
Get UV from XYZ according to 3D Homography of a projective geometry transform

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- Link: <https://github.com/shidafu/ViewConeCalibration.git>
- Date:2016/3/3
- Algorithm:

Get [UV] By solving:

$$s \begin{bmatrix} u \\ v \\ 1 \end{bmatrix} = \begin{bmatrix} h_{11} & h_{12} & h_{13} & h_{14} \\ h_{21} & h_{22} & h_{23} & h_{24} \\ h_{31} & h_{32} & h_{33} & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

- Inputs:

```
H----3 by 3 matrix: [h11 h12 h13 h14;
                    h21 h22 h23 h24;
                    h31 h32 h33 1]
```

```
XYZ----pointNum by cordNum matrix,
                    cordNum==3,pointNum>=4,
                    [x1,x2,...;
                    y1,y2,...;
                    z1,z2,...]
```

- Outputs:

```
UV----pointNum by cordNum matrix,
                    cordNum==2,pointNum>=4,
                    [u1,u2,...;
                    v1,v2,...]
```

```
function UV = GetUVFromXYZ(H,XYZ)
% Initial
[cordNum, pointNum]=size(XYZ);
if ~(cordNum==3 || cordNum==4)
    error('Input matrix size error!');
end
[hH, wH]=size(H);
if hH~=3 || wH~=4
    error('Input matrix size error!');
end
XYZ1=ones(4,pointNum,'double');
XYZ1(1:3,:)=XYZ(1:3,:);
UV=zeros(2,pointNum,'double');
% Algorithm
UVu=H(1,:)*XYZ1./H(3,:)*XYZ1;
```

```
UV(:,1)=UVu;  
UVv=H(2,:)*XYZ1./H(3,:)*XYZ1;  
UV(:,2)=UVv;
```

```
Error using GetUVFromXYZ (line 38)  
Not enough input arguments.
```

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