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%%          Calculation of Projection Matrix                           %%
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%%                                                                     %%
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%%  Date   : 10th Mar, 2014                                            %%
%%                                                                     %%
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clear all;
close all;

%% Vanishing Points in im-cords
Vx = [ 3346.54  ; -1084.27 ; 1  ];   % Vanishing Pt.
Vy = [ -1794.44 ; -1234.07 ; 1  ];   % --"--
Vz = [ 369.718  ; 3755.24  ; 1  ];   % --"--

%% World Origin in im-cords
WO = [ 393      ; 541      ; 1  ];

%% Reference axis-cords in im-cords
ref_x = [ 608 ; 430 ; 1 ];
ref_y = [ 172 ; 366 ; 1 ];
ref_z = [ 392 ; 402 ; 1 ];

%% Reference axis distances in unit pixels (can also be a ratio)
ref_x_dis = 300;
ref_y_dis = 400;
ref_z_dis = 183;

%% Scaling factors of the projection matrix
a_x = ( Vx \ (ref_x - WO) )  / ref_x_dis  %( A \ B ==> left division )
a_y = ( Vy \ (ref_y - WO) )  / ref_y_dis
a_z = ( Vz \ (ref_z - WO) )  / ref_z_dis


%% Construction of Projection Matrix
P = [  Vx*a_x , Vy*a_y , Vz*a_z , WO ]
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