3 |
| 37 | AH437 | Bus Stop 4 |
| 38 | AH438 | Bus Hanif |
| 39 | AH439 | Bus Ena |

| | | |
|----|-------|-------------------------|
| 40 | AH440 | Bus National |
| 41 | AH441 | Bus Shohag |
| 42 | AH442 | Bus Green Line |
| 43 | AH443 | Bus Grameen |
| 44 | AH444 | Bus Shyamoli |
| 45 | AH445 | Bus SR Plus |
| 46 | AH446 | Bus Desh |
| 47 | AH447 | Window 1 |
| 48 | AH448 | Window 2 |
| 49 | AH449 | Window 3 |
| 50 | AH450 | Window 4 |
| 51 | AH451 | Window 5 |
| 52 | AH452 | Window 6 |
| 53 | AH453 | Window 7 |
| 54 | AH454 | Window 8 |
| 55 | AH455 | Building 1 |
| 56 | AH456 | Building 2 |
| 57 | AH457 | Building 3 |
| 58 | AH458 | Building 4 |
| 59 | AH459 | Lamp post 1 |
| 60 | AH460 | Lamp post 2 |
| 61 | AH461 | Lamp post 3 |
| 62 | AH462 | Lamp post 4 |
| 63 | AH463 | Lamp post 5 |
| 64 | AH464 | Tea Stall 1 |
| 65 | AH465 | Tea Stall 2 |
| 66 | AH466 | Tea Stall 3 |
| 67 | AH467 | Tea Stall 4 |
| 68 | AH468 | Tea Stall Bench 1 |
| 69 | AH469 | Tea Stall Bench 2 |
| 70 | AH470 | Tea Stall Bench 3 |
| 71 | AH471 | Tea Stall Bench 4 |
| 72 | AH472 | Tea Stall Bench 5 |
| 73 | AH473 | Tea Stall Bench 6 |
| 74 | AH474 | Coffee Shop |
| 75 | AH475 | Coffee Shop side tree 1 |
| 76 | AH476 | Coffee Shop side tree 2 |
| 77 | AH477 | Ice cream shop |
| 78 | AH478 | Fruit Shop |
| 79 | AH479 | Food Shop |
| 80 | AH480 | Tea Stall Bench 7 |
| 81 | AH481 | Bus2 (1) |

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|----|-------|----------|
| 82 | AH482 | Bus2 (2) |
| 83 | AH483 | Bus2 (3) |
| 84 | AH484 | Bus2 (4) |
| 85 | AH485 | Bus2 (5) |
| 86 | AH486 | Bus3 (1) |
| 87 | AH487 | Bus3 (2) |
| 88 | AH488 | Bus3 (3) |

List of Functions To Represent Objects:

| SL# | Object Name | Function Name |
|-----|--|------------------------------|
| 1 | Sun & Moon | sunMoon_401 |
| 2 | Cloud | Cloud_402 |
| 3 | Sky | Sky_403 |
| 4 | Rare view of trees | rareView_404 |
| 5 | Main road + main road extern | FullRoad_405 |
| 6 | Bench 1, Bench 2, Bench 3, Bench 4 | Bench_400() |
| 7 | Terminal Building 1 | Terminal Building_1_400() |
| 8 | Terminal Building 2 | Terminal Building_2_400() |
| 9 | GasStation | GasStation_400() |
| 10 | plane | plane_413 |
| 11 | Train Area | TrainArea_400 |
| 12 | Train Line | TrainLine_400 |
| 13 | Train head | train_head_400 |
| 14 | Train Compartment1, train Compartment2 | train_Compartment |
| 15 | Bus Counter(National, Nabil, Hanif, Ena, Shohag, Green Line, Desh, Grameen) | busCounter_400 |
| 16 | Bus BRTC | busBRTC |
| 17 | truck1 | truck1_400() |
| 18 | truck2 | truck2_400() |
| 19 | Red Car | car1_400() |
| 20 | Yellow Car | car2_400() |
| 21 | CNG in Road, CNG in Gas Station | cng_400() |
| 22 | Bus Stop 1, Bus Stop 2, Bus Stop 3, Bus Stop 4 | Bus_Stop_400() |
| 23 | Bus (Hanif, Ena, National, Shohag, Green Line, Grameen, Shyamoli, SR Plus, Desh) | Bus1_400() |
| 24 | Window 1 | buildingWindow_400() |
| 25 | Window 2 | buildingWindow1_400() |
| 26 | Window 3 | buildingWindow2_400() |
| 27 | Window 4 | buildingWindow3_400() |

| | | |
|----|---------------------------------------|-----------------------|
| 28 | Window 5 | buildingWindow4_400() |
| 29 | Window 6 | buildingWindow5_400() |
| 30 | Window 7 | buildingWindow6_400() |
| 31 | Window 8 | buildingWindow7_400() |
| 32 | Building (1, 2, 3, 4) | building1_400() |
| 33 | Lamp post (1, 2, 3, 4) | lampPost_400() |
| 34 | Tea Stall (1, 2, 3, 4) | TeaStall_400() |
| 35 | Tea Stall Bench (1, 2, 3, 4, 5, 6, 7) | TeaStallSeat_400() |
| 36 | Coffee Shop | CoffeeShop_400() |
| 37 | Ice cream shop | IceCreamStall_400() |
| 38 | Fruit Shop | FruitShop_400() |
| 39 | Food Shop | FoodStall_400() |
| 40 | Bus2 (1, 2, 3, 4, 5) | Bus2_400() |
| 41 | Bus3 (1, 2, 3) | Bus3_400() |

List of Animation Functions with ID:

| SL# | Animation Function ID | Animation Function | Object/Scene |
|-----|-----------------------|-------------------------------|---|
| 1 | Ani(4)1 | plane_400_animation() | Plane move (depends on keypress) |
| 2 | Ani(4)2 | car1_400_animation() | Move Red Car |
| 3 | Ani(4)3 | car2_400_animation() | Move Yellow Car |
| 4 | Ani(4)4 | train_400_animation() | Move Train (depends on keypress) |
| 5 | Ani(4)5 | truck1_400_animation() | Move Truck 1 |
| 6 | Ani(4)6 | truck2_400_animation() | Move Truck 2 |
| 7 | Ani(4)7 | busBRTC_400_animation() | Move BRTC Bus (it will automatically stop for 3000 milliseconds in front of the bus stop) |
| 8 | Ani(4)8 | bus1_400_animation() | Move bus 1(Desh Travles) |
| 9 | Ani(4)9 | cng_400_animation() | Move CNG |
| 10 | Ani(4)10 | resumeBusBRTC_400() | Move BRTC bus for stop position in front of bus stop |
| 11 | Ani(4)11 | updateBusBRTC_400() | Stop movement of Bus BRTC |
| 12 | Ani(4)12 | updateBusWheelRotation_400() | Rotate Bus Wheel |
| 13 | Ani(4)13 | updateBRTCWheelRotation_400() | Rotate BRTC Bus Wheel |
| 14 | Ani(4)14 | updateTrainWheel_400() | Rotate Train Wheel |
| 15 | Ani(4)15 | updateTruck2Wheel_400() | Rotate Truck2 Wheel |
| 16 | Ani(4)16 | updateCNGWheel_400() | Rotate CNG Wheel |

| | | | |
|----|----------|-------------------------|---|
| 17 | Ani(4)17 | handleKeyboard_400() | Control plane, Bus, Train movement. Change day time and weather status |
| 18 | Ani(4)18 | mouseHandler() | SR Plus bus will mode with the mouse click. > Left Click (single finger click on touchpad) Bus move left < Right Click (Double finger click on touchpad) Bus move right |
| 19 | Ani(4)19 | update_animations_400() | Update all animations |

Conclusion:

This project successfully demonstrates a visually rich and interactive simulation of real-life urban environments, combining multiple scenes such as a metro station, busy street, peaceful park, and Mohakhali bus terminal. The design integrates key objects like buses, cars, trains, shops, and passengers to create a lively and realistic experience.

The addition of animations, such as moving buses, trains, and day-night transitions, brings the scenes to life and increases user engagement. Keyboard and mouse interactions allow users to control the movement of vehicles and switch between scenes, making the project not just a visual representation but an interactive experience.

Output:



