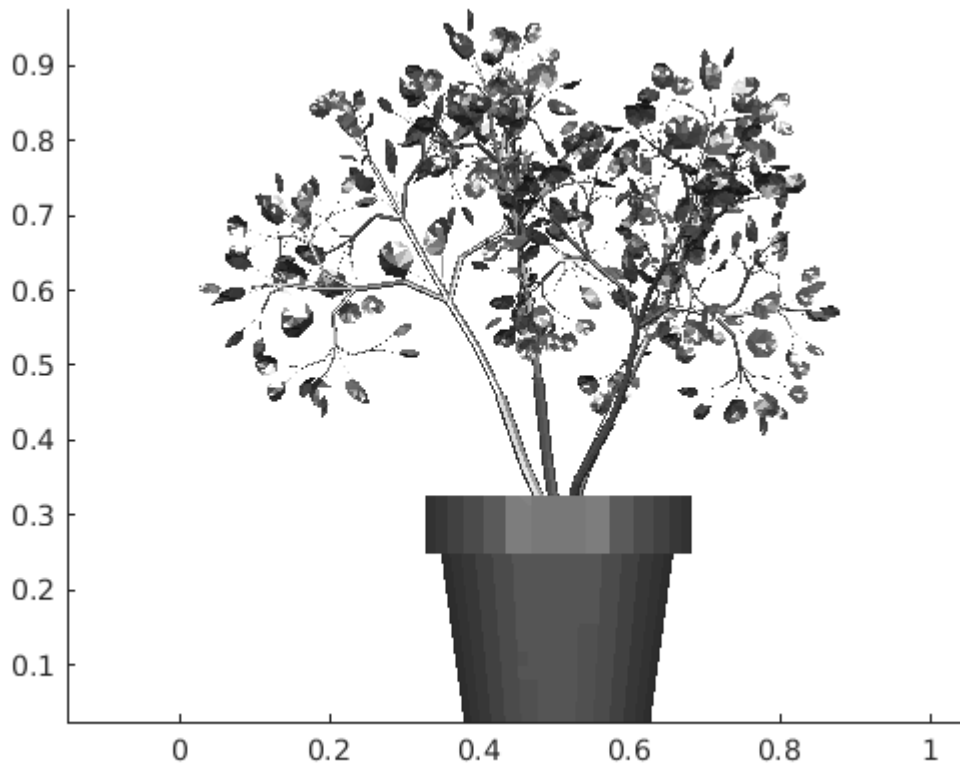


1. Homogenous Transformation Matrices

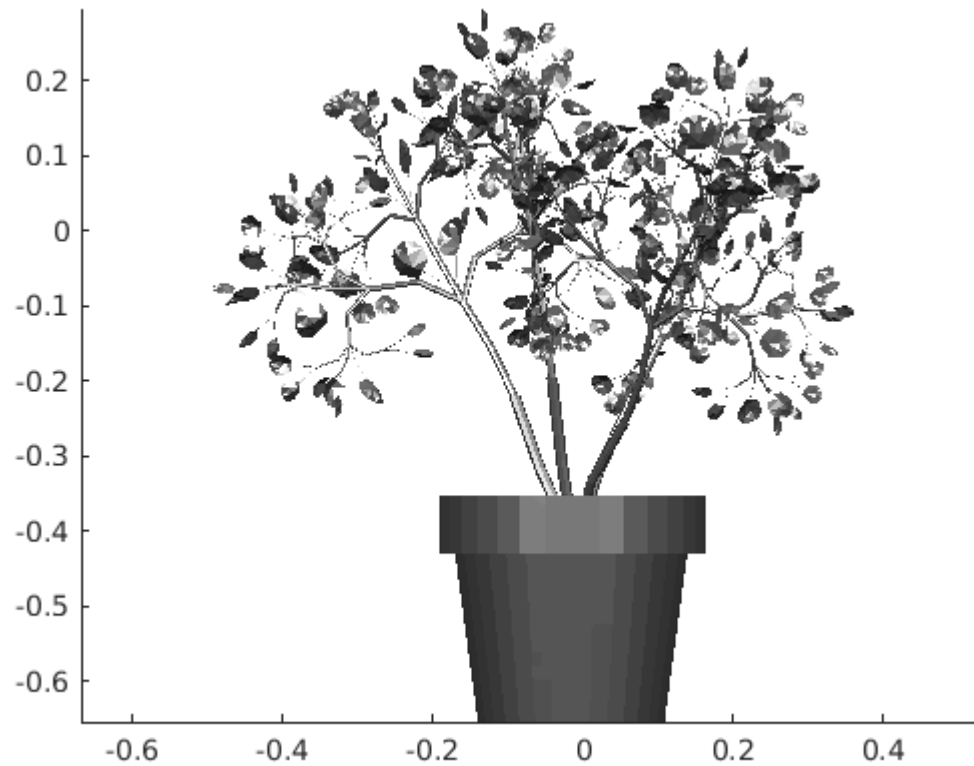
0. Load the 3-D Model.

```
[V,F] = openOFF('model.off', '');  
close all  
P = patch('Vertices', V, 'Faces', F, 'FaceVertexCData',0.3*ones(size(V,1),3));  
axis equal;  
shading interp;  
camlight right;  
camlight left;
```



1. Translate to Origin

```
Centroid=sum(V.',2)/19105;  
V_Origin=(V.'-Centroid).';  
figure;  
P2= patch('Vertices', V_Origin, 'Faces', F, 'FaceVertexCData',0.3*ones(size(V,1),3));  
shading interp;  
axis equal;  
camlight right;  
camlight left;
```

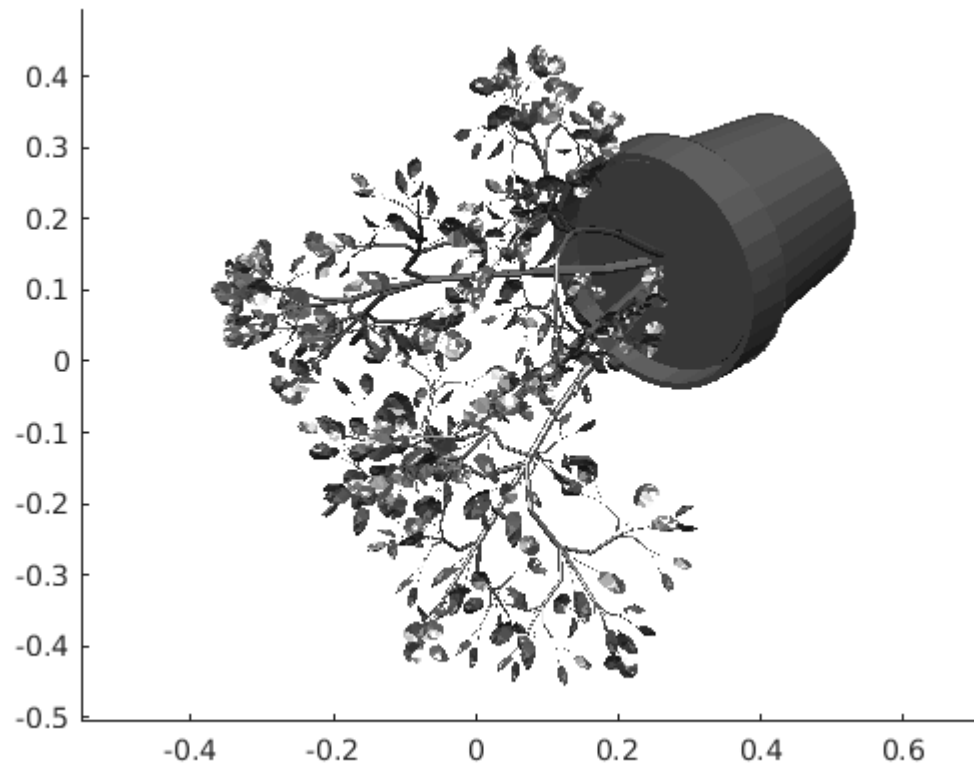


2. Rotate by 45 deg around X-axis then 120 deg around Z-axis

```
V_x1=X_ROT(45,V_Origin);
```

```
V = 19105x3
-0.0527    -0.2578     0.0781
-0.0515    -0.2579     0.0863
-0.0545    -0.2484     0.0735
 0.3096     0.0186     0.0793
 0.3104     0.0235     0.0839
 0.3070     0.0232     0.0861
 0.2870    -0.1401     0.0984
 0.2919    -0.1366     0.1045
 0.2912    -0.1428     0.1016
-0.0292     0.0662     0.0402
  ⋮
```

```
V_z1=Z_ROT(120,V_x1);
figure;
P3= patch('Vertices', V_z1, 'Faces', F, 'FaceVertexCData',0.3*ones(size(V,1),3));
shading interp;
axis equal;
camlight right;
camlight left;
```

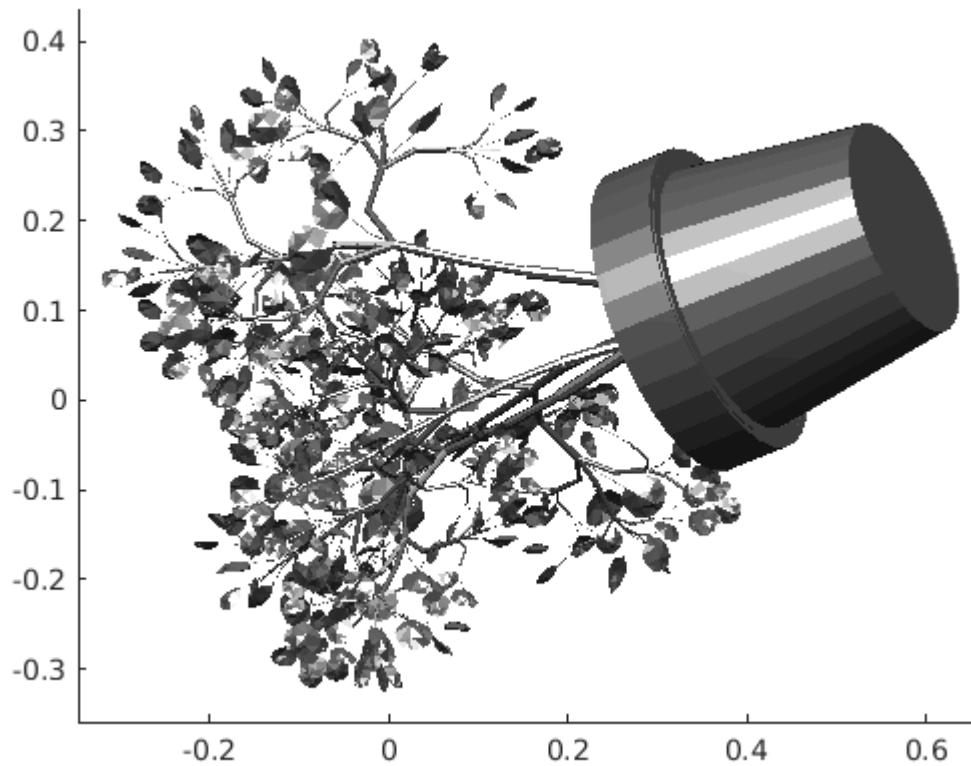


3. Rotate by 120 deg around Z-axis then 45 deg around X-axis.

```
V_z2=Z_ROT(120,V_Origin);
V_x2=X_ROT(45,V_z2);
```

```
V = 19105x3
    0.1365    -0.1553     0.1805
    0.1309    -0.1607     0.1834
    0.1344    -0.1505     0.1712
   -0.2145     0.1350     0.1956
   -0.2207     0.1332     0.1936
   -0.2202     0.1294     0.1923
   -0.1177     0.0672     0.3055
   -0.1259     0.0665     0.3074
   -0.1201     0.0667     0.3109
   -0.0506    -0.0315    -0.0575
      ⋮
```

```
figure;
P4=patch('Vertices', V_x2, 'Faces', F, 'FaceVertexCData', 0.3*ones(size(V,1),3));
shading interp;
axis equal;
camlight right;
camlight left;
```



4. Translate the 3-D Object after Transformation 3

```
figure;
P4=patch('Vertices', V_x2, 'Faces', F, 'FaceVertexCData', 0.3*ones(size(V,1),3));
V_translate=V_x2.' + [0.5 0.2 0.1].'
```

```
V_translate = 3x19105
    0.6365    0.6309    0.6344    0.2855    0.2793    0.2798    0.3823    0.3741 ...
    0.0447    0.0393    0.0495    0.3350    0.3332    0.3294    0.2672    0.2665
    0.2805    0.2834    0.2712    0.2956    0.2936    0.2923    0.4055    0.4074
```

```
P5=patch('Vertices', V_translate.', 'Faces', F, 'FaceVertexCData', 0.3*ones(size(V,1),3));
shading interp;
axis equal;
camlight right;
camlight left;
```

