2D Wave Equation Simulation

1. 2D Wave Equation:

The general form of the 2D wave equation is:

$$ \frac{\partial^2 u(x, y, t)}{\partial t^2} = c^2 \left(\frac{\partial^2 u(x, y, t)}{\partial x^2} + \frac{\partial^2

2. Finite Difference Method:

Using central differences for spatial derivatives and second-order finite differences for time derivatives,

the discretized wave equation is:

$$ u^{n+1}(x, y) = 2(1 - 2r) u^n(x, y) - u^{n-1}(x, y) + r \left(u^n(x+dx, y) + u^n(x-dx, y) + u^n(x, y+dy) + u

where r = (c² * dt²) / dx² is the Courant number.

3. Initial Condition:

The initial condition is a sine wave in both x and y directions:

$$ u(x, y, 0) = \sin\left(\frac{\pi x}{L_x}\right) \sin\left(\frac{\pi y}{L_y}\right) $$

4. Conclusion:

The finite difference method is used to approximate the solution of the 2D wave equation

numerically by discretizing both space and time.