

MR0071875 (17,196e) 65.0X

[Douglas, Jim, Jr.](#)

On the numerical integration of $\partial^2 u / \partial x^2 + \partial^2 u / \partial y^2 = \partial u / \partial t$ by implicit methods.

J. Soc. Indust. Appl. Math. **3** (1955), 42–65.

The author considers solution of $u_t = u_{xx} + u_{yy}$ with rather general initial and boundary conditions. Using mostly Fourier methods, he discusses convergence of three implicit difference schemes; for notation, see the preceding review [[MR0071874 \(17,196d\)](#)]. The first scheme is that of Peaceman and Rachford described above. The second and third schemes are extensions to two space dimensions of schemes given by O'Brien, Hyman, and Kaplan [*J. Math. Phys.* **23** (1951) 223–251; [MR0040805 \(12,751e\)](#)]:

$$\frac{u_{n+1} - u_n}{\Delta t} = (\Delta_x^2 + \Delta_y^2)u_{n+1}$$

and

$$\frac{u_{n+1} - u_n}{\Delta t} = \frac{1}{2}(\Delta_x^2 + \Delta_y^2)(u_n + u_{n+1}).$$

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