Computer Models
For
Fire and Smoke

Model Name:	FIRE
Version:	1.8
Classification:	Field model
Very Short Description:	CFD model with water sprays and coupled to solid/liquid phase fuel to predict burning rate and extinguishment.
Modeler(s), Organization(s):	J. H. Kent; Department of Mechanical Engineering University of Sydney NSW 2006 Australia
User's Guide:	In program
Technical References:	-----
Validation References:	Fletcher, D.F., Kent, J.H., Apte, V.B. and Green, A.R., Numerical Simulations of Smoke Movement from a Pool Fire in a Ventilated Tunnel, Fire Safety Journal 23, pp 305-325, 1994. Novozhilov, V., Moghtaderi, B., Fletcher, D.F. and Kent, J.H. CFD Modelling of Wood Combustion, Proceedings of the Second Asia-Oceania Symposium on Fire Science and Technology, Khabarovsk, Russia 13-17 September, pp286-297, 1995. Novozhilov, V., Moghtaderi, B., Fletcher, D.F., and Kent, J.H., Numerical Simulation of Enclosed Gas Fire Extinguishment by a Water Spray. Journal of Applied Fire Science, 5(2), 135-146, 1996. Novozhilov, V., Moghtaderi, B., Fletcher, D.F. and Kent, J.H. Computational Fluid Dynamic Modelling of Wood Combustion, Fire Safety Journal, 27(1), pp 69-84, 1996. Novozhilov, V., Harvie, D.J.E., Green, A.R. and Kent, J.H., A Computational Fluid Dynamic Model of Fire Burning Rate and Extinction by Water Sprinkler,

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Novozhilov, V., Moghtaderi, B., Kent, J.H. and Fletcher, D.F. Solid Fire Extinguishment by a Water Spray, Fire Safety Journal, vol. 32, Issue 2, pp.119-135 1999.

Harvie, D.J.E., Novozhilov, V., Kent, J.H. and Fletcher, D. F. An Experimental Study of Wood Crib Extinguishment by a Sprinkler Spray. Journal of Applied Fire Science, vol. 8, pt. 4, pp. 247-263, 1999.

Availability: Research Software, not commercial

Price: -----

Necessary Hardware: PC

Computer Language: FORTRAN

Size: Determined by specified grid size.

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Detailed Description:

FIRE is a computational fluid dynamics code for two-dimensional or three-dimensional combustion situations. It can be applied to solid, liquid or gas fuelled fires. *FIRE* predicts flow patterns and velocities,,gas species concentrations and smoke dispersal, temperatures, combustion, particle trajectories, convective heat transfer, radiative heat fluxes. Solutions can be steady state or time dependent.
The user can specify any boundaries and internal structure shapes for the flow domain by using a few fundamental building block shapes.
The grid is cartesian with variable cell size. Embedded fine grids to any level may be placed within coarse grids to improve resolution and efficiency.
The code contains sections for:

- fluid flow with combustion, energy and mass transfer,
- radiative heat transfer,
- particle trajectories eg. water droplets.
- solid or liquid phase fuel with combustion coupled to gas field.

The solutions are viewed with the dedicated 2D/3D graphics package.