

Abstract: This thesis focuses on fractal geometry with the aim of clearly presenting the fundamental concepts and principles of this branch of mathematics. The main topics include self-similarity, fractal dimensions (particularly box-counting and Hausdorff dimensions), measure theory (especially with emphasis on Hausdorff and Lebesgue measures), L-systems, iterated function systems (IFS), and Time Escape algorithms, particularly those related to Julia and Fatou sets.

The thesis is designed to accommodate readers of varying mathematical proficiency. Basic principles are explained in Chapters 1, 4, and 5, while Chapter 2 provides a detailed mathematical analysis of measure theory and dimensions. Practical aspects and algorithms used for fractal generation are described in Chapter 5, emphasizing general comprehensibility, allowing the reader to understand and apply the discussed methods without prior knowledge of a specific programming language.

An important part of this thesis are the illustrations created mainly in Ipe and using the accompanying fractal generation software developed for this thesis, which is available on GitHub.