UNIVERSITÀ DELLA CALABRIA

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE



Ph.D. programme in Mathematics and Computer Science

Title: Pythagorean hodograph curves

Speaker: Kai Hormann

Pythagorean-hodograph curves are characterized by the special property that their "parametric speed" — i.e., the derivative of the arc length with respect to the curve parameter — is a polynomial (or rational) function of the parameter. This distinctive attribute, achieved by a priori construction of the hodograph (derivative) components of polynomial or rational curves in the space as elements of Pythagorean (n+1)–tuples, endows the Pythagorean–hodograph (PH) curves with many computationally attractive features. In contrast to the traditional (Bézier/B–spline) schemes of computer-aided geometric design, the PH curve require models that are inherently non-linear in nature. However, by use of appropriate algebraic tools — complex numbers and quaternions for planar and spatial PH curves — their construction and analysis are greatly facilitated. The investigation of PH curves thus offers an excellent context and motivation for exploring the pervasive ties between algebra and geometry.