

**Dynamical study of plane curves in pieces of art:
an example for STEAM education in a technology-rich environment**

Th. Dana-Picard (JCT) and S. Hershkovitz (CET)

Architectural elements are built using geometric shapes, in 2D and 3D. In particular, rosettes (windows and vitrages on the main façade of monuments) use classical geometric constructions with compass and straightedge.

Joint usage of a Dynamical Geometry System (DGS) and a Computer Algebra System (CAS) allows building shapes that are more intricate. Such a construction appeals both to esthetic feeling and to mathematical understanding of plane curves. In general, these mathematical skills are developed in an undergraduate course devoted to Elementary Differential Geometry. Technological literacy grows together with them.

In various cultures, monuments have been built along the centuries according to the physical properties of certain plane curves and their generalization to 3D. New possibilities exist, based on a larger knowledge on curves and surfaces.

We will present some examples of plane curves and of their study, which can be used as basic elements for drawings, frescoes, paintings, etc. Some of them appear in existing monuments, other ones propose new ideas. The main example we will show is related to a map of the world from early Renaissance. The esthetic aspect is also an incitement to more mathematical study.

Finally we show a DGS based experimentation on the façade of a synagogue, which leads to the study of a "Witch of Agnesi".

References

Th. Dana-Picard and S. Hershkovitz (2017). Geometrical Features of a Jewish Monument: Study with a DGS, Preprint, submitted.

Th. Dana-Picard (2017). Automated study of a trifolium, Preprint, submitted.

R. Ferréol. <http://mathcurve.com>

A.A. Mazotti (2017). All Sides to an Oval, New York: Springer.