Abstract: We provide an algebraic framework to compute smallest enclosing and smallest circumscribing cylinders of simplices in Euclidean space $\mathbb{R}^n$. Explicitly, the computation of a smallest enclosing cylinder in $\mathbb{R}^3$ is reduced to the computation of a smallest circumscribing cylinder. We improve existing polynomial formulations to compute the locally extreme circumscribing cylinders in $\mathbb{R}^3$ and exhibit subclasses of simplices where the algebraic degrees can be further reduced. Moreover, we generalize these efficient formulations to the $n$-dimensional case and provide bounds on the number of local extrema. Using elementary invariant theory, we prove structural results on the direction vectors of any locally extreme circumscribing cylinder for regular simplices.

Stichworte: Smallest enclosing cylinder, Circumscribing cylinder, Simplex, Outer radius, Polynomial equations

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