

Techniques of morphing to stimulate the teaching with technology Examples within the TI N'Spire environment and Cabri 3D

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Abstract

“Continuity” is one of the two principles underlying dynamic geometry software, the other one is “determinism” (Bernard Geneves phD 2004). We know that we cannot respect together both of these principles in a DGS. Nevertheless, developers of such software have always tried to respect these two principles in most of the cases that we can meet in working with such software. Everybody is now aware that continuity in dynamicity is the revolution in visualisation of mathematics (Dahan J.J., Modeling Cha Cha dance within the TI NSpire and Cabri environments, Time 2008) and now it is time to show to the teachers the richness of this principle to model “morphing” (transforming continuously connex objects onto other ones) when using DGS. This paper presents within the TI NSpire environment several techniques to morph for example :

1. some number onto another one, some polygons onto others or onto a circle
2. some curve of function onto another one, some parametric or polar curves onto other ones or onto polygons
3. some circle onto ellipses to model rotation in parallel perspective
4. some surface $z_i = f_i(x,y)$ or parametric surface onto another one in military perspective (Geometry application) or in central perspective (3D graphing tool)

Lots of other examples will be presented at all levels using the CAS part of the software such as the morphing of the intermediate Fourier sums onto the Fourier sum

or the morphing of a flag floating in the air

The secret of all the techniques used here is based on the proportionality and how to respect it in using dilation in geometry, and barycenter formulae in the CAS.

A survey of 3D examples under Cabri 3D will show the power of these techniques .

Finally, this paper aims to provide ideas to teachers for using technology to treat motivating problems needing necessarily technology (at all levels).