Team Project Outline in LaTeX Template

First1 Last1 First2 Last2 First3 Last3

Abstract

It is of common practice to write an abstract that quickly tells readers what this paper is about and what major findings you have. An abstract should be one paragraph in length. Do not go off topic. An abstract should attract someone to read your paper. Avoid technical jargon and an abundance of symbols.

1 Introduction

A section briefly introduces the background and purpose of this paper.

2 Methods in this study

Show the methods that you're studying in this term paper. For example, you can write some subsections as follows to explain the difference scheme of each method, its complexity, local truncation error, etc.

2.1 Runge-Kutta method

This is a subsection about RK2 and RK4 methods.

2.2 Predictor-Corrector method

This is a subsection about RK2 and RK4 methods.

We consider the Adams 4th-order Predictor-Corrector method which uses the Adams-Bashforth 4-step explicit method for prediction and Adams-Moulton 3-step implicit method for correction. With initial value $w_0 = \alpha$, suppose we first generate w_1, w_2, w_3 using RK4 method. Then for $i = 3, 4, \ldots, N-1$:

- Use Adams-Bashforth 4-step explicit method to get a predictor $w_{i+1,p}$:

$$w_{i+1,p} = w_i + \frac{h}{24}[55f(t_i, w_i) - 59f(t_{i-1}, w_{i-1}) + 37f(t_{i-2}, w_{i-2}) - 9f(t_{i-3}, w_{i-3})] \quad (1)$$

- Use Adams-Moulton 3-step implicit method to get a corrector w_{i+1}:

$$w_{i+1} = w_i + \frac{h}{24}[9f(t_{i+1}, w_{i+1,p}) + 19f(t_i, w_i) - 5f(t_{i-1}, w_{i-1}) + f(t_{i-2}, w_{i-2})] \quad (2)$$

The output of iteration i is w_{i+1} after prediction step (1) and correction step (2).

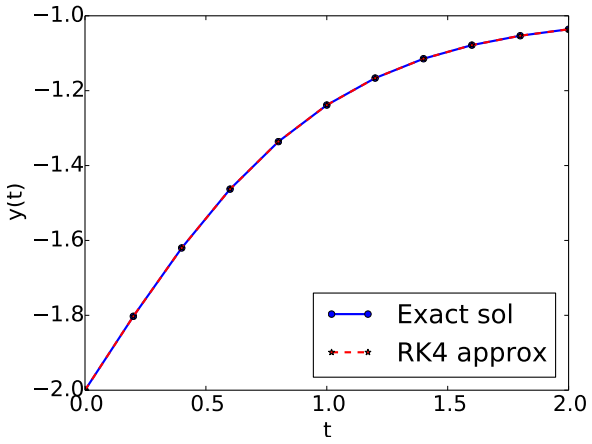

Figure 1: This is an example plot of RK4 on a test problem.

3 Numerical experiments

You will need to demonstrate the performance of the methods on several (ideally 3 to 5) example IVPs (of your own choice). You can choose some problems from textbook, but make sure that you explicitly state what the problem you chose for each test.

To show the performance, it is often better to use figures rather than tables (unless there are very few numbers to show). For example, you can show the result of RK4 using Figure 1. If you have multiple results, you can plot each with a curve (in different color/line-style/marker type) in the plot. If they are too close, you can consider to plot $|w_i - y_i|$, the error of estimate w_i to true solution $y_i = y(t_i)$, instead of actual y_i and w_i. This way, you can see which methods have lower errors (higher accuracy).

4 Discussion

This is a major part for this project. It should constitute your findings and thoughts. Based on the tests you have, you want to comment on the performance of these methods and how would you suggest to use in practice. Have extensive discussions with your team members and give detailed reasonings for your claims. You can cite books, papers, or other resources, such as [1]. "References" part below should show (only) those you cited in the main paper.

5 Summary

A quick summary to conclude the term paper using a paragraph or two.

References

[1] R. L. Burden and J. D. Faires. *Numerical Analysis 9th edition*. Boston, MA: Brooks/Cole, 2011.