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Generalizing Fröberg's Theorem on Ideals with Linear Resolutions

In 1990 Fröberg characterized the graphs whose edge ideals have a 2-linear resolution. He proved that they are exactly those graphs whose complement is chordal. A full generalization of Fröberg's theorem to higher dimensions would result in a complete combinatorial classification of the monomial ideals with linear resolutions, or equivalently, all Cohen-Macaulay monomial ideals. In recent years, many have succeeded in partially generalizing Fröberg's criterion. The general approach is to define a higher-dimensional notion of a chordal graph which can be applied to simplicial complexes or hypergraphs. I will introduce a new "cycle-based" definition of a *chordal simplicial complex* which strictly contains the previously introduced classes. I will provide a necessary condition for a monomial ideal to have a linear resolution and will discuss the converse statement.