Calculate volume by LIDAR point cloud

Simple script that calculates volume of terrain object (heap, hill, mountain, etc) by point cloud

Test data was loaded from OpenTopography
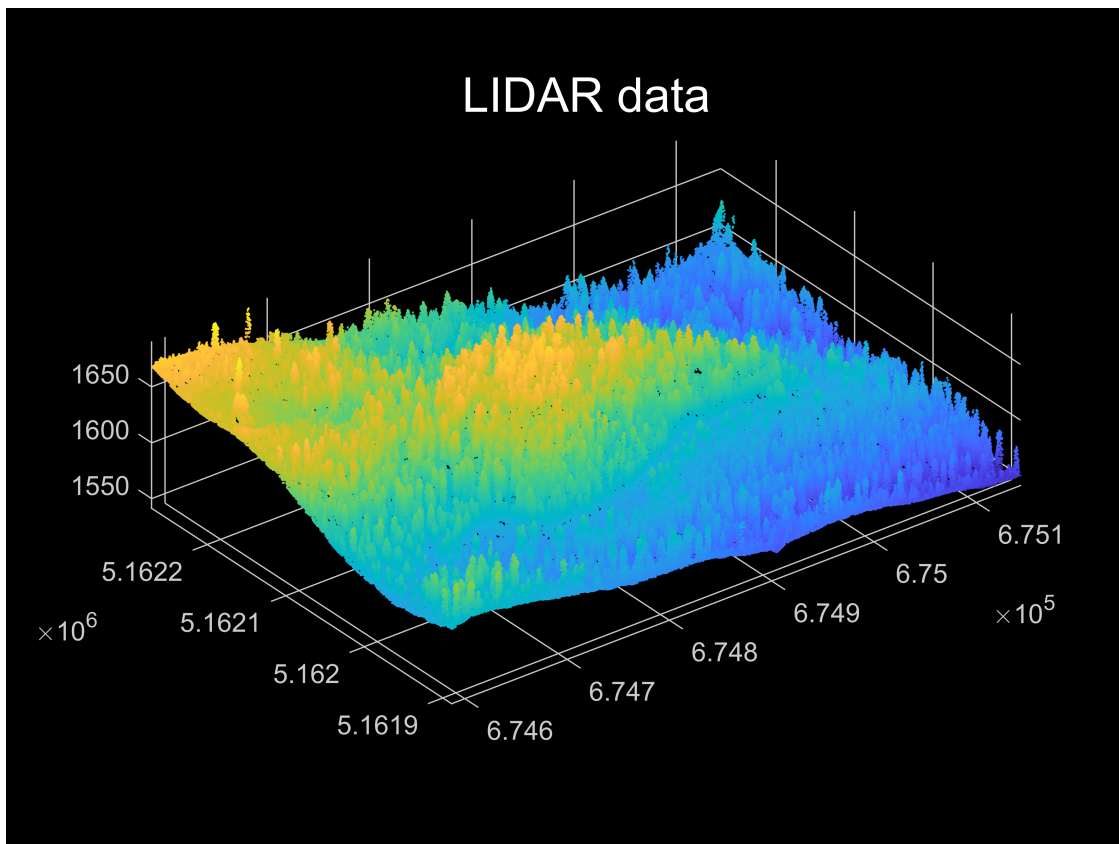
Following toolboxes are necessary:

Lidar Toolbox

Computer Vision Toolbox

Load LIDAR data

```
clear();
lasReader = lasFileReader(".\lidar_data.laz");
ptCloud = readPointCloud(lasReader);
```

Display point cloud

```
ax = pcshow(ptCloud.Location);
ax.GridAlphaMode = "manual";
ax.GridAlpha = 1;
title('LIDAR data', 'FontWeight','Normal','FontSize',18,'Color','white');
```


Do filtering

```
% With pcdenoise(...)
```

Convert point cloud to surface

```
dens = 27800;
x = double(ptCloud.Location((1:dens:end),1));
y = double(ptCloud.Location((1:dens:end),2));
z = double(ptCloud.Location((1:dens:end),3));

sx = double(sum(size(x)));
sy = double(sum(size(y)));

xg = linspace(min(x), max(x), sx);
yg = linspace(min(y), max(y), sy);

[Xg, Yg] = meshgrid(xg, yg);
Zg = griddata(x, y, z, Xg, Yg);

Zg(isnan(Zg))=min(min(Zg));
```

Calculate volume

```
vol = trapz(xg,trapz(yg, Zg));
```

Display surface

```
figure(Color='black');
s = surf(Xg, Yg, Zg);
s.Parent.Color = "black";
s.Parent.XColor = 'white';
s.Parent.YColor = 'white';
s.Parent.ZColor = 'white';

s.Parent.GridAlphaMode = "manual";
s.Parent.GridAlpha = 1;

pbaspect(daspect());

header = sprintf('Volume: %0.5e', vol);
title(header, 'FontWeight','Normal','FontSize',18,'Color','white');

lighting gouraud
shading  faceted
```

Volume: 3.27948e+08