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Combinatorial study of stable categories of graded Cohen-Macaulay modules over skew quadric hypersurfaces. (English) Zbl 07473276 Collect. Math. 73, No. 1, 43-54 (2022)

Summary: In this paper, we present a new connection between representation theory of noncommutative hypersurfaces and combinatorics. Let $S$ be a graded $(\pm 1)$-skew polynomial algebra in $n$ variables of degree 1 and $f = x_1^2 + \cdots + x_n^2 \in S$. We prove that the stable category $\mathcal{CM}^Z(S/(f))$ of graded maximal Cohen-Macaulay module over $S/(f)$ can be completely computed using the four graphical operations. As a consequence, $\mathcal{CM}^Z(S/(f))$ is equivalent to the derived category $D^b(\mod k^2)$, and this $r$ is obtained as the nullity of a certain matrix over $F_2$. Using the properties of Stanley-Reisner ideals, we also show that the number of irreducible components of the point scheme of $S$ that are isomorphic to $\mathbb{P}^1$ is less than or equal to $(r+1)^2$.

MSC:
16G50 Cohen-Macaulay modules in associative algebras
16S38 Rings arising from noncommutative algebraic geometry
18G80 Derived categories, triangulated categories
05C50 Graphs and linear algebra (matrices, eigenvalues, etc.)
13F55 Commutative rings defined by monomial ideals; Stanley-Reisner face rings; simplicial complexes

Keywords:
stable category; Cohen-Macaulay module; noncommutative quadric hypersurface; adjacency matrix; Stanley-Reisner ideal

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References:

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