

# Design by planar and spatial PH B-Spline curves

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This talk deals with the recently introduced classes of planar and spatial Pythagorean Hodograph (PH) B-Spline curves. PH B-Spline curves are odd-degree, non-uniform, parametric B-Spline curves whose arc length is a B-Spline function of the curve parameter and can thus be computed explicitly without numerical quadrature. Thus, although Pythagorean-Hodograph B-Spline curves have fewer degrees of freedom than general B-Spline curves of the same degree, they offer unique advantages for computer-aided design and manufacturing, robotics, motion control, path planning, computer graphics, animation, and related fields. Further details about these curves can be found in [1, 2, 3].

After shortly reviewing their construction and main properties we address solutions to several curve design applications, including the design of a PH B-Spline curve closest to a given reference curve, the interpolation of point and second order Hermite data as well as the construction of almost rotation minimizing spatial PH B-Spline curves as spine curves of rational tensor product B-Spline pipe surfaces.

**Joint work with:** Carolina Beccari, Lucia Romani.

## References

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- [2] G. Albrecht, C.V. Beccari, L. Romani. Spatial Pythagorean-Hodograph B-Spline curves and 3D point data interpolation. *Computer-Aided Geom. Design*, 80, 101868, 2020.
- [3] G. Albrecht, C.V. Beccari, L. Romani.  $G^2/C^1$  Hermite interpolation by planar PH B-spline curves with shape parameter. *Applied Mathematics Letters*, 121, 107452, 2021.