Generalized approximate implicitization with prescribed conditions

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Approximate implicitization is the process of determining an implicit form that matches a parametric representation as close as possible in some sense. In a discrete form, it has been numerically implemented by considering a least squares approach to a point cloud sampled from the original parametric variety. Examples of applications include approximating simple CAD geometries for the purposes of visualization, segmentation and supporting intersection computations. However, naive approaches to approximate implicitization do not necessarily preserve properties inherent in the geometry such as translational and rotational symmetries. In this talk we will show how approximate implicitization can be tailored to specific applications by imposing prior knowledge, such as known symmetries and interpolation conditions. The method will be illustrated by several examples and motivated by industrial applications.

Joint work with: Oliver Barrowclough, Georg Muntingh.

References

[1] T. Dokken. Aspects of intersection algorithms and approximation. *PhD thesis, University of Oslo*, 1997.

[2] O. Barrowclough. Approximate methods for change of representation and their applications in CAGD. *PhD thesis*, University of Oslo, 2012.

[3] A. Raffo, O. Barrowclough and G. Muntingh. A machine learning approach to reverse engineering based on clustering and approximate implicitization. Poster presented at *SIAM Conference on Industrial and Applied Geometry*, 2017. DOI: 10.13140/RG.2.2.20681.65125.