Smooth structures on moment-angle complexes for simplicial posets

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A moment-angle complex $\mathcal{Z}_K$ is a topological space equipped with an $(S^1)^m$-action, defined for an abstract simplicial complex K on the vertex set $\{1, \dots, m\}$. Lü and Panov have defined the moment-angle complex $\mathcal{Z}_\mathcal{P}$ for any finite *simplicial poset* $\mathcal{P}$ in [1]. It has been shown that a moment-angle complex $\mathcal{Z}_\mathcal{P}$ is a topological manifold if its geometric realization $|\mathcal{P}|$ is homeomorphic to a sphere in [1], and it admits a smooth structure invariant under the torus action if $\mathcal{P}$ is a star-shaped simplicial sphere (in this case, $\mathcal{P}$ is a simplicial complex) in [2]. However, any necessary and sufficient condition for a simplicial poset $\mathcal{P}$ so that $\mathcal{Z}_\mathcal{P}$ admits a structure of smooth $(S^1)^m$-manifold is not known.

We discuss a necessary condition and a sufficient condition for $\mathcal{P}$ so that the moment-angle complex $\mathcal{Z}_\mathcal{P}$ admits a structure of smooth $(S^1)^m$-manifold. This is joint work with Mikiya Masuda.

References

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