

Project 1 FYS3150

Anna Stray Rongve

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Abstract

Introduction

Theory and technicalities

Conclusion and perspectives

Project 1 a)

For $i = 0$ and $i = n$ the boundary conditions gives us $v(0) = v(1) = 0$.

For $i = 1$

$$-\frac{v_2 + v_0 - 2v_1}{h^2} = f_1$$

For $i = 2$

$$-\frac{v_3 + v_1 - 2v_2}{h^2} = f_2$$

For $i = n - 1$

$$-\frac{v_n + v_{n-2} - 2v_{n-1}}{h^2} = f_{n-1}$$

If you multiply both sides by h^2

$$-v_2 + v_0 - 2v_1 = h^2 \cdot f_1$$

$$-v_3 + v_1 - 2v_2 = h^2 \cdot f_2$$

$$-v_n + v_{n-2} - 2v_{n-1} = h^2 \cdot f_{n-1}$$

Which you can rewrite as a linear set of equations where

$$A = \begin{bmatrix} 2 & -1 & 0 & & & 0 \\ -1 & 2 & -1 & 0 & & \\ 0 & -1 & 2 & -1 & 0 & \\ \vdots & \vdots & \ddots & \ddots & \ddots & \vdots \\ 0 & & & -1 & 2 & -1 \\ 0 & & & 0 & -1 & 2 \end{bmatrix}$$

$$\hat{v} = \begin{bmatrix} v_1 \\ v_2 \\ v_3 \\ \vdots \\ v_{n-1} \end{bmatrix}$$

$$\text{and } \tilde{b}_i = \begin{bmatrix} \tilde{b}_1 \\ \tilde{b}_2 \\ \tilde{b}_3 \\ \vdots \\ \tilde{b}_{n-1} \end{bmatrix}$$

Where $\tilde{b}_i = h^2 \cdot f_i$

Project 1 b)

Appendix

Bibliography