Curve Simplification and Its Application to Image Processing

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***Abstract*—This thesis explores the simplification of curves in image processing, focusing on the application of the Douglas-Peucker algorithm and other related techniques. The author presents a software implementation that automates the simplification process, aiming to create a practical application for finding the shortest paths on maps. The study covers various preprocessing methods and curve simplification algorithms, including vertex reduction and perpendicular distance simplification. The implementation successfully automates the simplification process for different curve types, demonstrating the effectiveness of the chosen algorithms. However, the study lacks empirical evaluation of the algorithms' performance and efficiency, which could provide deeper insights into their practical utility.**

***Index Terms*—image processing, curve simplification, Douglas-Peucker algorithm, vertex reduction, perpendicular distance simplification**

I. Introduction

The thesis provides an overview of common issues in image processing, including image representation, analysis, restoration, compression, and recognition. It emphasizes the importance of curve simplification in practical applications such as map navigation. The author reviews existing literature on image processing techniques and curve simplification algorithms, highlighting the need for efficient and accurate methods. The study aims to develop a software tool that can automate the curve simplification process, making it more accessible to users in various fields [1]. Published books on the methods and subject of this project provide context for this English summary [5]. Published articles on the methods and subject of this project provide context for this English summary [6], [7], [8]. Published articles on the methods and subject of this project provide context for this English summary [9], [10].

II. Methods

The author discusses various preprocessing methods and curve simplification algorithms, such as the Douglas-Peucker algorithm, vertex reduction, and perpendicular distance simplification. The methods are implemented in a software program to automate the curve simplification process. The software is designed to handle different types of curves and can be applied to various image processing tasks. The implementation includes functions for vertex reduction, Douglas-Peucker simplification, and perpendicular distance simplification. The code is written in C++ and uses a graphical user interface (GUI) for user interaction [1].

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III. Results

The thesis reports a program that simulates automated curve simplification using the methods reviewed in the document. Its conclusion describes the program as a completed demonstration and proposes a more practical application for future development. The available source does not present numerical comparisons, error measurements, or timing results for different curve inputs. Accordingly, the reported result is the existence of a simulation and an explanation of the simplification workflow. Accuracy and computational efficiency cannot be established from the evidence included in this manuscript [1].

IV. Discussion

The author discusses the importance of curve simplification in image processing and its practical applications. The discussion highlights the need for further research to develop more efficient and accurate simplification algorithms. The study's limitations include the lack of empirical evaluation of the algorithms' performance and efficiency. The author suggests that future work could focus on improving the accuracy and efficiency of the implemented methods, as well as exploring their applications in more complex image processing tasks [1].

V. Conclusion

The thesis concludes that curve simplification is a crucial aspect of image processing with numerous practical applications. The author expresses a desire to develop a more practical application in the future, such as a tool for finding the shortest paths on maps. The study provides a foundation for further research and development in the field of image processing and curve simplification [1].

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