FLUENT UDF: Introduction

Advanced UDF
Modeling Course

Welcome to Fluent Europe

◆ Introducing your trainer….

◆ Domestic issues:
- Toilets – *all in entrance lobby near reception*
- Tea, Coffee and Water – *help yourself, in customer dining room*
- Fire Alarm and Escape Routes *(note alarms are tested at 09:15 Tuesday)*
- Visitors Badge – *Leave on front reception desk if you go out at lunchtime, and when you leave for the evening.*
- Smoking – *Outside only.*
- Taxis – *Please let reception know by lunchtime if you need a taxi for the evening.*

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UDF   Mar 2007

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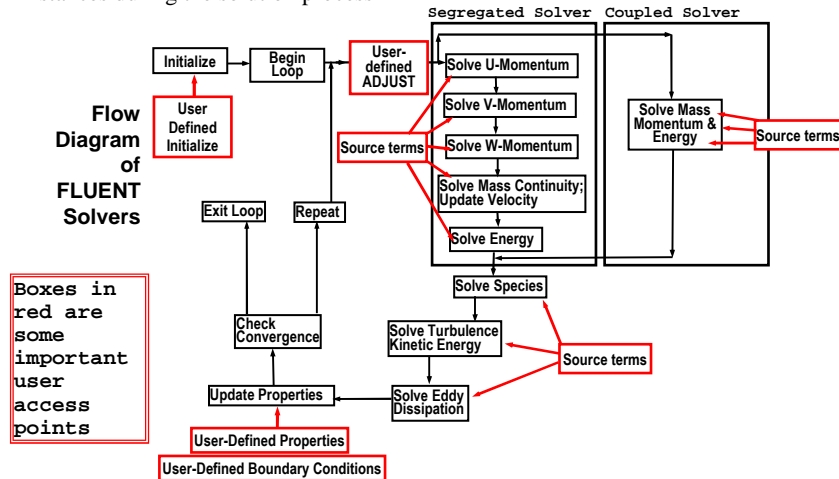
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Agenda

09:15 – 09:30	General Introduction to User Defined Functions
09:30 – 10:00	Fluent Data Structure and Macros
10:00 – 10:15	Break
10:15 – 10:45	Interpreted / Compiled UDF
10:45 – 11:45	UDF Hooks - 'DEFINE' Macros
11:45 – 12:30	Tutorial Session
12:30 – 13:30	Lunch
13:30 – 14:00	User Defined Scalars and Memories
14:00 – 14:30	UDF for Discrete Phase Model
14:30 – 15:00	UDF for Multiphase Flows
15:00 – 15:15	Break
15:15 – 16:00	Tutorial-session-2
16:00 – 16:30	UDF for Parallel FLUENT
16:30 – 17:00	Miscellaneous Functions / Macros

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Why Build UDFs?

- Standard interface can not be programmed to anticipate all needs
- Customization of boundary conditions, source terms, reaction rates (volume and surface), properties
- Solution initialization
- Adjust functions (once per iteration)
- Solve for user defined scalars
- Modify model specific parameters
- Many more...
- ◆ Limitations
    - Not all solution variables or solver models can be accessed by UDFs
        - Example: Cannot change specific heat (would require additional solver capabilities)

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User Access Points to the Solver

◆ Fluent is so designed that the user can access the solver at some strategic instances during the solution process

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User Defined Functions in FLUENT

◆ User Defined Functions are not just any C-functions:

● User access needs specific "Type" of function calls
● These Function types or macros are defined in the header file (e.g., udf.h)

◆ UDF's in FLUENT are available for:

● **Profiles** (Boundary Conditions)

velocity, temperature, turbulence, species, scalars

● **Source terms** (Fluid and solid zones)

mass, momentum, energy, species, turbulence, scalars

● **Properties**

viscosity, conductivity, density, scattering_phase_function (except specific heat)

● **Initialization**

zone and variable specific initialization

● **Global Functions**

adjust, read, write, execute_on_demand

● **Scalar Functions**

unsteady term, flux vector, diffusivity

● **Model Specific Functions**

reaction rates, discrete phase model, turbulent viscosity