Automated observation of properties of dynamic constructions

Zlatan Magajna, University of Ljubljana, Slovenia

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One of the essential features of dynamic geometry software is the ability to drag points and other objects. Dragging not only opens new ways of representing geometry concepts, but is also used for checking hypotheses. Given a dynamic construction, it is a common and efficient practice to check a geometric property by dragging - joined with visual perception or with measuring apparatus. If the considered property is not preserved under dragging it is certainly not a valid property of the construction, otherwise it reasonable to hypothesise that the property is true for the construction. Observing properties under dragging is an important step in learning concepts or learning to hypothesise, but there are also didactic situations where automated observation and detection of properties is reasonable. Perhaps the most relevant occurs in making up deductive (synthetic) proofs. In fact, such proofs can be considered as a combination of observed (hypothesised) properties organised into a deductive argumentation. Not being aware of certain properties of a construction may be an obstacle in developing the necessary deductions. Automated observation in this respect functions as a hypotheses production mechanism so that the student may focus on deductive argumentation. Automated observation may also serve for other purposes, for example as a generator of proof-oriented or construction exercises.

By automated observation of dynamic construction we understand automated search of measurement based properties, which are invariant under dragging. We shall present two aspects of automated observation of constructions: some mathematical and computational aspects and, even more important, some organisational aspects. The later are essential since automated observation 'sees' indeed many properties.

We shall illustrate the automated observation with a software program, OK Geometry. It detects properties of constructions made with some common dynamic geometry software programs.