Project 1 FYS3150

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I. INTRODUCTION

One of the most versitile tools in modern science is numerical integration, thus it it simportant to understand its limits. In this paper we have performed numerial integration of a second order differential equation. This was done by discretizing the differential equation, and formulating it as a matrix-vector equation. The matrix-vector equation was then solved using both a general, and specialzed Thomas algorithm, as well as LU-decomposition. T

II. FORMALISM

III. IMPLEMENTATION

IV. ANALYSIS

A. Relative error for Thomas' algorithms

$\log_{10}(h)$:	ϵ general algorithm	ϵ special algorithm	N
$-1.041\,393$	$3.026\,200 \times 10^{-1}$	$3.601\,314 \times 10^{-1}$	10^1
$-2.004\,321$	$3.426\,303 \times 10^{-2}$	$4.249\,885 \times 10^{-2}$	10^2
$-3.000\,434$	$3.474\,750 \times 10^{-3}$	$4.338\,587 \times 10^{-3}$	10^3
$-4.000\,043$	$3.479\,720 \times 10^{-4}$	$4.347\,831 \times 10^{-4}$	10^4
$-5.000\,004$	$3.480\,179 \times 10^{-5}$	$4.348\,760 \times 10^{-5}$	10^5
$-6.000\,000$	$4.210\,129 \times 10^{-6}$	$4.348\,746 \times 10^{-6}$	10^6
$-7.000\,000$	$1.005\,169 \times 10^{-6}$	$4.343\,971 \times 10^{-7}$	10^7
$-8.000\,000$	$-1.140\,500 \times 10^{-3}$	$3.765\,295 \times 10^{-8}$	10^8

Table I. Table with $\log_{10}$ of relative error for general and special Thomas' algorithms, and $\log_{10}$ of step size h

V. CONCLUSION

Appendix A: Source code

All code for this report was written in C++ and Python 3.8, and the complete set of files can be found at https://github.com/FunkMarvel/FYS3150_Project_1.git