Contents

0.1 Introduction

In that report, we purpose a simple method to solve the heat equation in the first case, and the convection equation in the second step. We create a Python package in order to brings together some commands to solve in 1 and 2 dimensional case these equations.

0.2 Heat equation

0.2.1 One dimensional case

Here we want to solve the heat equation in the one dimensinal case. We define the heat equation (HE) by :

$$\frac{\partial T}{\partial t} = \kappa \frac{\partial T}{\partial x}$$

with κ the diffusion coefficient. This coefficient can be define by the component of the bar. we can vary the characteristics of the bar but we will choose to take an aluminum bar with the following data :

$$\kappa = \frac{\lambda}{\rho C_p}$$

ρ $[Kg.m^{-3}]$	C_p $[J.K^{-1}.Kg^{-1}]$	λ $[W.m^{-1}.K^{-1}]$
2700	900	22

We are using here the finite difference method so wo define the following approximation :

$$\frac{\partial T}{\partial t} \approx \frac{T_{i,j}^{t+1} - T_{i,j}^{t}}{dt}$$

$$\frac{\partial T}{\partial x} \approx \frac{T_{i+1,j}^{t} - T_{i,j}^{t}}{dx}$$

So we obtain :

$$T_{i,j}^{t+1} = T_{i,j}^{t} + \frac{\kappa dt}{dx} \left(T_{i+1,j}^{t} - T_{i,j}^{t} \right)$$

0.2.2 Results

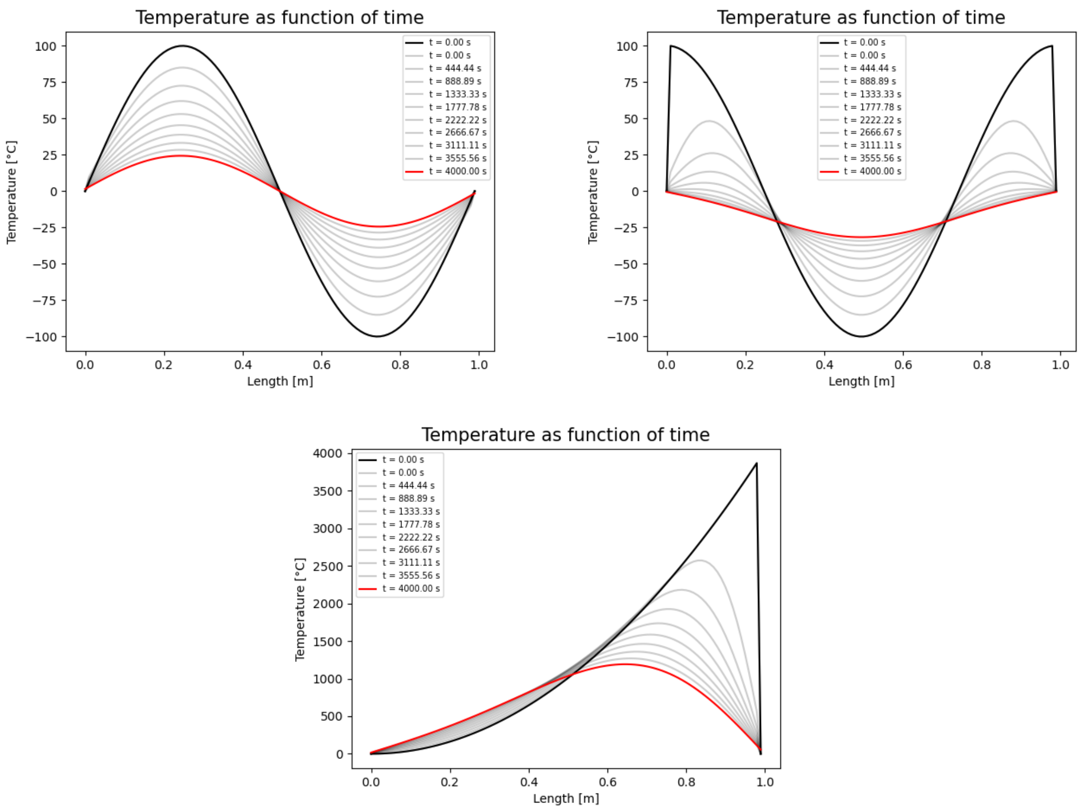

Figure 1: **Top left** : Sinus, **Top right** : Cosinus, **Bottom** : x^2