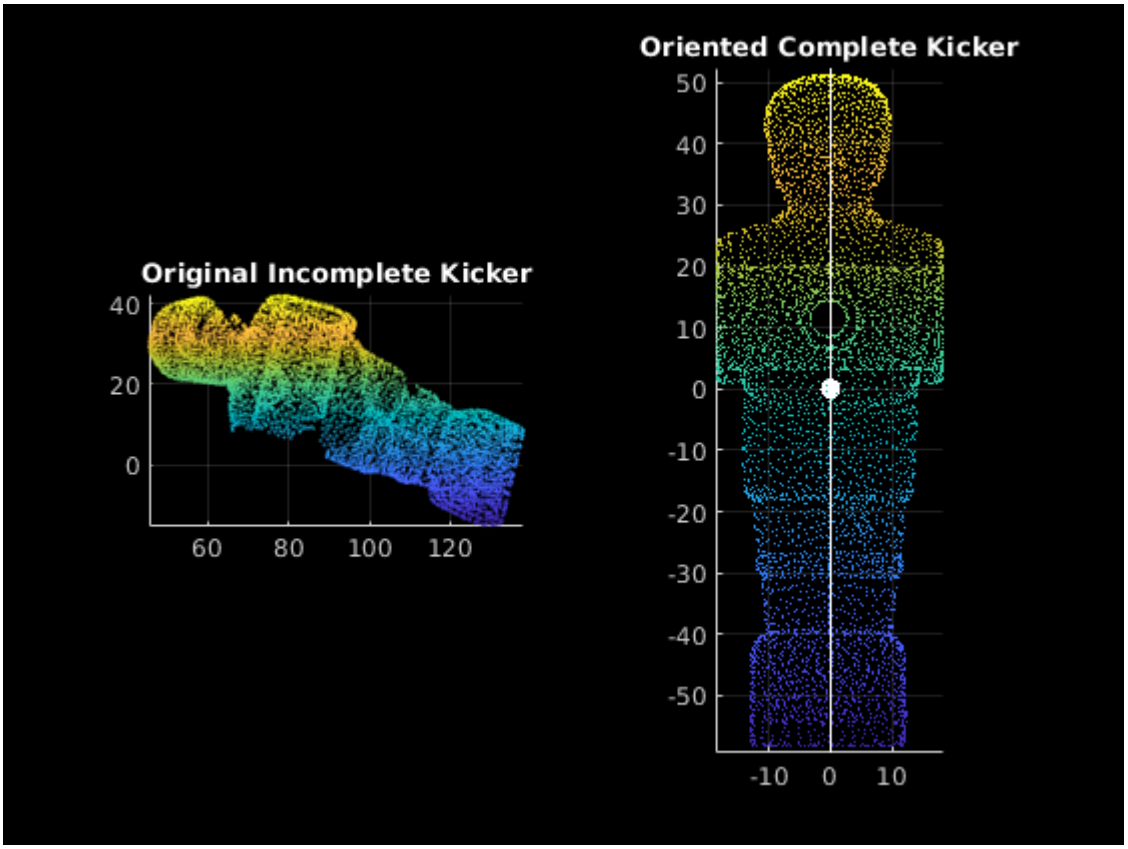
Using ICP Registration of the Incomplete model with original Complete model.

```
clear all; clc;

kicker_full = csvread("Kicker_complete_Output.xlsx");
kicker_full = pointCloud(kicker_full);

limx = [0 0
        0 0 ];
limy = [min(kicker_full.Location(:,2))-1 max(kicker_full.Location(:,2))-1
        min(kicker_full.Location(:,2))+1 max(kicker_full.Location(:,2))+1 ];
limz = [min(kicker_full.Location(:,3))-1 min(kicker_full.Location(:,3))-1
        max(kicker_full.Location(:,3))+1 max(kicker_full.Location(:,3))+1 ];
```

```
points = readtable("Kickerfigur_incomplete.xlsx");
points = points{:,1:3};
points_sorted = sortrows(points, 3);
gridStep = 1;
points_PC = pointCloud(points_sorted);
points_PC = pcdownsample(points_PC, "gridAverage", gridStep);
points_downsampled = points_PC.Location;
```

```
points_downsampled = pointCloud(points_downsampled);

figure(1)
subplot(1,2,1)
pcshow(points_downsampled)
hold on
title("Original Incomplete Kicker")
view([0 0])
hold off

subplot(1,2,2)
pcshow(kicker_full.Location)
title("Oriented Complete Kicker")
hold on
surf(limx, limy, limz, "LineStyle","-", "FaceAlpha",0.25,"EdgeColor",[1,1,1] )
plot3(0, 0, 0,'o','color','w',"MarkerSize",7,'MarkerFaceColor',"white")
hold off
view([0 0])
```




```
[tform, movingReg, rmsscore] = pcregistericp(points_downsampled, kicker_full, ...
                "MaxIterations",100, "Tolerance",[0.01, 0.01], "Extrapolate",true);
rmsscore
```

```
rmsscore = 0.2174
```

```
tform.Rotation
```

```
ans = 3×3
    0.2433    0.6068   -0.7567
   -0.2394    0.7936    0.5594
    0.9399    0.0451    0.3384
```

```
rotMat = tform.Rotation;
theta_x = atan2(rotMat(2,2), rotMat(3,3))*180 / pi
```

```
theta_x = 66.9077
```

```
theta_y = atan2(-rotMat(3,1), sqrt(rotMat(3,2)^2+ rotMat(3,3)^2))*180 / pi
```

```
theta_y = -70.0409
```

```
theta_z = atan2(rotMat(2,1), rotMat(1,1))*180 / pi
```

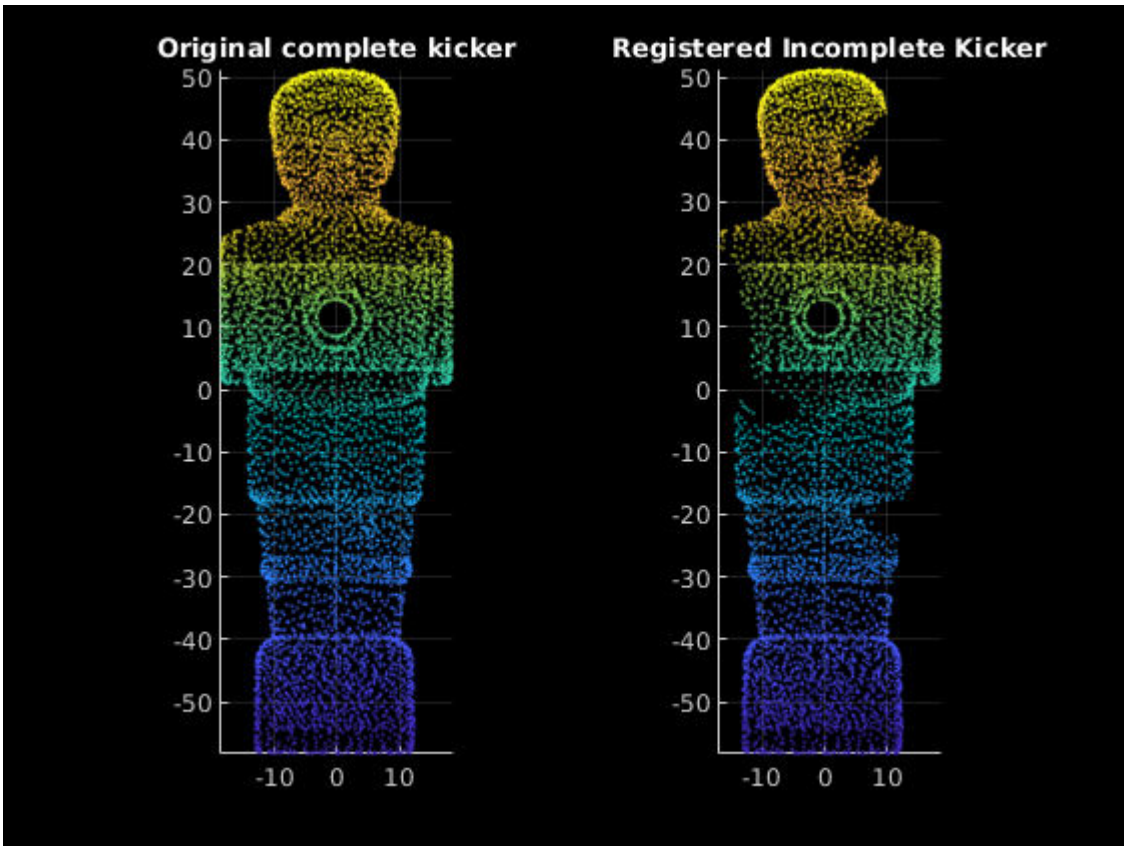
```
theta_z = -44.5370
```

```
tform.Translation
```

```
ans = 1×3
```

```
   -37.8332  -55.2840   62.5596
```

```
[tform, movingRegistered, rmsscore] = pcregistericp(points_downsampled, kicker_full, "M
movingRegistered = movingRegistered.Location;
movingRegistered = sortrows(movingRegistered);
subplot(1,2,1)
pcshow(kicker_full)
title("Original complete kicker")

subplot(1,2,2)
pcshow(movingRegistered)
title("Registered Incomplete Kicker")
subplot(1,2,2)
view([0 0])
```




```
clear ax1; clear ax2;

[num_rows, ~] = size(movingReg);
for i = 1:num_rows
    point = movingReg(i,:);
    point(1) = -1*point(1);

    movingReg = [movingReg
                 point ];
```

```
end


subplot(1,2,1)
pcshow(kicker_full.Location)
title("Original Kicker")

subplot(1,2,2)
pcshow(movingReg)
title("Registered, Interpolated Kicker")

subplot(1,2,2)
view([0 0])

subplot(1,2,1)
view([0 0])
```