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Well Ordered Facet Covers and the Subadditivity Property of Monomial Ideals

It is known that the subadditivity property for the maximal degrees of the syzygies of a graded ideal of a polynomial ring $K[x_1, \ldots, x_n]$ fails to hold, while, under restrictive conditions, many cases have been known to hold. On the other hand, the problem is still open for the class of monomial ideals and has been investigated by several researchers and using different approaches.

In this talk, we will present the problem in terms of facet covers of simplicial complexes as defined by Erey and Faridi (2015): a subset $\{F_1, \ldots, F_i\} \subseteq \text{Facets}(\Gamma)$ of facets of a simplicial complex Γ is called a *facet cover* of Γ if every vertex v of Γ belongs to F_j for some $1 \leq j \leq i$. A facet cover is called *minimal* if no proper subset of it is a facet cover of Γ. A minimal facet cover $\{F_1, \ldots, F_i\}$ is called *well ordered* if, for every facet $H \notin \{F_1, \ldots, F_i\}$ of Γ, there exists $k \leq i-1$ such that

$$F_k \subseteq H \cup F_{k+1} \cup \cdots \cup F_i.$$