

The animation project is about **“Simulation of Traffic Control”**

The animation sequence is designed with the following steps:

- Storyboard Layout
- Object definitions
- Key-frame specification
- Generation of in-between frames.

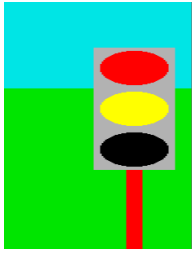
Storyboard Layout :

- The purpose of this project is to show the simulation of traffic signal using OpenGL. This project mainly show the simulation of traffic in two mode, day mode and night mode.
- Traffic lights at the intersection show green for one direction. Cars moving smoothly in the green-lighted direction. Transition from red light to green light can be made by simply pressing uppercase or lowercase letter 'G' or 'g'.
- Transition from green light to red light can be made by simply pressing uppercase or lowercase letter 'R' or 'r'. In this case cars will be stopped in that particular place.
- In day and night mode, there will be also seen the simulation of airplane and in night mode we will see the movement of comet along X direction. This can be done by pressing right click of mouse and then selecting airplane or comet or both.
- By default in day and night mode, this project will represent the movement different shape of cloud and cars along with X direction.

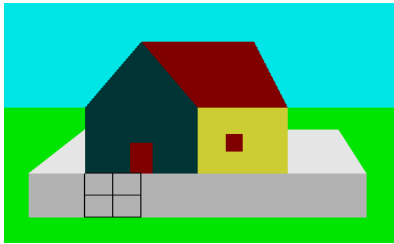
Object definitions:

Actually object definition include all the participants that take action in animation sequence. Objects are the building blocks of an animation sequence and can include characters, props, backgrounds, and various other elements that make up the animated world.

Some of the objects that take action in this project may include the following :



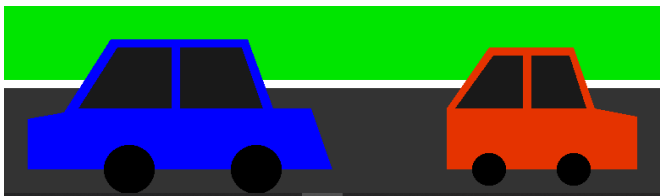
- Traffic signal



- house



- Airplane



- Cars



- Cloud

Traffic Light: Traffic light give the direction to cars when to stop and when to movement where red light indicate to stop the car and green light allow to move the car.

Cars: Cars are moving from one place to another depending upon the traffic light.

Cloud: By default clouds are moving along the X direction in day and night mode.

Airplane: Airplane is moving along the X direction depending upon user. That means if the user active the airplane switch then it could be happened.

Keyframe specification:

In computer graphics and animation, keyframes are specific frames within a sequence that define the state or position of an object or element at a particular point in time. When animating a traffic signal, we can use keyframes to specify the changes in the signal's lights and the corresponding timing for those changes. Here's a keyframe specification for a traffic signal animation

Initial State

- Red light on for the traffic traveling in one direction (e.g., North-South).
- Green light on for the traffic traveling in the perpendicular direction (e.g., East-West).
- Pedestrian "Don't Walk" signal illuminated.

Green for First Direction

- Red light turns off completely for the first direction.
- Green light fully illuminates for the first direction.

Red for First Direction

- Green light turns off completely for the first direction.
- Red light fully illuminates for the first direction.

These keyframes represent the sequence of changes in the traffic signal lights and their timing. We can continue this pattern to create a looped animation that simulates the operation of a typical traffic signal. We can adjust the timing and duration of each frame to match real-world traffic signal timings as needed for our animation.

Generation in between frames:

In computer graphics animation, in-between frames, also known as "interpolated frames" or simply "in-betweens," are frames that fill the gaps between two keyframes to create a smooth transition or motion. In the context of a traffic signal

animation, we can use in-between frames to smoothly transition the traffic signal lights (e.g., from red to green) and make the animation appear more realistic. Here's how to generate in-between frames for a traffic signal animation.

In Keyframe specification, we have seen three frame named:

- initial state.
- Green light state
- Red light state.

In-between Frames between Frame 1 and Frame 2:

- A frame where the red light is gradually fading out (dimming) for the first direction while the green light is gradually increasing in intensity (brightening).
- A frame where the green light is fully illuminated for one direction while the red light is completely turned off for the perpendicular direction.

In-between Frames between Frame 2 and Frame 3:

- A frame where the green light is gradually fading out for one direction while the red light is gradually increasing in intensity for the same direction.
- A frame where the red light is fully illuminated for one direction while the green light is completely turned off for the perpendicular direction.

Frame Rate:

OpenGL-based animation typically render frames at a specific frame rate, often measured in frames per second (FPS). For instance, if our project runs at 60 FPS, it means that approximately every 1/60th of a second, a new frame is rendered on the screen.

Frame Timing:

Because rendering occurs at a fixed frame rate, the time interval between frames can vary slightly due to system performance. To achieve consistent movement regardless of frame rate fluctuations, we incorporate the time elapsed between frames into our calculations. This is known as delta time and helps adjust the speed of movement and animation.

Some Screenshot that reflect the overview of this project

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C:\Users\HP\Documents\Project\Emnei\bin\Debug\Emnei.exe
=====
==>      Alim Uddin Asif      <==
#---Graphics Project:-'Simulation of Traffic Control'---#
#---Help Center (How to Operate ?) ---#
> Press 'r' or 'R' to change the signal light to Red
> Press 'g' or 'G' to change the signal light to Green
> Press 'd' or 'D' to make it Day Time
> Press 'n' or 'N' to make it Night Time
> Press RIGHT MOUSE BUTTON to display menu
  > Select 'Aeroplane' to add moving Aeroplane
  > Select 'Comet' to add moving Comet
  > Select 'Quite' to Exit the application
=====

```

Fig: Help center for new user

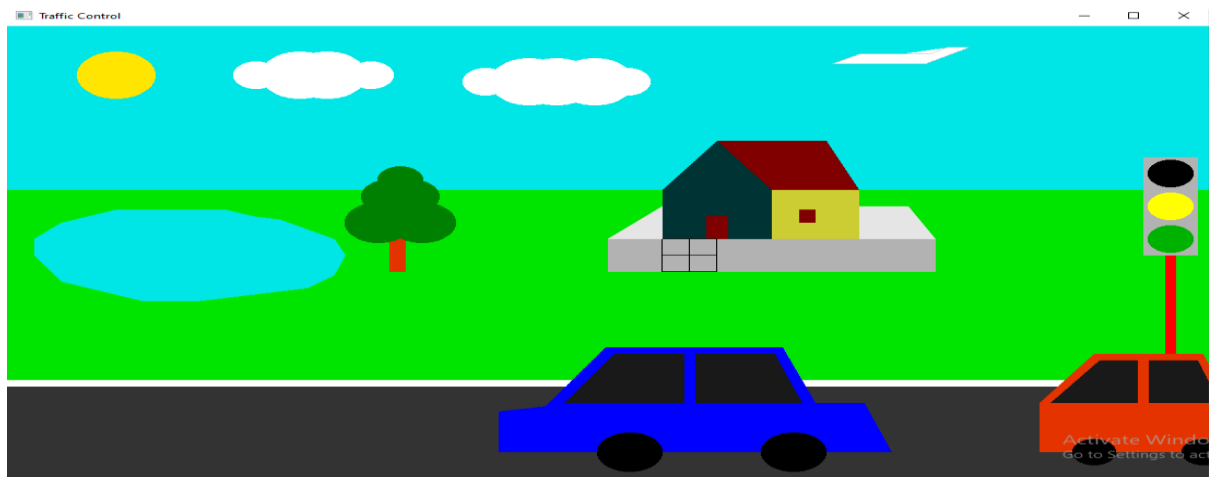


Fig: Traffic control at day mode



Fig: Traffic control at night mode