COMPUTABLE REPRESENTATION OF CONTINUOUS MOTION IN DYNAMIC GEOMETRY ENVIRONMENTS

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In compulsory education, geometry is presented as a model to organise the physical environment, including considerations on the motion of objects in space (through the geometric transformations). Besides, we use drawings to represent, at the same time, geometrical concepts and physical objects, and the dynamic geometry environments give us the possibility of moving the drawings on the screen. This feature is used to promote in students the construction of geometrical knowledge from exploration and conjecture activities (Laborde, 1998) and has consequences on the behaviour of the users and their reasoning style (Hölzl, 1996).

In this work we analyse to what extent the computational model of the geometry implemented in a dynamic geometry environment provides models for continuous physical motion. In particular, we go over the utility of dynamic geometry environments to simulate the motion of mechanical linkages, as this activity allows us to compare, by means of dynamic drawings, the computable representation of geometric properties with the real motion of a mechanism.

Analysing a simple example, we provide foundations for the particular behaviours observed in the motion of a picture on the screen, which require a subtle interpretation to be understood in a purely physical context. This approach allows us to go deeply into the particular relations existing between the different contexts that come into play: physical, geometrical and computational. In this way, we reflect on the new epistemological and didactic questions derived from the computable representation of the knowledge (Balacheff, 1994).

We consider this work to be a previous step to deduce didactic consequences on the students' perceptions of the moving drawings; in particular those concerning the uses of the dragging mode as a tool not only for automatic drawing of many instances of the same construction, but also to produce continuous motion.

References

Balacheff N. (1994). *Didactique et intelligence artificielle*. Recherches en Didactique des Mathematiques, Vol. 14, n. 1.2, pp. 9-42.

Hölzl R. (1996). *How does dragging affect the learning of geometry*. Int. Journal of Computers for Mathematical Learning 1, pp.169-187.

Laborde C. (1998). *Visual phenomena in the teaching/learning of geometry in a computer-based environment.* In Perspectives on the teaching of geometry for the 21st century. Mammana C., Villani V. Eds,. pp. 113-121. Dordrecht: Kluwer Acad. Pub.