Cfd in excel essay

Students learning computational fluid dynamics and heat transfer for the first time typically spend an inordinate amount of time struggling with algorithm development and programming issues. The use of the visual presentation and automated solution capabilities of Excel can help bolster the student's understanding of basic discrimination issues unencumbered by programming details. Cell formatting can be used to visualize the geometry and how the grid variables interact with one another, a feature that is particularly helpful when dealing with irregular geometries or staggered grids.

Results can be easily shown on contour or x-y plots. Although the number of grid points and thus accuracy is limited by the number of equations that the Solver tool can handle, a spreadsheet model is nevertheless valuable for giving students an intuitive feel for discrimination before going on to write code. Two applications are described. The first is a dimensional conduction problem that is introduced to show how Solver can be used to solve systems of finite difference equations.

The second demonstrates the solution of the incompressible Anniversaries equations using the staggered grid formulation. The conduction problem is one that is easily incorporated into an undergraduate heat transfer class, while the flow problem is appropriate for a graduate level course.

Values interact with one another and visualization of results. Kumar and AY-Shanty [4] describe how spreadsheets can be used to solve simple fluid static problems and the modified Bernoulli equation. Wiggins [5] describes a

spreadsheet solution Of the unsteady Coquette flow problem using Gaussian elimination.

Moratoria [6] solves the incompressible Navies-Stokes equations and the energy equation for a two-dimensional channel flow using the artistic-stream function formulation along with the circular reference (sometimes referred to as the iteration') feature of the spreadsheet package. The voracity-stream function formulation requires post-processing to obtain velocities procedure that can be automated in the spreadsheets solution of a Poisson equation for pressure. Moratoria et al.

[7] show how various aeronautical problems can be solved using the matrix inversion and circular reference solution functions.

Although the numbers of changing cells and constraints are limited by Solver, its use provides a straightforward way to solve the discredited heat rancher and fluid flow equations. In this paper we show how Solver can be used to solve a relatively simple but nonlinear heat conduction problem and the incompressible Navies-Stokes equations in primitive variable form on a staggered grid. An INTRODUCTION THE SEE OF spreadsheets for solving the finite difference equations resulting from discrimination of the governing differential equations for heat conduction is well documented.

Moniker and Anta [1 , 2] describe how the iteration capability of spreadsheets can be used to solve multidimensional steady and transient conduction problems.

They also discuss how the contour plot feature can be used to easily visualize results (contour plots in Excel are, however, limited to plotting results in relatively simple geometries). Schuman [3] describes how the Solver tool in Excel can be used to solve two-dimensional steady conduction problems.