Quadratic

$$\frac{U_{t,x} - U_{t-1,x}}{\mathrm{dt}} + \frac{U_{t,x}\,(U_{t,x} - U_{t,x-1})}{\mathrm{dx}} = 0 \tag{1}$$

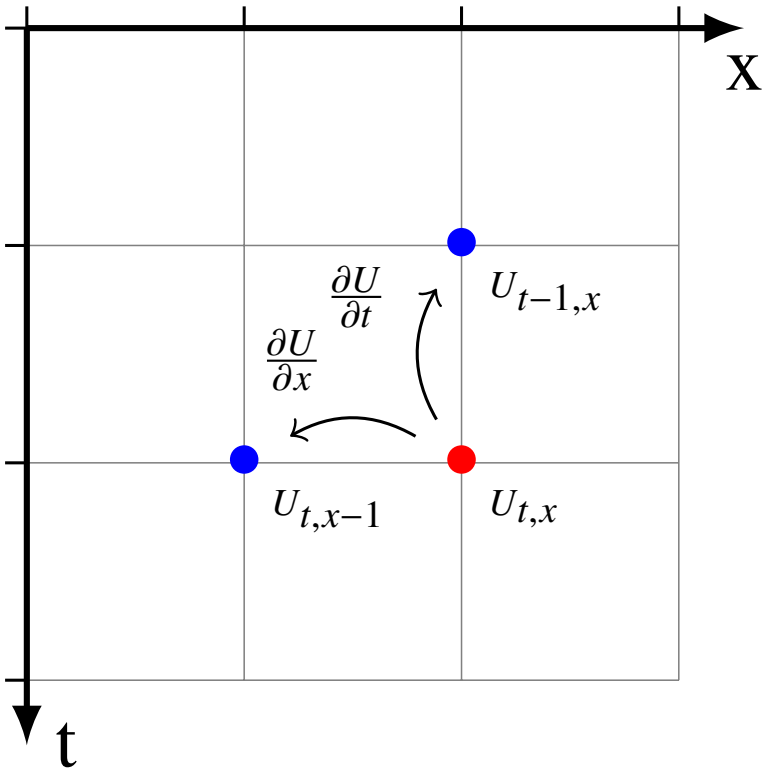
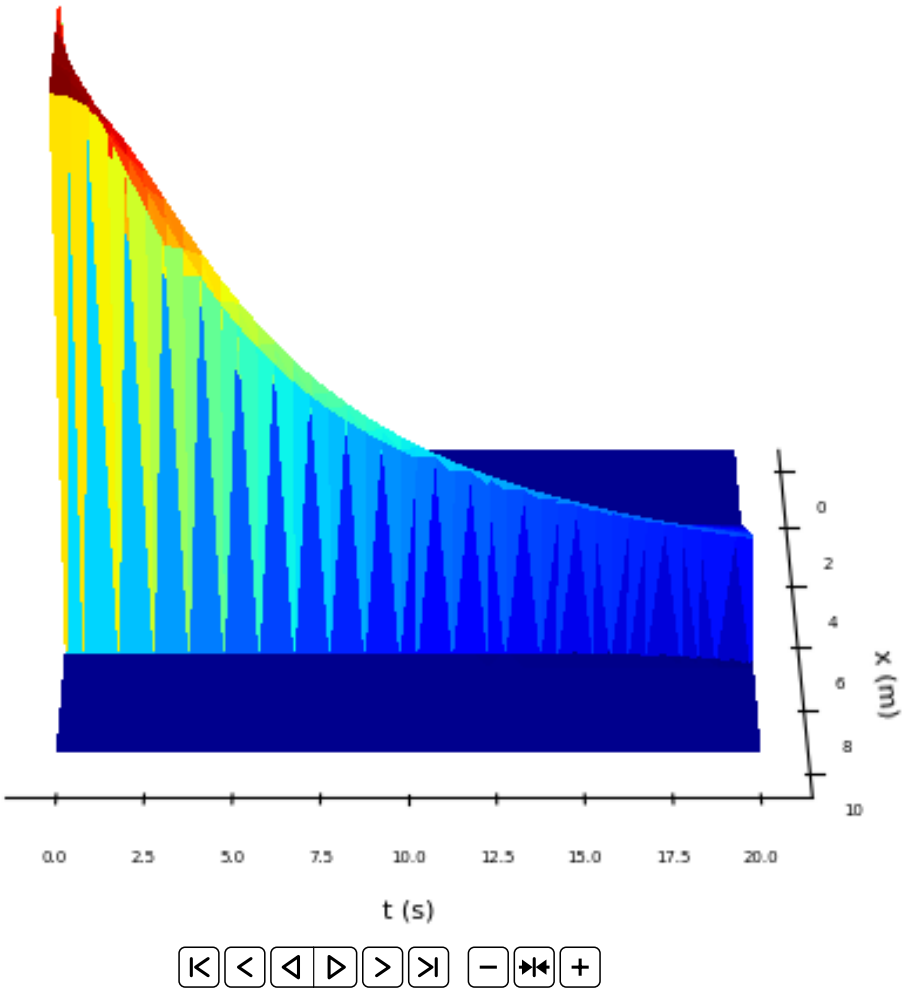


Figure 1: Quadratic Approach Derivative


0
2
4
6
8
10
x (m)
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
t (s)

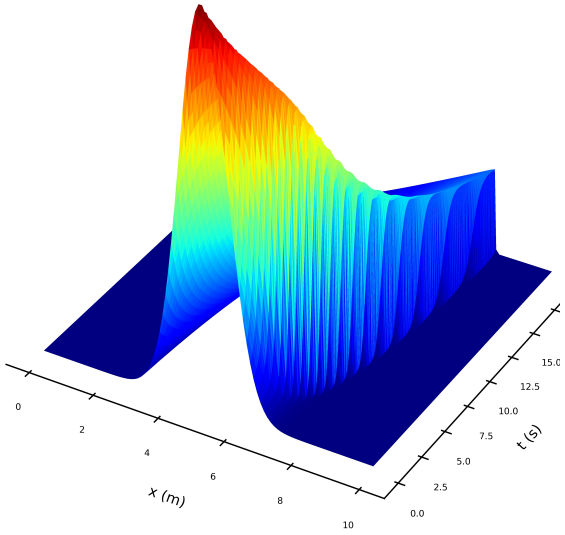


Figure 2: Linear Approach

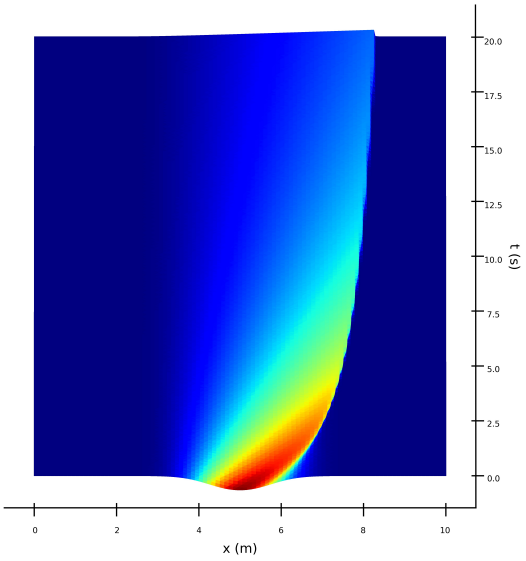


Figure 3: Linear Approach

Linear 1

$$\frac{U_{t,x} - U_{t-1,x}}{\mathrm{dt}} + U_{t,x}\frac{(U_{t-1,x} - U_{t-1,x-1})}{\mathrm{dx}} = 0 \tag{2}$$

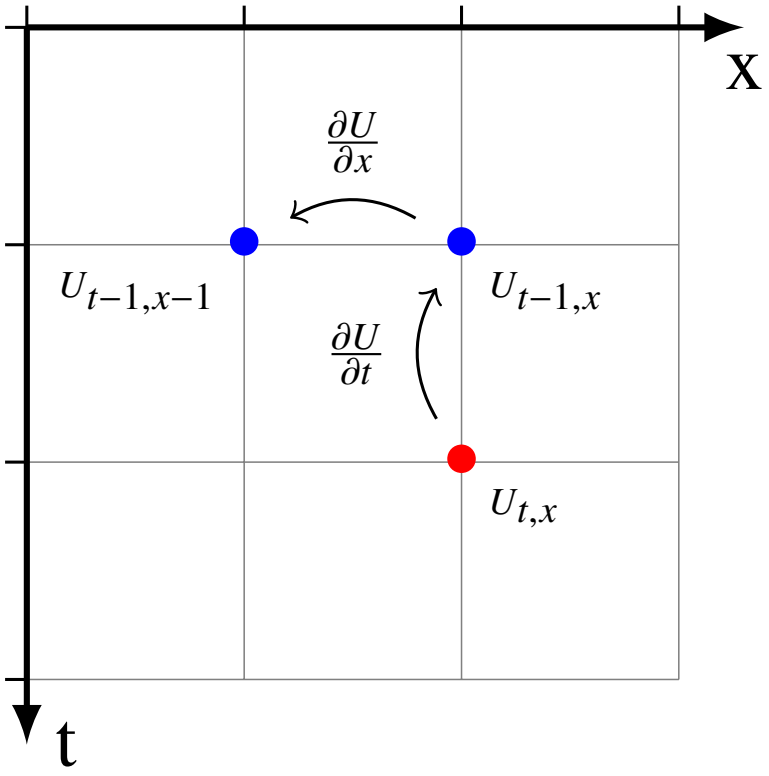


Figure 4: linear Approach Derivative

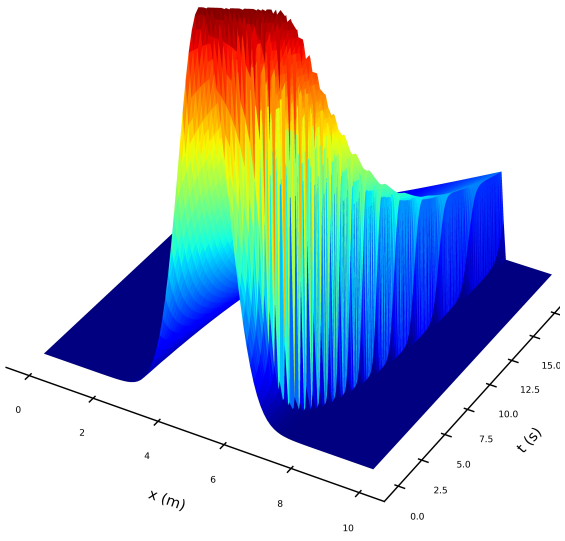


Figure 5: Linear Approach

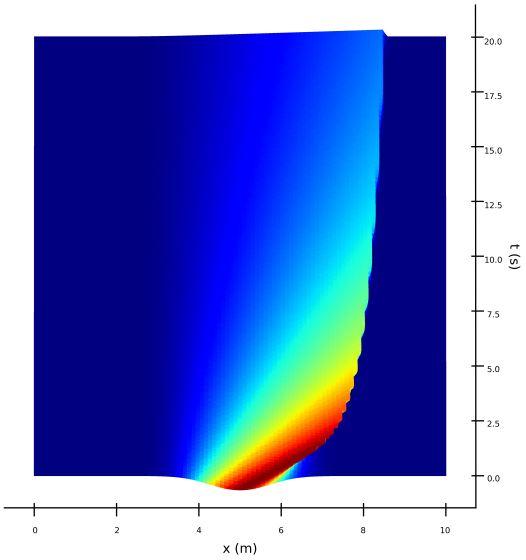


Figure 6: Linear Approach

Linear 2

$$\frac{U_{t,x} - U_{t-1,x}}{\mathrm{dt}} + U_{t-1,x}\frac{(U_{t-1,x} - U_{t-1,x-1})}{\mathrm{dx}} = 0 \tag{3}$$

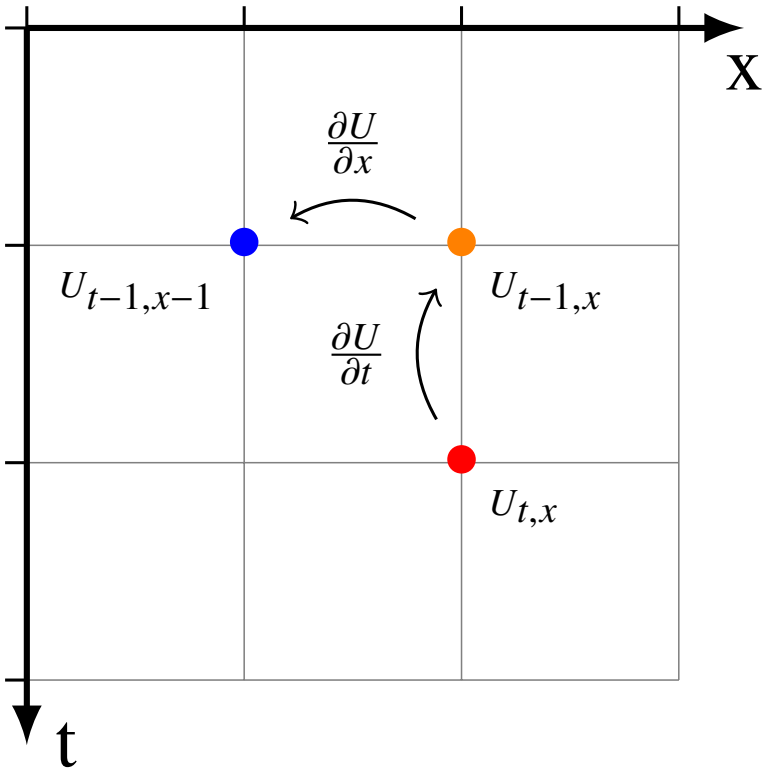


Figure 7: linear Approach Derivative

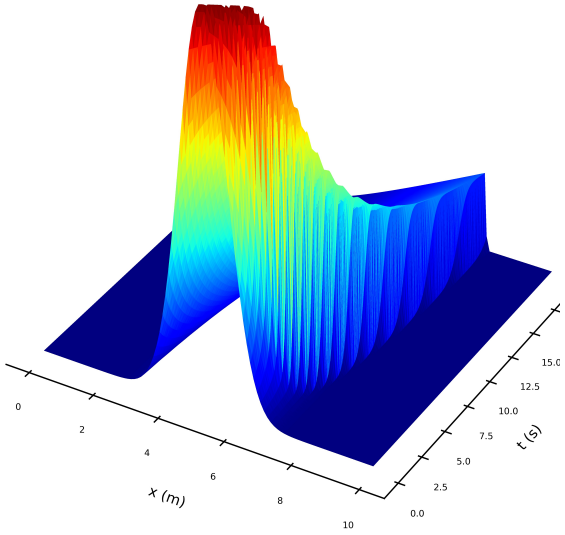


Figure 8: Linear Approach

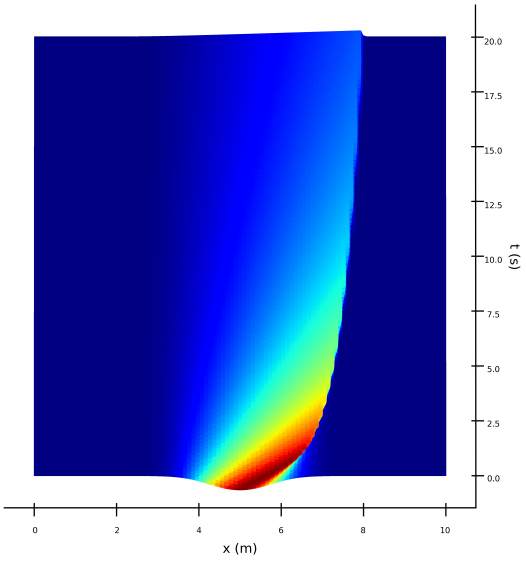


Figure 9: Linear Approach

Linear 3

$$\frac{U_{t,x} - U_{t-1,x}}{\mathrm{dt}} + U_{t-1,x}\frac{(U_{t-1,x+1} - U_{t-1,x-1})}{2\mathrm{dx}} = 0 \tag{4}$$

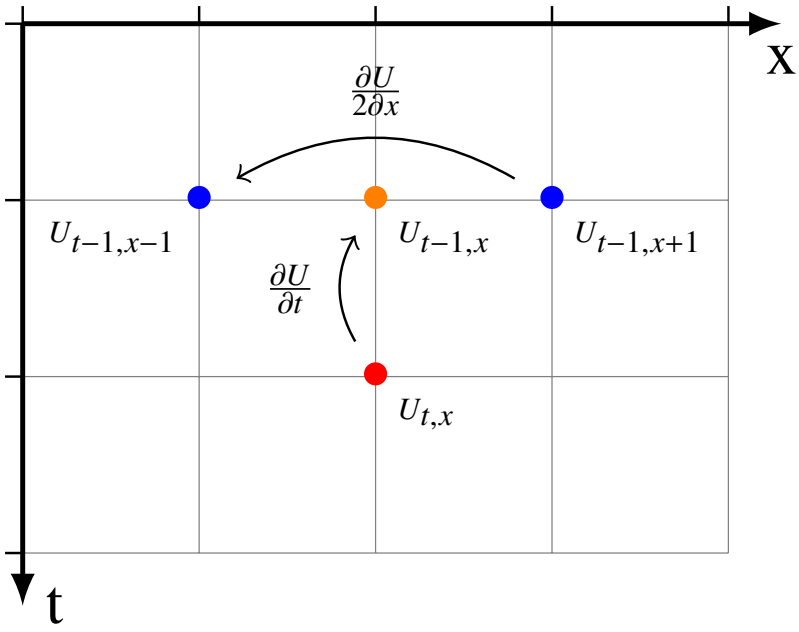


Figure 10: linear Approach Derivative

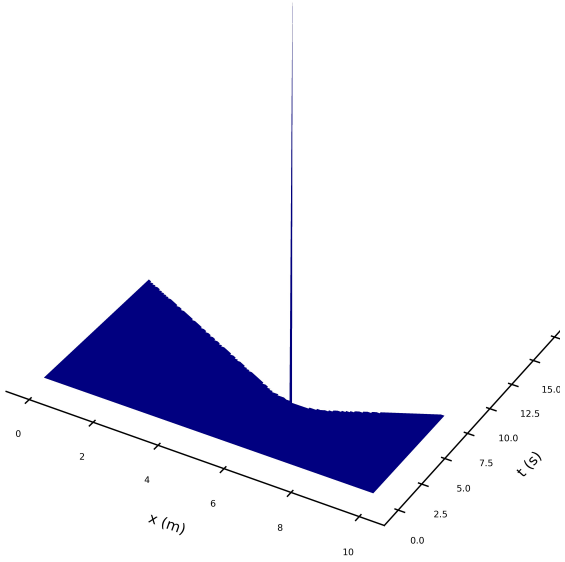


Figure 11: Linear Approach

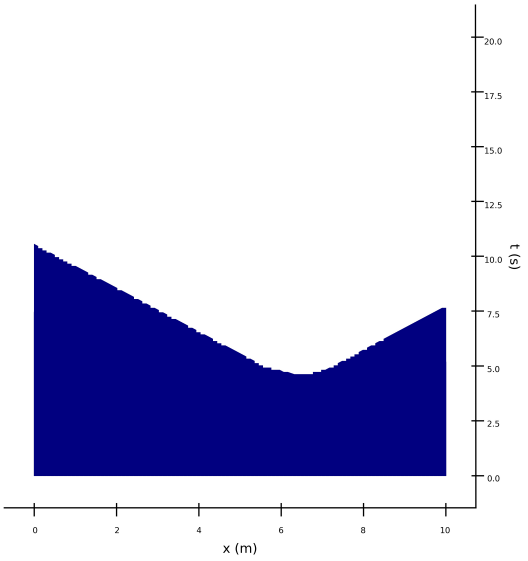


Figure 12: Linear Approach

Linear 4

$$\frac{U_{t,x} - U_{t-1,x}}{\mathrm{dt}} + U_{t,x}\,\frac{(U_{t-1,x+1} - U_{t-1,x-1})}{2\mathrm{dx}} = 0 \tag{5}$$

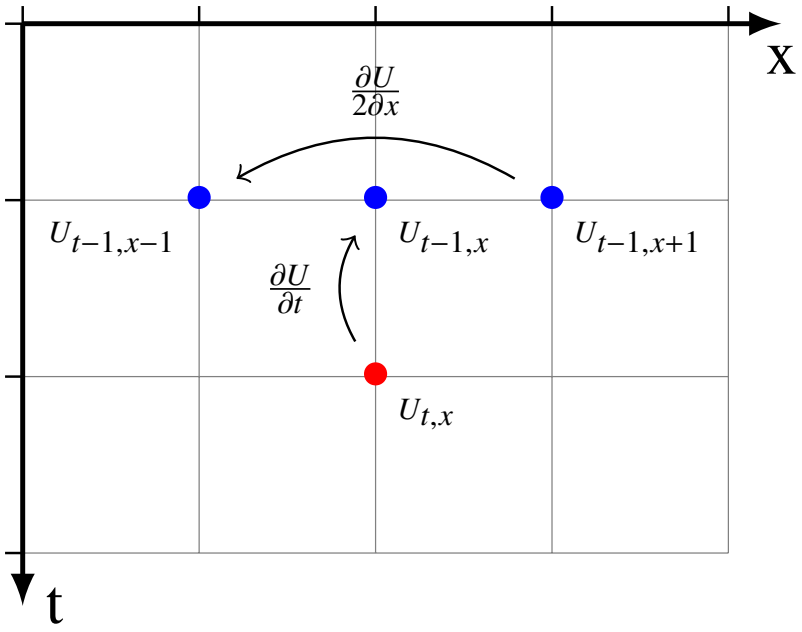


Figure 13: linear Approach Derivative

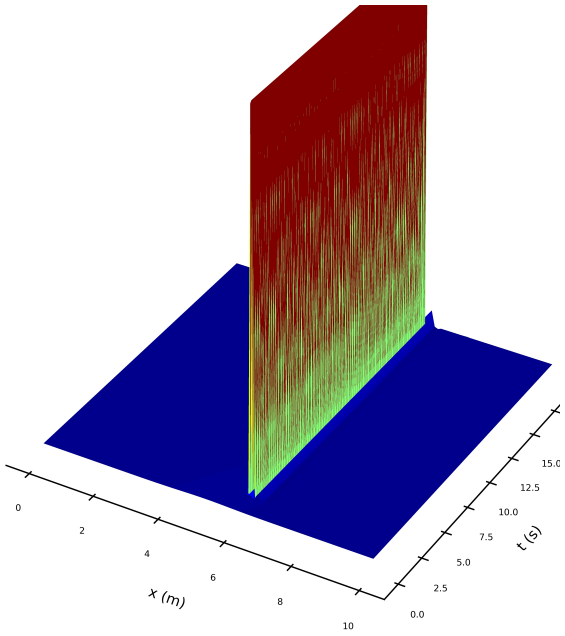


Figure 14: Linear Approach

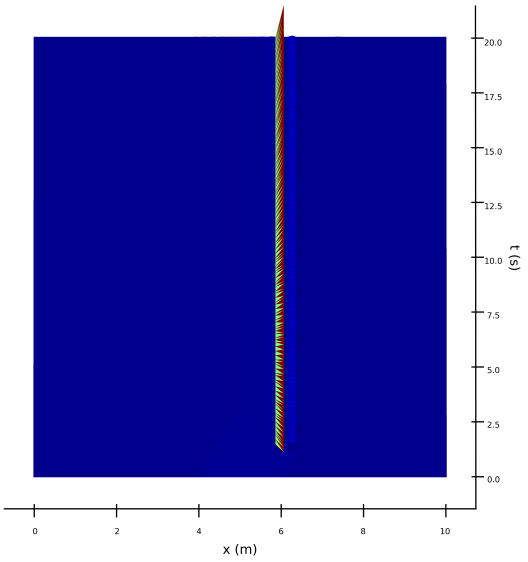


Figure 15: Linear Approach

Linear 5

$$\frac{U - U_t}{\mathrm{dt}} + \frac{U_t\,(U - U_x)}{\mathrm{dx}} = 0 \tag{6}$$

$$U = \frac{U_t\,\mathrm{dx} + U_t\,U_x\,\mathrm{dt}}{\mathrm{dx} + U_t\,\mathrm{dt}} \tag{7}$$