AI based Pointer to Geometric Effects

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Abstract. The aim of this work is to rediscover one of TRIZ's best-known tools, the Pointer to geometric phenomena and effects. It is part of a large group of pointers that also includes that to physical effects, to chemical effects and to specific technologies. They were introduced by Altshuller as direct tools for solving a problem. Easy to use but difficult to construct, these tools largely remained on paper, with the exception of the pointer to physical effects, which instead has had numerous software implementations, including recent ones. Studies on the geometric one, on the other hand, are stuck in 1989, in the never-translated book by Vikentiev and Yefremov. The authors' work started from there, translating it from Russian, recovering what had already been done and developing it at its weakest points. In the absence of a rigorous theoretical basis, they worked on a definition of geometry and the nature of the relationship between the geometry of an element of the system and its functionality. The concept of multilevel shape and topology was introduced, and material was added to the list of pointers. For the construction of the libraries that enable the pointer to function, a systematic working methodology was developed that benefited from the latest text mining technologies, including large language model, named entity recognition, syntactic parsers, and others. These were appropriately combined to recognize design features and geometries from natural language documents taken from patents. In this paper we show both the methodological path to build the library and a demonstration of how to integrate libraries of geometric effects within dynamic pointers to existing physical effects.

Keywords: CAI - Computer Aided Innovation, AI - Artificial Intelligence, Problem-solving, Pointer to Physical Effects, Pointer to Geometric Effects, TRIZ, Patents.