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My Design Document

My coursework depicts a mountain scene consisting of 3D objects and quadrics. It includes boulders, mountains, a tree and vehicles. The sun will rise and set, and vehicles will move relative to each other along the mountain road. When the car moves to the right and stops in front of the tree, the van will simultaneously move to the left and vice versa.

Scene Graph:

Scene origin
- [S(25,1,20) T(0,-1,-10)] Ground plane
- [S(25,1,10) Rx(90) T(0,4,-20)] Sky plane
- [T(-5.7,currentSun,-19)] Sun
- [T(-4.1,-0.2,-8.5)] First boulder
- [T(-4.1,-0.2,-10)] Second boulder
- [Rx(30) T(-0.5,-1.0,-15)] Mountain
- [T(1.6,-1,-4.3)] Tree
  - [Rx(-90)] Trunk
  - [T(1.6,-0.1,-4.3)] Leafy head
- [S(0.23,0.4,0.6) T(currentVan,-0.1,-2.5)] Van
  - [S(0.23,0.4,0.6) T(currentVan,-0.1,-2.5)] Van front
  - [S(0.2,0.2,0.2) T(currentVan,-0.3,-2.2)] First wheel
  - [S(0.2,0.2,0.2) T(currentVan + 0.2,-0.3,-2.2)] Second wheel
- [S(0.25,0.2,0.25) T(currentCar,-0.3,-2.0)] Car
  - [S(0.85,0.85,0.85) T(0.0,0.0,0.0)] Car roof
  - [T(0,-0.65,0.8)] First wheel
  - [T(0.85,-0.6,0.5)] Second wheel
  - [T(0.8,-0.6,-0.2)] Third wheel
  - [T(-0.2,-0.65,-0.5)] Fourth wheel

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User interaction

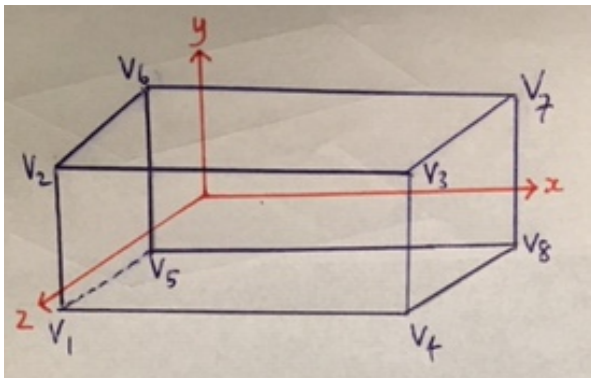
- Press the escape key to exit the application
- Press the space key to reset the application
- Hold the x, y and z keys to view the scene along the x, y and z axis, respectively
- While viewing the scene along the x, y or z axis, use the up and down cursor keys to increase or decrease the viewpoint's distance from the scene origin
- Press U to make the sun rise
- Press D to make the sun set
- Press R to move the car to the right and the van to the left
- Press L to move the car to the left and the van to the right

References of textures

Ground plane: https://pixabay.com/photos/way-highway-mountains-landscape-2101730/
Sky plane: https://imagesofrmnp.com/photo/trail-ridge-sunrise/?gallery=sunrise

Custom objects

My first object is a car which consists of a cuboid and a prism on top.

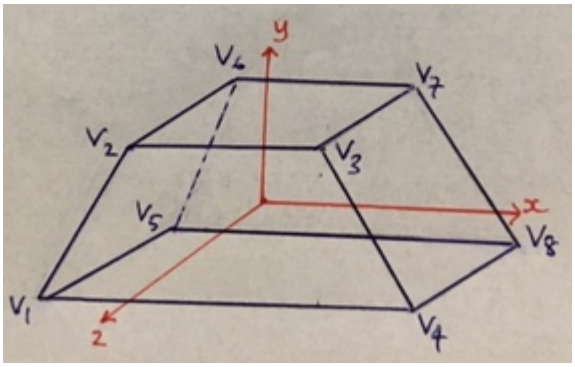


Coordinates:

Vertex	x	y	z
v1	-0.5	-0.5	0.5
v2	-0.5	0.1	0.5
v3	1.4	0.1	0.5
v4	1.4	-0.5	0.5
v5	-0.5	-0.5	-0.5
v6	-0.5	0.1	-0.5
v7	1.4	0.1	-0.5
v8	1.4	-0.5	-0.5

Faces:

Face	Vertices
Near	v3, v2, v1, v4
Right	v7, v3, v4, v8
Far	v6, v7, v8, v5
Left	v2, v6, v5, v1
Top	v7, v6, v2, v3
Bottom	v4, v1, v5, v8



Coordinates:

Vertex	x	y	z
v1	-0.4	0.1	0.5
v2	0.0	0.7	0.5
v3	0.7	0.7	0.5
v4	1.2	0.1	0.5
v5	-0.4	0.1	-0.5
v6	0.0	0.7	-0.5
v7	0.7	0.7	-0.5
v8	1.2	0.1	-0.5

Faces:

Faces	Vertices
Near	v3, v2, v1, v4
Right	v7, v3, v4, v8
Far	v6, v7, v8, v5
Left	v2, v6, v5, v1
Top	v7, v6, v2, v3
Bottom	v4, v1, v5, v8

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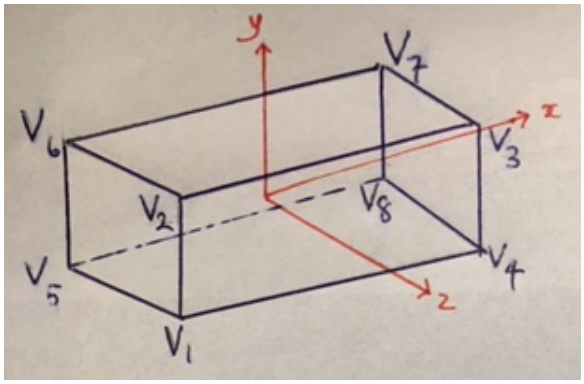
My second object is a van which consists of a cuboid and a prism at the front.

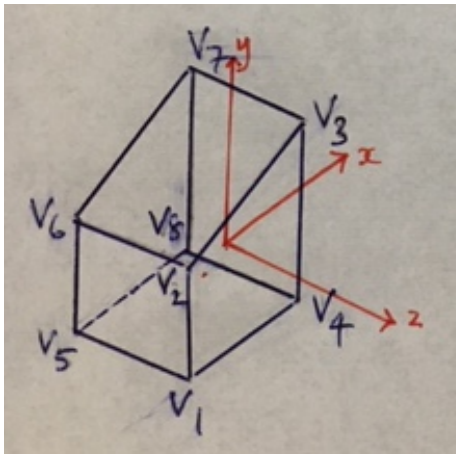


Coordinates:

Vertex	x	y	z
v1	0.0	-0.5	0.5
v2	0.0	0.1	0.5
v3	1.4	0.1	0.5
v4	1.4	-0.5	0.5
v5	0.0	-0.5	-0.5
v6	0.0	0.1	-0.5
v7	1.4	0.1	-0.5
v8	1.4	-0.5	-0.5

Faces:

Vertex	Vertices
Near	v3, v2, v1, v4
Right	v7, v3, v4, v8
Far	v6, v7, v8, v5
Left	v2, v6, v5, v1
Top	v7, v6, v2, v3
Bottom	v4, v1, v5, v8



Coordinates:

Vertex	x	y	z
v1	-0.5	-0.5	0.5
v2	-0.5	-0.2	0.5
v3	0.0	0.1	0.5
v4	0.0	-0.5	0.5
v5	-0.5	-0.5	-0.5
v6	-0.5	-0.2	-0.5
v7	0.0	0.1	-0.5
v8	0.0	-0.5	-0.5

Faces:

Vertex	Vertices
Near	v3, v2, v1, v4
Right	v7, v3, v4, v8
Far	v6, v7, v8, v5
Left	v2, v6, v5, v1
Top	v7, v6, v2, v3
Bottom	v4, v1, v5, v8