Group action on X

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Let $E = k^3$. Form $V = (E \otimes E)^{\oplus 2}$. The group S_3 act on E by $e_i \mapsto e_{\sigma(i)}$. We get an induced action on $E \otimes E$. We have a $\mathbb{Z}_2$-action on V given by switching factors. This gives us a $D_6 \simeq S_3 \times \mathbb{Z}_2$-action on V.

Inside $\mathbb{P}(V)$ we have the Calabi-Yau variety X, given by $M \cap H$, where H is a generic codimension 6 linear subspace, and M is the zero set of the 2×2-minors of two matrices with entries in $E \otimes E$.

If we choose H such that $G = \mathrm{dP}_6$ act on H, we get an action on X. Our goal is to choose H such that X is nonsingular and have a dP_6-action.

Lemma 0.1. *One such invariant hyperplane is given by the span of*

$$f_{ij}^{\alpha} = e_i^{\alpha} \otimes e_j^{\alpha} + t e_{-i-j}^{\alpha+1} \otimes e_{-i-j}^{\alpha+1},$$

where $i \neq j \in \mathbb{Z}_3$ *and* $\alpha \in \mathbb{Z}_2$.