Generalized Rose Surfaces and their Visualization with *Mathematica*

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In [1] we studied *circular surfaces* $\mathcal{CS}(\alpha, p)$ that are defined by a curve α and a congruence of circles $\mathcal{C}(p)$, where $\mathcal{C}(p)$ contains all circles passing through the points $P_{1,2}(0, 0, \pm p)$, $p = \sqrt{q}$, $q \in \mathbb{R}$. Depending on the type of points $P_{1,2}$, $\mathcal{C}(p)$ is an elliptic, parabolic or hyperbolic congruence of circles. It was shown that the *rose surfaces*, treated in [2], are circular surfaces $\mathcal{CS}(\alpha, p)$ where α is a rose (rhodonea) and $\mathcal{C}(p)$ is an elliptic or parabolic congurence. The rose lies in the plane $z = p$ having the directing point P_i as the point of the highest multiplicity.
If we extend α to all cyclic-harmonic curves with the polar equation $r = \cos\frac{n}{d}\varphi + k$, $k \in \mathbb{R}^+ \cup \{0\}$, $\varphi \in [0, 2d\pi)$, and include hyperbolic congruences $\mathcal{C}(p)$, numerous forms of new class of surfaces are obtained. This class we call *generalized rose surfaces*, study their algebraic properties and visulaize their shapes with the program *Mathematica*.

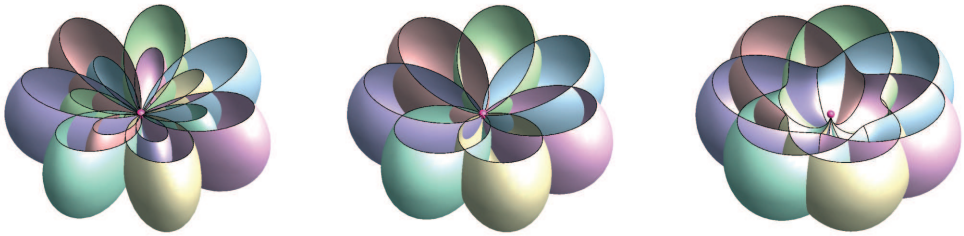

Figure: Three examples of generalized rose surfaces.

References

[1] S. GORJANC, E. JURKIN, Circular surfaces $\mathcal{CS}(\alpha, p)$. *manuscript*

[2] S. GORJANC, Rose Surfaces and their Visualizations.
Journal for Geometry and Graphics, **13** (1), 59–67 (2010).

[3] S. IZUMIYA, K. SAJI, N. TAKEUCHI, Circular Surfaces.
Advances in Geometry **7** (2), 295–313 (2007).