Approximation of Functions and Applications

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***Abstract*—This thesis focuses on the approximation of functions and its applications, particularly in scenarios where functions are given as discrete data or complex analytical expressions. The author explores various methods such as polynomial interpolation, uniform approximation, least squares approximation, and rational function approximation. The study includes the implementation of a program to apply these methods, using tools like MATLAB and Simulink. The author acknowledges the limitations due to time constraints and limited knowledge in the field, noting that the exact performance metrics of the implemented methods are not provided. The research suggests further exploration of function approximation methods and their practical applications in real-world problems.**

***Index Terms*—function approximation, interpolation, least squares, spline, numerical methods, MATLAB**

I. Introduction

Real-world problems often involve high-complexity issues, making exact solutions impractical. Approximation algorithms provide near-accurate solutions with minimal error, making them suitable for practical applications. The thesis aims to study various function approximation methods and their applications, especially in fields like surveying and meteorology where discrete data are common. The author notes that the study is limited by time constraints and a lack of in-depth knowledge in the field, which may affect the accuracy and completeness of the research [1]. Published books 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 thesis covers several approximation methods, including polynomial interpolation (Lagrange and Newton), spline interpolation, and least squares approximation. The author also discusses the implementation of a program to apply these methods, using tools like MATLAB and Simulink. The methods are described in detail, with the author providing theoretical foundations and practical examples. However, the exact performance metrics of the implemented methods are not provided, and the author acknowledges the limitations due to time constraints and limited knowledge [1].

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III. Results

The results include the implementation of a program that applies various approximation methods, but the exact performance metrics are not provided. The author describes the implementation of polynomial interpolation, spline interpolation, and least squares approximation, but does not report any measured evaluation or performance data. The author notes that due to time constraints and limited knowledge, the research may contain errors and limitations [1].

IV. Discussion

The author discusses the limitations of the study, noting that due to time constraints and limited knowledge, the research may contain errors. The study suggests further research into function approximation methods and their applications to solve real-world problems. The author emphasizes the need for more in-depth exploration of these methods and their practical applications, particularly in fields like surveying and meteorology where discrete data are common [1].

V. Conclusion

The thesis concludes that the study has successfully explored various function approximation methods and their applications, but acknowledges the need for further research to improve the methods and their practical applications. The author suggests that more in-depth research is needed to address the limitations and improve the accuracy and completeness of the methods. The study provides a foundation for future research in function approximation and its applications in real-world problems [1].

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