

## Method and algorithms for fractal synthesis and 3D model visualization of physical objects

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A method and algorithms for the synthesis of models of physical objects with a given objective function are proposed. Fractal synthesis is used by scientists to solve various scientific problems [1, 2]. The novelty of the proposed method is the introduction into the process of a preliminary synthesis of a physical object, the author algorithms using fractal mathematics, gene mutations and parallel computations.

An experiment on the synthesis and 3D visualization of the energy storage device was carried out. For the analogue was taken Tesla device with a spherical capacity for the accumulation of electrical energy. In Fig. 1 presents the visualization of the process of mutations in the synthesis of new sketch solutions of the energy storage device.

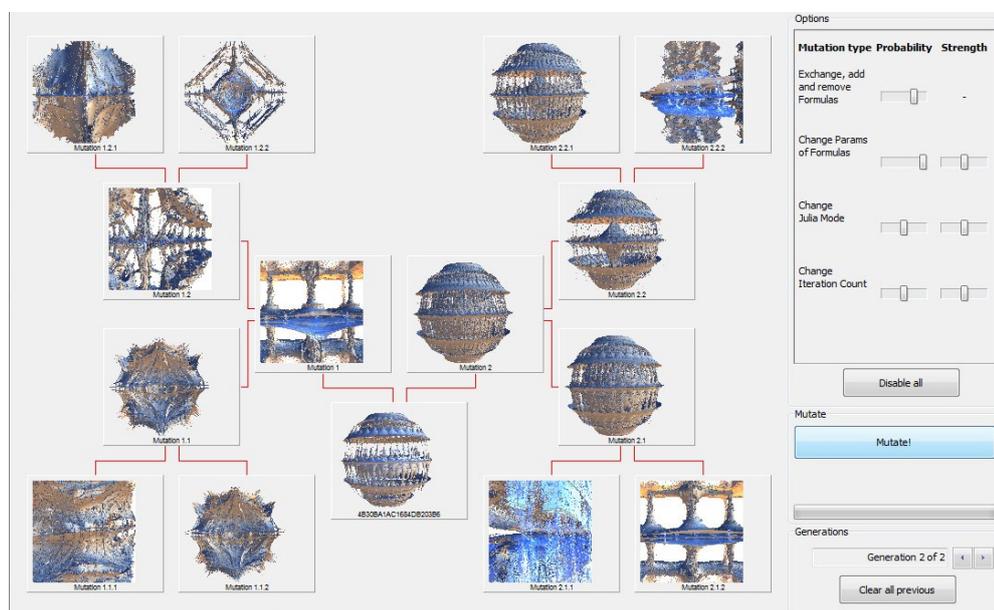


Fig.1. An example of mutations visualization in the synthesis of new sketch solutions of the energy storage device

If a solution is found after the mutation phase, you can begin calculating the details or scaling the resulting sketch. This may require a lot of computer time, and, perhaps, additional parallel computing. The algorithm of detailing consists in splitting the sketch model into sectors, each of which is calculated by a separate processor. In case the result of detailed elaboration does not suit the developer, you can repeat the procedure of the "gene mutation" to find a new solution.

As a result of the work of the developed algorithms, not ready, but sketchy 3D visualizations of design solutions of physical objects that require further classical refinement are obtained. This is, in fact, a method-creator, generating possible new scientific and engineering solutions.

### Sources

1. P. Polotti. Fractal additive synthesis. IEEE Signal Processing Magazine. 2007. Volume: 24. Issue: 2.
2. P. Waliszewski. Computer-Aided Image Analysis and Fractal Synthesis in the Quantitative Evaluation of Tumor Aggressiveness in Prostate Carcinomas. PMS. 2016; v6: 110. Published online 2016 May 9. doi: 10.3389/fonc.2016.00110. PMID: 27242954.