**CMP405 Coursework Report**

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1. **Summary**

Of the features which were outlined in the assessment brief, I chose to implement the following features:

**Usability:**

* Object selection via mouse picking.
* Multiple object selection via mouse picking.
* Use of click and drag to move, rotate and scale objects.
* User-defined camera speed parameters.
* Camera focusing on the selected object.
* Arcball camera orbiting.

**World Editing**

* Copying and pasting of the selected object.
* Object creation window.
* Object manipulation.
* Usage of multiple cameras (the object focusing uses its own separate camera to preserve the position of the free-moving camera, and both use different functions).

1. **Controls:**

**Camera Controls:**

* Use A and D to move the camera left or right.
* Use W and S to move the camera forwards or backwards.
* Use Q to move the camera up, and E to move it down.
* Hold the right mouse button and move the mouse to rotate the camera.
* Press F to focus on the object which is currently selected. Whilst in this mode, hold the right mouse button and move the mouse to use the arcball camera.
* Press R to exit the focus mode and return to the previous camera position and allow free camera movement again.

**Mouse Picking:**

* Press the left mouse button whilst hovering over any object in the scene to select it.
* Hold shift whilst selecting objects to select them all at once. This will allow you to manipulate them all simultaneously.

**Object Functions:**

* Hold control and press V to paste the object currently being selected, at a slight offset to the current object.
* When using any of the object manipulation modes, hold control and move the mouse to manipulate in the X and Y axis, or press W/S whilst holding control to manipulate it in the Z axis.
* Press delete to remove the currently selected object from the scene graph.

**UI Menus:**

* To edit camera movement speed and rotation speeds, go to File->Camera Controls, and use the sliders to adjust.
* Use the modes menu to select between normal (free moving camera), translate (move objects), scale (change object sizes) and rotation (rotate objects).
* To create a new object, go to Edit->Create Object, and fill out fields in the dialogue window which appears.
* Using the red paste button has the same effect as pressing ctrl+V and will paste the currently selected object.

1. **Features**
   1. **Mouse Picking**
      1. **Single Mouse Picking**
      2. **Multi-Object Picking**
   2. **Cameras**
      1. **Camera Movement**
      2. **Camera Rotation**
      3. **Camera Focusing**
      4. **Arcball Camera**
      5. **Camera Switching**
      6. **User-Defined Camera Controls**
   3. **Copying and Pasting of Objects**
      1. **Copying**
      2. **Pasting**
      3. **Adding to Scene**
   4. **Object Manipulation**
      1. **Translating Objects**
      2. **Rotating Objects**
      3. **Scaling Objects**
      4. **Using Mouse Movement**
   5. **Object Creation**
      1. **Using the Window**
      2. **Creating the Object**
      3. **Adding to Scene**
2. **Conclusion**
3. **References**

<https://learn.microsoft.com/en-us/cpp/mfc/reference/csliderctrl-class?view=msvc-170> – Using the sliders in Forms (MS Documentation), used in camera controls window to edit the speeds.

<https://stackoverflow.com/questions/21865034/how-to-set-a-default-value-for-edit-control-box-in-a-dialog-that-is-added-to-m> - Setting the default value in edit boxes (StackOverflow), used in object creation window to enter default position, rotation and scale.

<https://learn.microsoft.com/en-us/cpp/mfc/reference/ccombobox-class?view=msvc-170> – Using the combo boxes in Forms (MS Documentation), used in object creation window to create the dropdown menus for models and textures.

<https://github.com/microsoft/DirectXTK/wiki/Rendering-a-model> - Adding new models (WFCC Wiki), used to add the fence model to the project.

<https://asliceofrendering.com/camera/2019/11/30/ArcballCamera/> - Using the arcball camera (Programmer Blog), used for the object focusing camera.