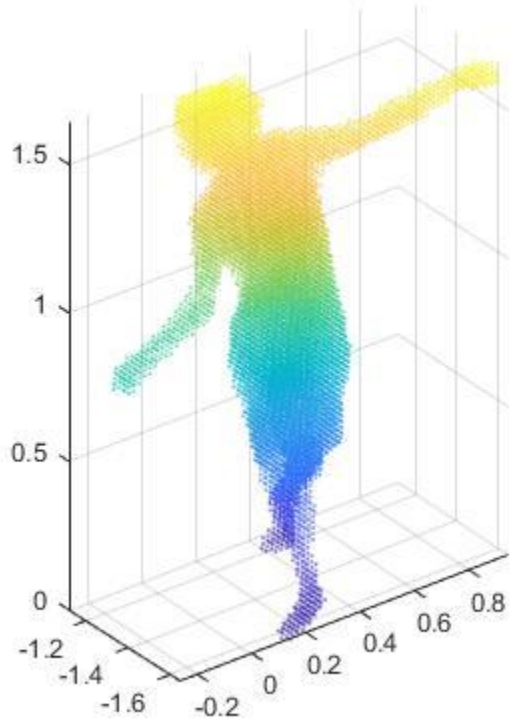
CS 532 HW 4

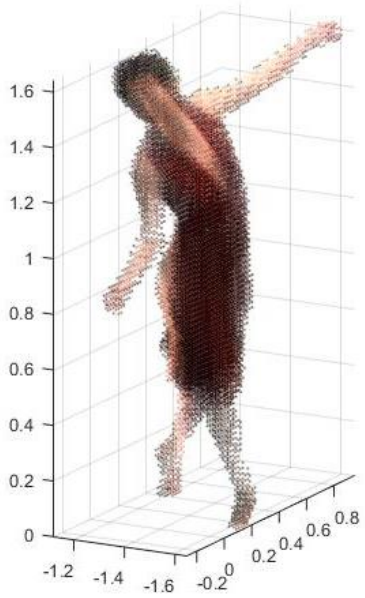
Part 1 and 2)

In this part we have to decide on the number of voxels to be included for the 3D model of the dancer given in the images. The dancer silhouettes are given in order to decide this, the projection matrices are used to find the voxel location using these silhouette intersections. We find the location of the voxel where the particular location is white in all the silhouettes and that is colored in the voxel grid whereas others are neglected. We get a 3D model as follows



Part 3)

The coloring of the voxels has to be done using photo consistency method. However, the last image is taken to color the model here, shown as follows:



CODE:

```
clc
clear all
close all

silhouettes = cell(8,1);

srcFiles = dir('C:\Users\Jolton\Desktop\HW4\*.pbm');  % the folder in which
ur images exists
for i = 1 : length(srcFiles)
    filename = strcat('C:\Users\Jolton\Desktop\HW4\',srcFiles(i).name);
    silhouettes{i} = im2double(imread(filename));
%     figure, imshow(silhouettes);
end

Image = imread('C:\Users\Jolton\Desktop\HW4\cam07_00023_0000008550.png');

% Images = cell(8,1);

% srcFiles = dir('C:\Users\Jolton\Desktop\HW4\*.png');  % the folder in which
ur images exists
% for i = 1 : length(srcFiles)
%     filename = strcat('C:\Users\Jolton\Desktop\HW4\',srcFiles(i).name);
%     Images{i} = imread(filename);
% %     figure, imshow(silhouettes);
% end

rawP = [ 776.649963  -298.408539 -32.048386  993.1581875 132.852554
120.885834  -759.210876 1982.174000 0.744869  0.662592  -0.078377
4.629312012;
    431.503540  586.251892  -137.094040 1982.053375 23.799522   1.964373    -
657.832764 1725.253500 -0.321776 0.869462  -0.374826 5.538025391;
```

```
    -153.607925 722.067139  -127.204468 2182.4950   141.564346  74.195686   -
637.070984 1551.185125 -0.769772 0.354474  -0.530847 4.737782227;
    -823.909119 55.557896   -82.577644  2498.20825  -31.429972  42.725830   -
777.534546 2083.363250 -0.484634 -0.807611 -0.335998 4.934550781;
    -715.434998 -351.073730 -147.460815 1978.534875 29.429260   -2.156084   -
779.121704 2028.892750 0.030776  -0.941587 -0.335361 4.141203125;
    -417.221649 -700.318726 -27.361042  1599.565000 111.925537  -169.101776 -
752.020142 1982.983750 0.542421  -0.837170 -0.070180 3.929336426;
    94.934860   -668.213623 -331.895508 769.8633125 -549.403137 -58.174614  -
342.555359 1286.971000 0.196630  -0.136065 -0.970991 3.574729736;
    452.159027  -658.943909 -279.703522 883.495000  -262.442566 1.231108    -
751.532349 1884.149625 0.776201  0.215114  -0.592653 4.235517090];


Proj_mat = zeros(3,4,8);

for i=1:8
    for j=1:3
        Proj_mat(j,1:4,i) = rawP(i,4*(j-1)+1:4*(j-1)+4);
    end
end

%% Grid dimensions

x_len = 2.5 -(-2.5);
y_len = 3 -(-3);
z_len = 2.5 - 0;

grid_vol = x_len*y_len*z_len;

no_of_voxels = 50000000;

voxel_vol = grid_vol/no_of_voxels;

voxel_len = nthroot(voxel_vol,3);

img_cord = zeros(3,1,8);

three_D_voxel_count = 0;

% x_y_vec = zeros(1,6);
x_y_vec = []; Color = [];
l = 0;

for x = -2.5:voxel_len:2.5
    for y = -3:voxel_len:3
        for z = 0:voxel_len:2.5
            count = 0;
            world_cord = [x; y; z; 1];
            for i = 1:8
                img_cord(:,:,i) = Proj_mat(:,:,i)*world_cord;
                img_cord(:,:,i) = round(img_cord(:,:,i)/img_cord(3,:,i));
```

```
                if img_cord(2,:,i) > size(silhouettes{i},1) ||
img_cord(2,:,i) <= 0 || img_cord(1,:,i) > size(silhouettes{i},2) ||
img_cord(1,:,i) <= 0
                    continue;
                elseif silhouettes{i}(img_cord(2,:,i),img_cord(1,:,i)) == 1
                    count = count + 1;
                    if count == 8
                        l = l+1;
                        three_D_voxel_count = three_D_voxel_count+1;
                        world_cord = reshape(world_cord(1:3), [1,3]);
                        x_y_vec(l,1:3) = world_cord;
                        Color(l,1:3) =
reshape(Image(img_cord(2,:,i),img_cord(1,:,i),1:3), [1,3]);
%                         Color(l,1:3) = reshape(Images{randi([1
8],1,1)}(img_cord(2,:,i),img_cord(1,:,i),1:3), [1,3]);
                        count = 0;
                    end
                elseif silhouettes{i}(img_cord(2,:,i),img_cord(1,:,i)) == 0
                    break;
                end
            end
        end
    end
end


% write_ply('Dancer.ply', x_y_vec, Color)

ptCloud = pointCloud(x_y_vec);
ptCloud.Color = uint8(Color);
pcwrite(ptCloud,'Ballerina','PLYFormat','ascii')
show = pcread('Ballerina.ply');
pcshow(show)
```