Boqian Yu 03708925

Derivation:

Let $P_L \triangleq O_L X$ and $P_R \triangleq O_R X$, we have:

$$P_R = R P_L + t,$$

which implies that P_R and $R P_L + t$ are colinear. We have:

$$\begin{aligned}
0 = (RP_L + t) \times P_R &= (RP_L) \times P_R + t \times P_R \\
&= (RP_L) \times P_R + t \times (RP_L + t) \\
&= (RP_L) \times P_R + t \times (RP_L)
\end{aligned}$$

multiply P_R^T on both sides

$$\begin{aligned}
0 &= P_R^T \cdot ((RP_L) \times P_R) + P_R^T \cdot (t \times (RP_L)) \\
&= P_R^T \cdot (t \times (RP_L)) \\
&= P_R^T \cdot [t]_\times R \cdot P_L
\end{aligned}$$

where $[t]_\times \cdot (RP_L) = t \times (RP_L)$.

Going back to the definition of essential matrix, we have $E = [t]_\times R$