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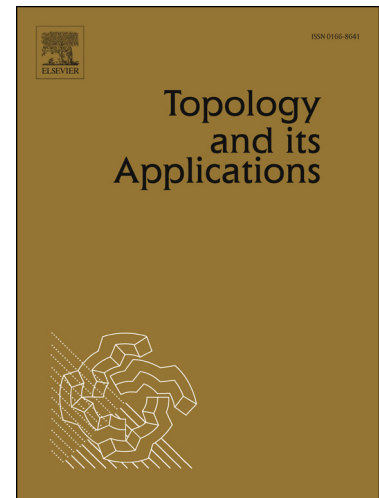
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# Mixed labyrinth fractals

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## Abstract

Labyrinth fractals are self-similar fractals that were introduced and studied in recent work [2, 3]. In the present paper we define and study more general objects, called *mixed labyrinth fractals*, that are in general not self-similar and are constructed by using sequences of *labyrinth patterns*. We show that mixed labyrinth fractals are dendrites and study properties of the paths in the graphs associated to prefractals, and of arcs in the fractal, e.g., the path length, and the box counting dimension and length of arcs. We also consider more general objects related to mixed labyrinth fractals, formulate two conjectures about arc lengths, and establish connections to recent results on generalised Sierpiński carpets.

## 1 Introduction

Labyrinth fractals are self-similar fractals that were introduced and studied by Cristea and Steinsky [2, 3]. In the present paper we deal with *mixed labyrinth fractals* that are a generalisation of the labyrinth fractals studied before [2, 3]. Mixed labyrinth fractals are fractal sets obtained by an iterative construction that uses labyrinth patterns, as described in Sections 2 and 3, and are in general not self-similar. We remind that generalised Sierpiński carpets [4, 5] studied some years ago were also defined with the help of patterns, and are in general not self-similar. There are recent results [11] on the topology of a class of self-similar Sierpiński carpets called *fractal squares*. In the case of the mixed labyrinth fractals, there are special restrictions on the patterns, that correspond to the properties of labyrinth sets [2, 3]. Labyrinth patterns have three properties, which we formulate in Section 3, with the help of graphs that we associate

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