$\boxed{\text{why use } (R\ t) \text{ in camera}}$

1. Given basis $\{f_1 f_2 f_3\}$, $\{g_1 g_2 g_3\}$

(here we do not need $f_1 f_2 = 0$)

If $(f_1 f_2 f_3) = (g_1 g_2 g_3) H$, ($H$ is 3×3)

$x = (f_1 f_2 f_3) x_f$, (x_f is 3×1)

$\Rightarrow x = (g_1 g_2 g_3) H x_f$

$\therefore x_g = H x_f$

2. In space $\langle e_1, e_2, e_3 \rangle$, O is origin, choose coordinate system

f: $\{f_1, f_2, f_3\}, f_0$, (f_0 origin)

g: $\{g_1 g_2 g_3\}, g_0$ (g_0 origin)

If point p is represented by p_f is system f, p_g in g,

$$\Rightarrow p_g = (H\ f_{0g}) \begin{pmatrix} p_f \\ 1 \end{pmatrix}$$

proof:

① $p - f_0 = (f_1 f_2 f_3) p_f$

$= (g_1 g_2 g_3) H p_f$

② $(p - f_0)_g = H p_f$

$\therefore p_g - f_{0g} = H p_f$

③ $\therefore p_g = H p_f + f_{0g}$

$= (H\ f_{0g}) \begin{pmatrix} p_f \\ 1 \end{pmatrix}$

3. If f, g is standard orthogonal basis,

$\Rightarrow (H\ f_{0g})$ becomes $(R\ t)$