American International University Bangladesh

Computer Graphics

Course Code: CSC4118

Fall Semester 2023-24

Project Report

From dawn to dusk

Under the Guidance of

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Lecturer

Department of Computer Science, FST

I. Group Member Details

Group Member Name	ID
1. Tonmoy Dey	20-44206-3
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Team Leader Name:	Tonmoy Dey
Section:	F

II. Table of Contents:

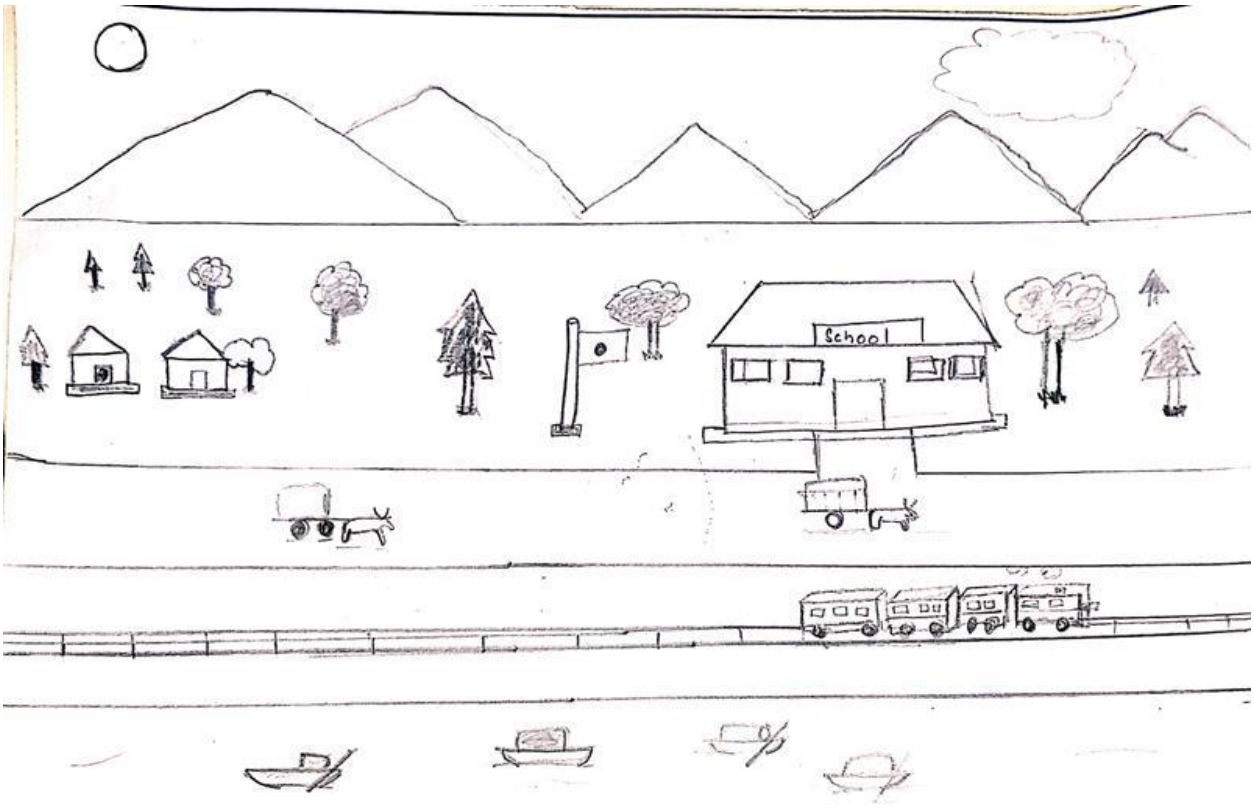
- **Introduction:**

  Imagine a village on your screen where a river flows with a little boat sailing, a train chugs along animated tracks, clouds move across the sky, the sun rises and sets, trees sway gently, and roads buzz with activity. You can even make it rain with droplets falling and forming puddles. The goal is to create a charming and calming digital village experience, bringing the simplicity and beauty of rural life to your fingertips. Open Graphics Library is used to create different 2D objects of the scenario. Code blocks are used for programming.

- **Motivation:**

  Welcome to our project, that is made up of code and Open Graphics Library (OpenGL). Picture a cozy town where a river flows gently, a small boat sails peacefully, and a train moves on animated tracks. The sky changes with clouds, giving us beautiful sunrises and sunsets. Trees and roads with the peaceful sounds of country life. If you want a moment to relax or enjoy simplicity, our village is here for you. In addition, there is more – with code and OpenGL, we can make it rain, watch droplets fall. Dive into the code, and we are not just watching – we are making this digital village come alive.

- **Diagram:**



- **List of objects:**

The objective of this project is to bring a digital village to life using the Open Graphics Library (OpenGL) and C++ programming. We aim to apply the knowledge acquired throughout the course, implementing various 2D objects such as lines, triangles, quads, polygons, and circles. The project is divided into four sections based on the working sequence, encompassing the creation of a realistic village view with animated elements like vehicles, clouds, and rain. Three distinct viewing modes—day, night, and rain—add to the project's versatility. Additionally, the project incorporates a keyboard controlling system for user interaction. In essence, the goal is to create a charming and calming digital village experience, offering users the opportunity to both appreciate and actively engage with the simulated rural environment on their screens.

- **Functions to represent the objects:**

1. GL_TRIANGLES: This handy function is used for creating triangles, those simple shapes formed by connecting three points. It is like the building block for displaying 2D triangles in our digital village, giving it a basic and fundamental structure.

2. GL_LINES: If triangles are the foundation, lines add the strokes. With GL_LINES, we can effortlessly create lines by specifying starting and ending points. It is smart; if we give it an odd number of points, it simply ignores the extra one, making line-drawing a breeze.

3. GL_QUADS: Moving on to shapes with a bit more sides, GL_QUADS is our tool for making quadrilaterals—fancy word for four-sided shapes. The trick here is to make sure all four corners are on the same flat surface; otherwise, things might look a bit wonky.

4. GL_POLYGON: It allows us to construct more shapes that are complex by connecting a bunch of points. It is like connecting the dots to form interesting and intricate figures within our digital canvas.

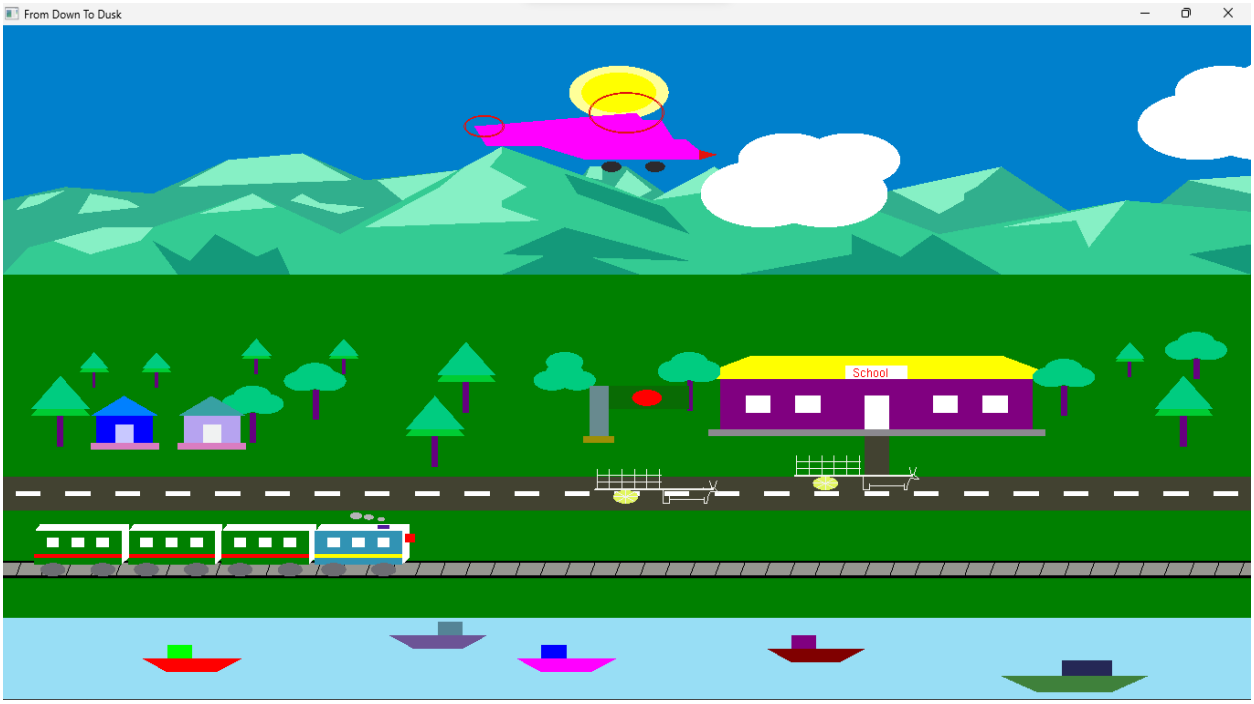
5. glColor3f(): Bringing our village to life means adding some color, and that's where glColor3f() steps in. We get to play how much red, green, and blue we want our objects get painted in the way of our choosing.

For Animation:

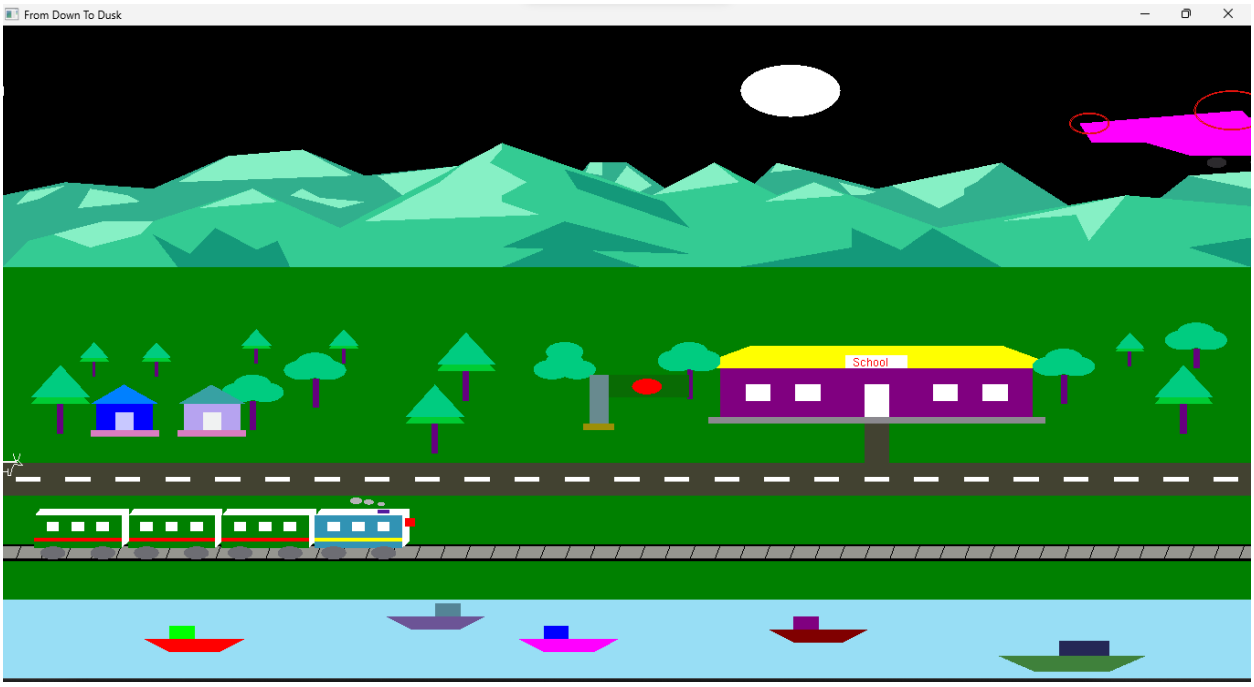
6. glTranslatef(): Imagine glTranslatef() as a key that makes things move in our digital village. With its three magic numbers (x, y, z), it sends objects on a journey, creating a lively show. It is like telling an object, "Start from here and end up there." The real trick is using glPushMatrix() and glPopMatrix() to make the magic happen smoothly. It is like putting a spell on our digital village, making it come alive with energy and motion, turning it into an exciting and immersive world.

- **Output Screenshot:**

1. **Day View:**



2. **Night View:**



3. Rain View:

- **Demo Link:**

  https://drive.google.com/file/d/18C5GfHMkwQ-zvWIH0RkXRbRPNhWOblIH/view

- **Uniqueness of your Project:**

  The thing that makes this project special is how it brings a digital village to life using OpenGL and C++ programming. Unlike just looking at pictures, this project makes things move, like boats, clouds, and rain. We can even switch between daytime, nighttime, and rainy views to make it feel real. It uses basic shapes like triangles and lines and adds colors to make everything look nice. The project is organized in a way that makes it easy to understand and create. Overall, it is unique because it combines simple graphics, moving things, and lets us control what happens in this little digital village.

- **Extra work:**

  In addition to the core elements, we've added some extra stuff to make the digital village even more interesting. Picture this: a plane soaring through the skies, a flag waving in the breeze, train rails stretching across the landscape, roads buzzing with activity, and a quaint bullock cart moving through the village paths. These additions not only bring more life to the project but also provide additional objects to interact with and control. The inclusion of a variety of elements adds layers of detail, making the digital village a richer and more

engaging environment. It is like expanding the canvas of our digital village to include more sights and activities, turning it into a dynamic world that we can explore and enjoy.

- **Conclusion:**

In conclusion, this project serves as a digital canvas where we construct a village using the specialized code of OpenGL and C++. It is not just a static display but also rather a dynamic blend of various scenarios and controllable elements, providing an immersive and enjoyable experience. The project goes beyond visual observation; it transforms our imaginative ideas into a tangible digital reality. By putting us in control, we can shape the movement and activities within the village. Moreover, this digital creation offers a unique perspective on rural life, adding an educational and explorative dimension to the coding. It is like creating our own fun world on the computer, where we use special code to make a little village. We can decide how things move and what happens, making it cool. It is not just looking at pictures; it is like playing in our own digital playground. This project lets us see and imagine a village, showing us how awesome coding can be in a way that is easy to understand and enjoy.

- **Future Work:**

Looking ahead, there are many things we can do to make this project even better. We could make the pictures in our digital village look even more real by adding fancier graphics and special effects. In addition, we can give users more things to play with and control in the virtual village, making it more fun. Moreover, using different programming languages and tools to make the project work better for more people. In addition, as technology always changes, we might try adding virtual reality or other stuff to make the digital village experience even more awesome. While making this project, there are full of chances to come up with new ideas for everyone.

- **Contribution:**

Name & Id	Work Details
Tonmoy Dey (20-44206-3)	Building, Trees, Road, Bullock Cart, Flag with Animation.
MD. Abdul Muneem Adnan (20-44213-3)	Helicopter, Hills, Sun, Moon, Cloud, Rain with Animation.
Bishal Paul (22-47036-1)	Train, Rail line, Boat, River with Animation.

Reference:

[1] "Computer Graphics," *GeeksforGeeks*. https://www.geeksforgeeks.org/computer-graphics-2/

[2] T. Akenine-Möller, E. Haines, and N. Hoffman, *Real-Time Rendering*. CRC Press, 2019.

[3] "OpenGL Programming/Basics/3DObjects - Wikibooks, open books for an open world," *en.wikibooks.org*. https://en.wikibooks.org/wiki/OpenGL_Programming/Basics/3DObjects (accessed Nov.20, 2023).

[4] Computer Graphics, Class Material and Lab Task.