Galerkine methods for the 1D Helmholtz equation

An introductory example

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October 3, 2025

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The Helmholtz equation

Bla

Our problem

We will consider the following complex-valued problem:

Our 1D Helmholtz problem

$$\frac{\mathrm{d}^2 u}{\mathrm{d}x^2} + k^2 u = 0 \ \text{ in } \ ]0,1[$$

$$u(0) = ik$$

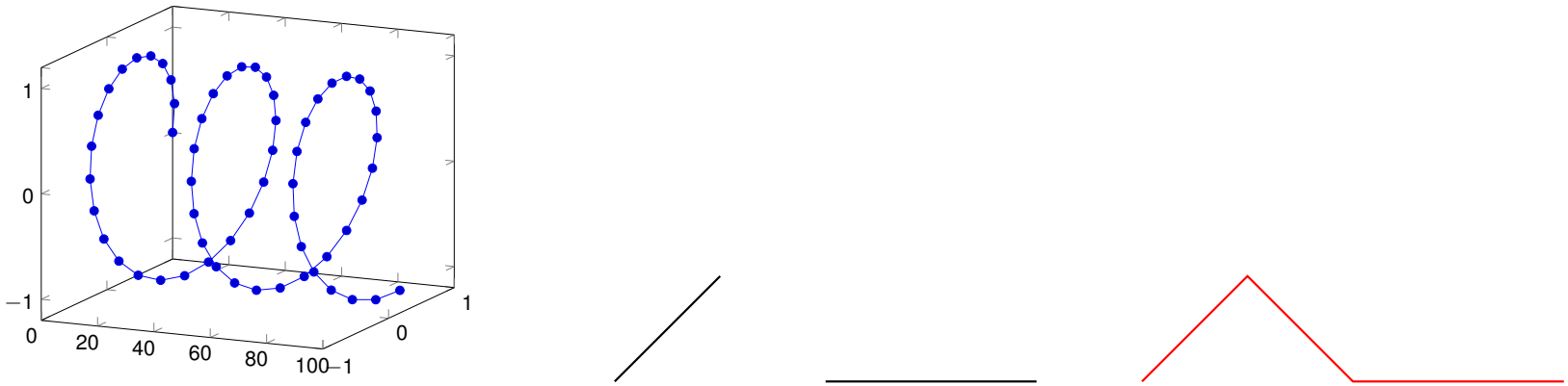
$$u(1) = iku(1)$$

The exact solution

The problem can be solved by seperating the real and imaginary parts and using first year real analysis results (linear partial differential equations of order 2). This yields the unique solution thus defined:

The exact solution

$$\forall x \in [0,1],\ u(x) = e^{ikx}$$



(a) First subfigure

(b) Second subfigure

Figure: A figure

A beamer style for CS x Greenwich

Getting started

```
\documentclass{beamer}
\usetheme{cs}
```

Commands

- `\logocstext[<scale>]`
  displaying the CentraleSupélec logo with text

- The logo is scaled to fixed height
- `\timestamp`
  displaying compilation date

2025-10-3 18:36

Commands

- `\logogretext[<scale>]`
  displaying the University of Greenwich's logo with text
  

- The logo is scaled to fixed height

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Plain frame

This feels empty...

Example slide 0

Block

Sample text in a normal block. Alerted text.

Alert block

Sample text in an alert block

Example

Sample text for an example

Example slide 1

We compute the matrix of outputs as[1]:

$$\text{Attention}(Q, K, V) = \text{softmax}(\frac{QK^T}{\sqrt{d_k}})V$$

[1] Ashish Vaswani et al. *Attention Is All You Need*. June 2017. arXiv: 1706.03762

Example slide 2

Header 1	Header 2	Header 3
Cell 1-1	Cell 1-2	Cell 1-3
Cell 2-1	Cell 2-2	Cell 2-3
Cell 3-1	Cell 3-2	Cell 3-3

Table: A Simple Table

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Bibliography I


Vaswani, Ashish et al. *Attention Is All You Need*. June 2017. arXiv: 1706.03762.