SOLUTION TO THE UNSTEADY HEAT DIFFUSION EQUATION

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The partial differential equation for the unsteady heat diffusion equation involves time evolution of the field along the space.In order to solve this continuous field equation computationally numerical approximation or finite element method like finite difference method is used. According to the given boundary and initial conditions,we initialize the square domain [0,1]*[0,1] with temperatures specified.we use a matrix to store the data initially in the c++ code.Then we will use the finite difference method for the discretization of the partial differential equation.first order partial derivatives are found through forward difference method , second order partial derivatives are found through forward and backward differences.

Then we dynamically change the temperature of the space with time evolution using our discrete difference equation.Contour plots and surface plots are plotted at given time steps that is 5 seconds,20 seconds,50 seconds,7200 seconds.After analysing the plots we can infer that at time 7200 seconds the space showed completely uniform distribution of heat intensity unlike in the beginning the heat intensity was limited to a circular region. As the system evolved through time, the heat flowed in a unsteady manner through the space and it took some time for the system to settle to uniform distribution.This model is just trying to simulate the system through numerical approximations so there will be errors when compared to the real system itself.