Queen Mary
University of London

School of Electronic Engineering and Computer Science

EBU6231 – 3D Graphics for Augmented and Virtual Reality

Individual Project

Coursework Title: 3D Graphics Showcase for VR and AR

Weighting: 25% of the total module marks

1. Overview

This coursework requires students to design, model, and present personalised 3D content for immersive platforms. This is an individual coursework.

Each student should prepare a real-life personal photo of themselves and use it for the 3D modelling process. The coursework consists of two levels:

- Level 1: Use OpenGL to create a pixel-art style 3D self-figure model.
- Level 2: Use Unity to develop immersive experiences for:
  - Virtual reality (VR) via simulator
  - Mobile augmented reality (AR) using a smartphone

Objectives:

- Develop practical skills in OpenGL modelling and basic Unity operations
- Represent individual identity through creative 3D expression
- Build cross-platform deployment skills in VR and AR
- Explore and apply AI tools in a creative development pipeline
- Demonstrate communication and problem-solving during live presentation

2. Level 1 – OpenGL (80%)

3D Graphic Modelling for Level 1:

Students must create a unique 3D graphic model using OpenGL including:

- A pixel-style 3D model of your self-portrait
- A pixel-style 3D model of your name

Each student must provide a photo of themselves, as shown in Figure 1 (a), and at a later stage **the chosen real-life personal photo will need to be uploaded to QMPlus and checked by TAs for verification of genuineness**. The 3D graphics model in OpenGL should resemble the real-life personal photo and reflect the personal characteristics, such as gender, skin tone, hairstyle, clothing and accessories, etc. Students should use pixel-art approach for the design—examples in Figure 1 (b) and (c) illustrate possible styles. A flat 3D style similar to Figure 1(c) is acceptable, although models with complexity and various depths are likely to receive higher marks.

(a) (b) (c)

Figure 1. Example of 3D Self-Portrait in OpenGL

(a) (b)

Figure 2. Another Example for 3D Self-Portrait Modelling

Students should aim to capture the recognisable characteristics of the real-life personal photo during the modelling process. Bear in mind that 'reflecting reality' is one of the marking criteria, and it may be disadvantageous if the graphics appear too generic. Therefore, it should be in the students' best interest to **choose a real-life personal photo with distinctive features** that can be easily identified by the audience and readily modelled in OpenGL, for example, a red long coat, a red hoodie, glasses, posture, or brightly coloured clothing and accessories. Figure 2 shows another example, where the sitting posture, bald head, white beard, and glasses all contribute to the distinctive features; together with the matching colours of the clothing and shoes, the 3D model mirrors the real-life image with clear resemblance. **It is not essential to show the face in the real-life photo, and students can wear a mask or show side/back profile instead of front face.**

This task must also include a 3D model of your own name in the pixel style. Examples are shown in Figure 3. The name can be initials, first name only, or last name only (**nicknames are not allowed**). There is no restriction on the colours and styles for the 3D graphics.

Figure 3. Example of 3D Names in OpenGL

Level 1 Media Production:

The 3D self-portrait and name models should be placed in a creative **landscape** of your choice, e.g. floor, road, mountains, or rivers. The display of the 3D graphics should follow basic film-making strategies, where the **camera** dynamically captures the figures and scenes from different distances and angles to enhance storytelling (an example is given on QMPlus). **Animations** should be created to produce an appealing visual impact.

Level 1 Stretch Features:

A small portion of the marks will be reserved for students who demonstrate exceptional effort and produce outstanding work in OpenGL. Students are encouraged to attempt more complex solutions in order to deliver high quality product, for example:

- A wide range of accessory assets
- User interactions
- High-resolution bespoke models
- Advanced lighting
- Texture

Level 1 Demo video:

Any screen-capturing software is fine. Recommended length is **1 - 2 minutes**. Do not exceed 3 minutes long. QMPlus only supports the file size up to 50 MB which should suffice in common scenarios, and if your video file size is bigger than this, you can provide a link for downloading it elsewhere. Do not to use any rare video file types.

This demo video is a form of digital portfolio, which supports continuous professional development (CPD) by serving as a dynamic, reflective record of ongoing learning and professional achievements, enabling individuals to document, evaluate, and plan their development over time. Therefore, the following **requirements** are essential for the video:

- Include all graphic assets
- All camera and animation effects are included
- Demonstrate stretch features if any
- Marks will not be awarded for features that are not presented in the demo video
- Well suited for both technical and non-technical audiences

3. Level 2 – Unity (20%)

3D Graphics for Level 2:

Students need to import the OpenGL models into a Unity scene. Only the 3D self-portrait and name models need to be imported. Students may choose one of the following deployment platforms to showcase their graphics:

- VR experience (simulator)
- AR application via smartphone

Students have two options of adding the 3D graphic models to the Unity scenes:

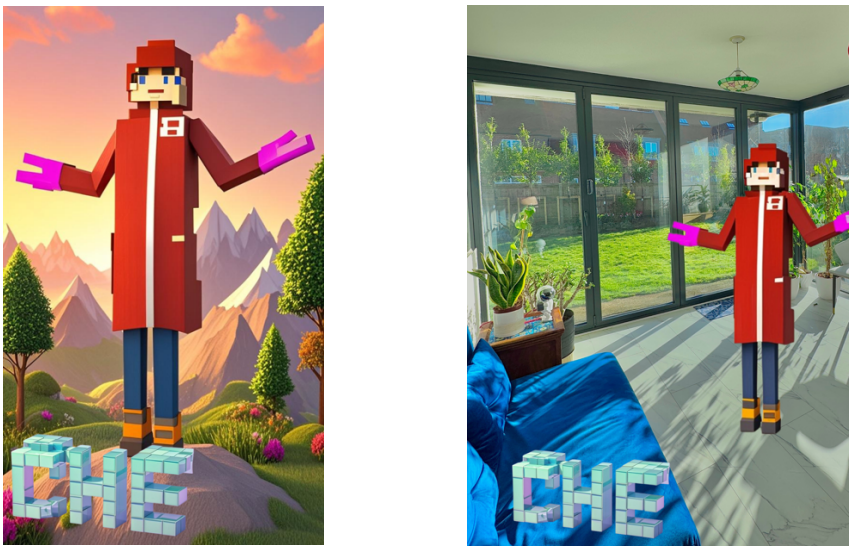
1) Export the 3D graphic models from OpenGL and then import them to Unity
2) Use Blender to create a new set of models from scratch

Both options have pros and cons, so there is no better or worse choice. No matter which option students choose, the requirement is that the added 3D graphic models in Unity should reflect the real-life personal photos that have been provided.

Level 2 Scenes:

Students are permitted to use template projects from Unity and there are no restrictions on the scenes – students are free to use any existing scenes or import scenes from the Unity Asset Store. There is no requirement on the setup of the scenes. Figure 3(a) shows an example of the 3D self-portrait graphics imported to a template VR scene in Unity, which

is downloaded from Unity Asset Store; Figure 3(b) shows an AR example where a 3D model is placed in a real-life scene from a smartphone camera.



(a) VR scene (b) AR scene

Figure 3. Placement of 3D Graphics in VR and AR Scenes

Level 2 Demo video:

The requirements of the demo video for level 2 are the same as level 1, except that the content should include either the screen recording of VR simulator, or the screen recording of Mobile AR app.

4. AI-Assisted Development

AI use is highly encouraged as a professional skill. All students should use generative AI tool to assist with the whole development process.

The given **GenAI Log Template** must be used to document the reflective learning process. The log file does not need to include exhaustive information of all activities involving generative AI – students are only required to provide one strong example for each item, demonstrating how they have gained knowledge and skills, and/or how they have formed critical judgement throughout their development journey with the assistance of GenAI.

It is recommended to use either ChatGPT or DeepSeek so that **public links** for the conversation can be created and shared (i.e. to be included in the GenAI Log file).

5. Submission and Assessment

The submission deadline on QMPlus is **27th November, Thursday**. The following 6 or 8 files can be included (Large files can be uploaded to a cloud elsewhere as long as students can provide a downloading link):

1) The original real-life personal photo that students have chosen
2) The zipped file of all.cpp files for OpenGL models
3) A text file to mention the stretch features (if applicable)
4) Level 1 demo video for the OpenGL
5) The zipped Unity project files either for VR or AR
6) Blender source file (if applicable)
7) Level 2 demo video for VR or AR
8) Generative-AI log file

A viva session will be held by the TAs during the Lecture 20 timeslot on **28th November, Friday**. The viva is individual-based, and each will last 4 - 5 minutes. There is no need to prepare any presentation for the viva. The viva is mainly to verify the real-life personal photo and the 3D self-portrait with the real person, and to assess the use of GenAI in the development process.

The marking criteria is shown in Table 1:

	Component	Marks
Level 1. OpenGL	Reflecting the reality (self-portrait and name)	10
	Creative landscape	10
	Dynamic camera movement	10
	Animations	10
	Modular programming	10
	Stretch feature for outstanding performance	20
Level 2. Unity	3D graphic models reflecting the reality	10
	Demonstration of VR simulator or mobile AR	10
	Viva & reflective learning in GenAI	10
	Total	100

Table 1. Marking Criteria

6. Disclaimer & Informed Consent

We may include your real-life personal photo alongside your 3D graphic models in the module showreel or in public showcase events for teaching, research, or scholarly purposes. If we plan to use your photo in this way, we will contact you individually to request your explicit consent for both your photo and your work to be included in the public domain. No personal photo will be used without your prior agreement.