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In the assumption, we have to say that $\{L_i\}$ & $\{L_i'\}$ must lie in a hyperplane in $\mathbb{P}^5$.

$\dashv$

Consequently the lines $\{L_i, L_i'\}$ lie in a unique 4-plane. In sum, we have proved the rather amusing result:

The set of nondegenerate skew-symmetric quadratic forms on $\mathbb{C}^4$, up to multiplication by scalars, is in one-to-one correspondence with the set of tetrahedra inscribed in and circumscribed about a given tetrahedron T_0 in $\mathbb{P}^3$.

$\ulcorner$ A = Set of nondegenerate skew-symmetric quadratic forms on $\mathbb{C}^4$.

B = Set of hyperplanes in $\mathbb{P}^5$ s.t $G \cap$ hyperplane is smooth.

Given $\eta \in A$, then $\exists$ a unique $\omega \in \Lambda^2 \mathbb{C}^4$, up to multiplication by scalars, s.t $\Gamma_\omega = \eta$.

$\Rightarrow$ $H_\omega = \Gamma_\omega$, for $H_\omega = \{\omega' ; \omega' \wedge \omega = 0\}$

$\omega = a_{12}\, e_1 \wedge e_2 + a_{13}\, e_1 \wedge e_3 + a_{23}\, e_2 \wedge e_3 + a_{24}\, e_2 \wedge e_4 + a_{34}\, e_3 \wedge e_4$

$\Rightarrow$ $\omega' = x_{ij}\, e_i \wedge e_j$

$\Rightarrow$ $\{\omega' \wedge \omega = a_{12}\, x_{34} + \cdots = 0\} = H_\omega$

$\Rightarrow$ H_ω is a hyperplane $\Rightarrow$ If $H_{\omega_1} = H_{\omega_2}$, then $\omega_1 = \alpha\, \omega_2$ vice versa.