

WEEK 11 - ASSIGNMENT 8(CE APPLICATION)

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In [14]: import numpy as np
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In [8]: import matplotlib.pyplot as plt
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In [10]: import matplotlib.animation as animation
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In [16]: plate_length = 50
max_iter_time = 1000
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In [18]: import numpy as np
import matplotlib.pyplot as plt

# Parameters
nx, ny = 50, 50 # Grid points
dx, dy = 0.1, 0.1 # Grid spacing
alpha = 0.01 # Thermal diffusivity
dt = 0.01 # Time step
steps = 500 # Number of time steps

# Initial condition
u = np.zeros((nx, ny))
u[int(nx/4):int(3*nx/4), int(ny/4):int(3*ny/4)] = 100 # Heat source

# Time-stepping loop
for step in range(steps):
    u_new = u.copy()
    for i in range(1, nx-1):
        for j in range(1, ny-1):
            u_new[i, j] = u[i, j] + alpha * dt * (
                (u[i+1, j] - 2*u[i, j] + u[i-1, j]) / dx**2 +
                (u[i, j+1] - 2*u[i, j] + u[i, j-1]) / dy**2
            )
    u = u_new

# Plot the result
plt.imshow(u, cmap='hot', extent=[0, nx*dx, 0, ny*dy])
plt.colorbar(label="Temperature")
plt.title("2D Heat Equation")
plt.xlabel("x")
plt.ylabel("y")
plt.show()
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