

# **Drawing 3D: Coordinates**

**CSCI 4229/5229  
Computer Graphics  
Summer 2022**

# Lorenz Observations

- Compute coordinates or store?
  - Readability over efficiency
- The attractor does not fit in  $(-1,+1)$ 
  - Transform coordinates
- The attractor should remain the same when viewed from different positions
  - Recompute from fixed position or store
- Avoid IO (read or write)
  - Bad for performance in display
  - Bad user interface anywhere else

# The Issue

- Lorenz attractor  $(x,y,z)$  values are generally in the range  $(-50,50)$  in all three dimensions
- How do you get OpenGL to display the whole range of values?
- Assume
  - Lorenz values are in an array  $x[i],y[i],z[i]$ ,  $i=0,\dots,n-1$
  - double *dim* is defined somewhere as 50

# Option 1

```
void display()  
{...  
    for (i=0;i<n;i++)  
        glVertex3d(x[i]/dim , y[i]/dim , z[i]/dim);  
...}
```

# Option 2

```
void display()  
{...  
    for (i=0;i<n;i++)  
        glVertex4d(x[i] , y[i] , z[i] , dim);  
...}
```

# Option 3

```
void display()
{...
    glScaled(1/dim , 1/dim , 1/dim);
    for (i=0;i<n;i++)
        glVertex3d(x[i] , y[i] , z[i]);
...}
```

# Option 4

```
void display()
```

```
{...
```

```
    for (i=0;i<n;i++)
```

```
        glVertex3d(x[i] , y[i] , z[i]);
```

```
...}
```

```
void reshape()
```

```
{...
```

```
    glScaled(1/dim , 1/dim , 1/dim);
```

```
...}
```

# Option 5

```
void display()
```

```
{...
```

```
    for (i=0;i<n;i++)
```

```
        glVertex3d(x[i] , y[i] , z[i]);
```

```
...}
```

```
void reshape()
```

```
{...
```

```
    glOrtho(-asp*dim,asp*dim,-dim,dim,-dim,dim);
```

```
...}
```