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Ue: (U_{xx} for $0 \leq x \leq 1m$, $0 \leq t \leq 0.1$ day $\Delta x = 0.2_m$

$U_t = C U_{xx}$

Initial condition

$U(x,0) = x^4 k = f(x)$

Boundary conditions

$U(0,t) \; 0 \; (---) > U(1,t) = 1k$

at $t = 0$

$U_{0,0} = 0^2 k$ when $x = 0.4$, $U_{2,0} = (0.4)^4$

$= 0.0256$

when $x > 0.8$; $U_{4,0} = (0.8)^4$

$= 0.4096$

when $x = 0.2m$ when $x = 0.6m$ when $x = 1$

$U_{1,0} = (0.2)^4$ $U_{3,0} = (0.6)^4$ $U_{5,0} = 1^4$

$= 0.0016$ $= 0.1296$ $= 1$

1) $U_t = (U_{xx} \; x = 0$

$U_b = (U_{=xx}$

$\frac{dy}{dt} = C\frac{dy}{dx}$ for $0 \leq x \leq 1$

$0 \leq t \leq 0.1$ day

Initial Condition

$U \leq x, U) = x^4 k \; t = 0$ $\S$ $0 \leq x \leq 1$

Bc

$u(0,t) = 0$ k

$u(1,t) = k$

$0 < t \leq 0.1$ day

$$u_{i,j+1} - u_{ij} = \frac{c\Delta t}{\Delta x^2}\left[\frac{u_{i+1} - 2u_{ij} + u_{i-j}}{\partial e^2}\right]$$

$$u_{e,i+1} - u_{ij} = \frac{c\Delta t}{\Delta x^2}\left[u_{i+1,j} - 2u_{ij} + u_{i-1,j}\right]$$

$$\frac{c\Delta t}{\partial x^2} = 0$$

$$u_{i,j+1} - u_{i,i} = [(u_{i+j} - 2u_{nij} - u_{i-ii})$$

$$u_{i,j+1} - r(u_{i+1} - 2u_{ij} + u_{i+1,j}) + u_{i,j}$$

$$u_{j,j+1} = [u_{i+1,j} + (1-2r)u_{iuj} + u_{ji,j})$$

$$r = (\Delta t/\Delta x^2) \quad \frac{1 \times 0.02}{(0.2)^2} = \frac{0.02}{0.04} = 0.8$$

from the equation

$$u_{i+j} = u_{ij} + r[u_{i+1,j} - 2u_{ij} + u_{j-1,j}]$$

at $j = 0$

$$u_{i+1} = u_{i,0} + r(u_{2,0} - 2u_{i,0} + u_{2,0}]$$

$$= 16 \times 10^{-3} + 0.5\,[0.0256 - 2(1.6 \times 10^{-3}) + 0]$$

$$u_{1,1} = 0.0128$$

$$i+1 = 2$$

$$u_{2,1} = u_{2,0} + r[u_{3,0} - 2u_{2,0} + u_{1,0}$$

$= 0.0250 + 0.5[0.1296 - 2[0.0256] + 1.6 \times 10^{-3}]$

$u_{2,1} = 0.0656$

$i+1 = 3$

$u_{3,1} = u_{3,0} + r[u_{4,0} - 2u_{3,0} + u_{2,0}$

$= 0.1296 + 0.5[0.4096 - 2[0.1896] + 0.0256]$

$u_{3,1} = 0.2176$

$i+1 = 4$

$u_{4,1} = u_{4,0} + r[u_{5,0} - 2u_{4,0} + u_{3,0}]$

$= 0.4096 + 0.5[1 - 2[0.4096 + 0.1296]$

$u_{4,1} = 0.5948$

at $j = 1$

$u_{i,2} = u_{i,1} + r[u_{i+1,j} - 2u_{i,1} + u_{i-1,1}]$

at $i = 1$

$u_{1,2} = u_{1,1} + 5[u_{2,1} - 2u_{1,1} + u_{0,1}]$

$= 0.00123 + 0.5[0.0656 - 2[0.0128] + 0]$

$u_{1,2} = 0.0328$

at $i = 2$

$u_{2,2} = u_{2,1} + r[u_{3,1} - 2u_{2,1} + u_{1,1}]$

$= 0.0656 + 0.5[0.2176 - 2[0.0656] + 0.0128]$

$= 0.1152$

at $i = 3$

$u_{3,2} = u_{3,1} + r[u_{4,1} - 2u_{3,1} + u_{2,1}]$

$= 0.2176 + 0.5[0.3648 - 2(0.21767 + 0.0656$

4

$u(3,2) = 0.3152$

at $i = 4$

$u_{4,2} = u_{4,1} + r[u_{5,1} - 2u_{4,1} + u_{3,1}]$

$= 0.5648 + 0.5[1 - 2(0.5648) + (0.2176)$

$= 0.6088$

$\Rightarrow \delta = 2$

$u_{i,3} = u_{i,2} + \sigma[u_{i+1,} 2u_{i,2} + Bi-1]$

at $i = 1$

$u_{i,3} = u_{1,2} + \sigma[u_{2,2} - 2u_{1,2} + u_{0,2}]$

$= 0.0378 + 0.5[0.1152] - 2[0.0318] + 0$

$= 0.0576$

at $i = 2$

$u_{2,3} = u_{2,2} + r[u_{3,2} - 2u_{2,2} + u_{1,2}]$

$= 0.1152 + 0.5[0.3152 - 2[0.1152] + 0.03$

$= 0.174$

at $i = 3$

$u_{3,3} = u_{3,2} + \sigma[u_{4,2} - 2u_{3,2} + u_{2,2}$

$= 0.3152 + 0.5[0.6088 - 2[0.3152] + 0.1152$

$= 0.3620$

at $i = 4$

$u_{4,3} = u_{4,3} + \sigma[u_{5,2} - 2u_{4,2} + u_{3,2}]$

$= 0.6088 + 0.5[1 - 2[0.6088] + 0.3152]$

$u_{4,3} = 0.6576$

$j = 3$

$u_{i,4} \approx u_{i,3} + r(u_{i+1,3} - 2u_{i,3} + u_{i-1,3})$

at $i = 1$

$u_{1,4} = u_{1,3} + r[u_{2,3} - 2u_{1,3} + u_{0,3}]$

$= 0.0576 + 0.5(0.174) - 2[0.0576) + 0]$

$u_{1,4} = 0.087$

at $i = 2$

$u_{2,4} = u_{3,3} + r[u_{3,3} - 2u_{2,3} + u_{1,3})$

$= 0.174 + 0.5[0.362) - 2(0.174) + 0.0576)$

$= 0.2098$

at $i = 3$

$u_{4,4} = u_{4,3} + r[u_{5,3} - 2u_{4,3} + u_{3,3}]$

$0.6576 + 0.5[1 - 2(0.6576] + 0.367$

$= 0.681$

$j = 4$

$u_{i,5} = u_{i,4} + r(u_{i+1,4} - 2u_{i,4} + u_{i-1,4})$

at $i = 1$

$= 0.087 + 0.5[0.7098 - 2(0.087) + 0]$

$u_{1,5} = 0.1049$

$u + 1 = 2$

$u_{2,5} + u_{2,4} + r[u_{3,4} - 2u_{2,4} + u_{1,4}]$

$= 0.2098 + 0.5[0.4155 - 2(0.2098) + 0.039]$

$= 0.2514$

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at $i = 3$

$$u_{3,5} = u_{3,4} + 0.5(u_{4,4} - 2u_{3,4} + u_{2,4})$$

$$= 0.4158 + 0.15[0.681 - 2[0.4158] + 0.209$$

$$= 0.4454$$

at $i = 4$

$$u_{4,5} = u_{4,4} + r(u_{5,4} - 2u_{4,4} + u_{3,4})$$

$$= 0.681 + 0.5[1 - 2[0.681] + 0.4156]$$

$$= 0.7079$$

note at $u_{0,5} = 0$ and $u_{5,5} = 1$

T/x	0	0.2	0.4	0.6	0.8	1
0	0	0.0016	0.0256	0.1296	0.4096	1
0.02	0	0.0128	0.0656	0.2176	0.5648	1
0.04	0	0.0328	0.1152	0.3152	0.6088	1
0.06	0	0.0576	0.194	0.362	0.6576	1
0.08	0	0.087	0.2098	0.4158	0.681	1
0.1	0	0.1049	0.2314	0.4454	0.7079	1

0.1	0.1048	0.2314	0.4454	0.7079	1
0.08	0.087	0.2098	0.4158	0.681	1
0.06	0.576	0.194	0.362	0.6576	1
0.04	0.0320	0.1132	0.3152	0.6085	1
0.2	0	0.0128	0.0656	0.2176	0.5646	1
	0.2	0.4	0.6	0.8	1