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

$= 0.5(0.3152) + 0.5(1)$

$u_{4,3} = 0.6576$

<u>for $J=3$</u>

When $i=1$ $u_{1,4} = 0.5(u_{0,3}) + 0.5(u_{2,3})$

$= 0.5(0) + 0.5(0.1764) = 0.0882$

When $i=2$ $u_{2,4} = 0.5(u_{1,3}) + 0.5(u_{3,3})$

$= 0.5(0.0576) + 0.5(0.362) =$

0.2098

When $i=3$ $u_{3,4} = 0.5(u_{2,3}) + 0.5(u_{4,3})$

$= 0.5(0.1764) + 0.5(0.6576)$

$= 0.4158$

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

$= 0.5(0.362) = 0.6814$

<u>for $J=4$</u>

When $i=1$ $u_{1,5} = 0.5(u_{0,4}) + 0.5(u_{2,4})$

$= 0.5(0.2098) = 0.1069$

When $i=3$. $u_{3,5} = 0.5(u_{2,4}) + 0.5(u_{4,4})$

$0.5(0.2098) + 0.5(0.681)$

$= 0.4454$

When $i=4$ $u_{4,5} = 0.5(u_{3,4}) + 0.5(u_{5,4})$

$0.5(0.4154) + 0.5(1)$

$= 0.7079$

When $i = 3, j = 0 = u_{3,1} = 0.5(u_{2,0}) + 0.5(u_{4,0})$

$= 0.5(0.0256) + 0.5(0.4096)$

$u_{3,1} = 0.2176$

When $i = 4, j = 0 = u_{4,1} = 0.5(u_{3,0}) + 0.5(u_{5,0})$

$= 0.5(0.0256) + 0.5(0.4096)$

$u_{4,1} = 0.5648$

for $j = 1$

When $i = 1$: $u_{1,2} = 0.5(u_{0,1}) + 0.5(u_{2,1})$

$= 0.5u_{0,1} + 0.5u_{2,1} = 0 + 0.5(0.0656)$

$u_{1,2} = 0.0328$

When $i = 2$: $u_{2,2} = 0.5(u_{1,1}) + 0.5(u_{3,1})$

$= 0.5(0.0128) + 0.5(0.2176)$

$u_{2,2} = 0.1152$

When $i = 3$ $u_{3,2} = 0.5(u_{2,1}) + 0.5(u_{4,1})$

$0.5(0.0656) + 0.5(0.5648)$

$u_{3,2} = 0.3152$

When $i = 4$ $u_{4,2} = 0.5(u_{3,1}) + 0.5(u_{5,1})$

$= 0.5(0.2176) + 0.5(1)$

$u_{4,2} = 0.6088$

for $j = 2$

When $i = 1$ $u_{1,3} = 0.5(u_{0,1}) + 0.5(u_{2,2})$

$= 0 + 0.5(0.1152) = 0.05 + 0.4$

When $i = 2$ $u_{2,3} = 0.5(u_{1,2}) + 0.5(u_{3,2})$

$= 0.5(0.0328) + 0.5(0.3152)$

$= 0.124$

When $i = 3$ $u_{3,3} = 0.5(u_{2,2}) + 0.5(u_{4,2})$

$= 0.5(0.1152) + 0.5(0.6088)$

$= 0.362$

Scanned with CamScanner

Jude-Shima Favour 17/ENG02/039
Computer Engineering ENG 382 V1

$$U_t - CU_{xx} = 0$$

$$\frac{du}{dt} - C\frac{d^2u}{dx^2} = 0$$

$$\frac{du}{dt} = \frac{Cd^2u}{dx^2}$$

$$\frac{U_{i,j+1} - U_{ij}}{\Delta t} = \frac{C \cdot U_{i+1,j} - 2U_{ij} + U_{i-1,j}}{\Delta x^2}$$

$$U_{ij+1} - U_{ij} = \frac{C\Delta t}{\Delta x^2}[U_{i+1,j} - 2U_{ij} + U_{i-1,j}] \cdot \Delta t/\Delta x^2$$

$U[x_0] = x^4$

$\Delta x = 0.2$, $\Delta t = 0.02$ day

For conditions

At $x=0 \rightarrow x^4 = 0$

At $x = 0.2 \rightarrow 0.2^4 = 1.6 \times 10^{-3}$

At $x = 0.4 \rightarrow 0.4^4 = 0.0256$

At $x = 0.6 \rightarrow 0.6^4 = 0.1296$

At $x = 0.8 \rightarrow 0.8^4 = 0.4096$

At $x = 1 \rightarrow 1^4 = 1$

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

$$U_{ij+1} = rU_{i-1,j} + (1-2r)U_{ij} + U_{i+1,j}$$

When $i = 1, J = 0$

$$U_{11} = 0.5U_{0,0} + 0.5U_{2,0}$$

$$= 0.5(0) + 0.5(0.0256)$$

$$U_{11} = 0.0128$$

When $i = 2, J = 0$

$$U_{211} = 0.5(U_{1,0}) + 0.5(U_{3,0})$$

$$= 0.5(1.6 \times 10^{-3}) + 0.5(0.1296)$$

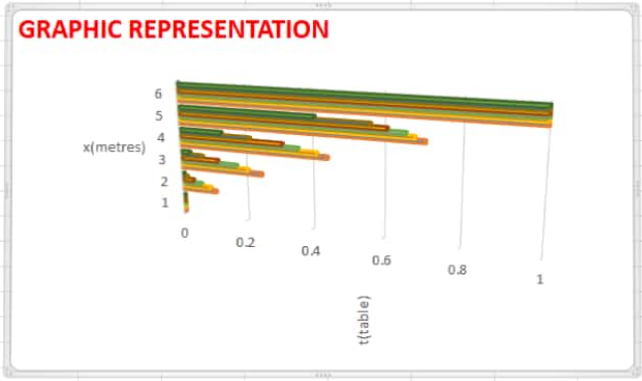
$$U_{211} = 0.0656$$

Scanned with CamScanner

Chart 1

0.1	0	0.1049	0.2514	0.4454	0.7079	1
0.08	0	0.087	0.2098	0.4158	0.681	1
0.06	0	0.0576	0.174	0.362	0.6576	1
0.04	0	0.0328	0.1152	0.3152	0.6088	1
0.02	0	0.0128	0.0656	0.2176	0.5648	1
0	0	0.0016	0.0256	0.1296	0.4096	1
	0	0.2	0.4	0.6	0.8	1

0.5



Scanned with CamScanner