**Abstract**

The following report analyses the utilization of scientific code to solve the two-dimensional diffusion equation. The analysis consists in the solution of the differential equation using the implicit numerical method and the Crank-Nicolson Iterative method. The report indicates all of the specifications of the parameters used in the analysis, including the boundary conditions, code language used and specific hardware used to run simulations. The results will evaluate the effects of the number of iterations applied, a study of the grid convergence and the effects of diffusive CFL. The report ultimately concludes with a comparison of the expected results using the theoretical behavior. It was found that with \_\_\_\_,\_\_\_\_\_,\_\_\_\_\_ the solution of the two-dimensional diffusion equation is \_\_\_\_\_\_,\_\_\_,\_\_\_\_\_ respectively. When compared to the expected theoretical behavior it was found that the applied numerical methods had an error of \_\_\_\_,\_\_\_\_,\_\_\_ when using \_\_\_\_\_,\_\_\_\_\_,\_\_\_\_\_. It was also found that the implicit method and the Crank Nicolson method each had an error of \_\_\_\_ and \_\_\_ when compared to the analytical solution. It can therefore be concluded that the \_\_\_\_\_\_method is more effective than the \_\_\_\_method especially when using\_\_\_\_\_.

**Mathematical Statement of Project**

Using computer code and numerical methods, more specifically the implicit discretization and the Crank-Nicolson discretization methods, the following two-dimensional diffusion equation is to be solved:

With domain…

And with boundary conditions…

Where…

**Discretized version of Equations**

**Description of numerical method and Pseudo Code**

**Technical Specifications of Computer Used**

**Results**

Parameters Used in Simulations

Evaluation of the effect of n (number of points used)

Study of Grid Convergence

Effect of Diffusive CFL

Comparison of Expected theoretical behaviour

Order of Spatial accuracy of discretization