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Line graphs for fractals

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Fractals are very interesting and ubiquitous objects. One of methods which allow for a fractal construction is the Lindenmayer system [1]. For each analysed graph we construct its line graph [2]. Nodes in a line graph constructed for a given graph replace its edges, and two nodes in a new graph are connected if they have a common node in the original graph. The question we ask is if the obtained line graphs show fractal properties. In this case we should be able to find the Lindenmayer system which allows for the line graph construction.

In our earlier paper [3] some symmetric fractals were analysed in terms of the number of classes of nodes. Now, the method is applied for graphs and their line graphs constructed on fractals to compare their symmetry.

We have shown that line graphs constructed on fractal graphs demonstrate fractal properties. We found the related Lindenmayer systems and calculated the fractal dimension for a set of line graphs, which for all analysed examples is equal to the fractal dimension of original graphs. As the structure of cyclic and linear graphs and their line graphs is very similar, the related number of classes is also the same. This is no more true for higher order fractals. Also in this case pattern of a change of the number of classes with the graph size is not trivial. For the fractals analysed in this paper the number of classes is much lower than the number of nodes; this means that the ratio of the reduction of the system size when described by classes is high. This is due to the high symmetry of the considered examples.

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