# Discretized Version for Thesis

Conditions for Problem as found in paper (1226) for pseudo homogenous Model

|  |  |
| --- | --- |
| **Initial Conditions for t=0** | **Boundary Condition (BC)** |
|  | for z = 0 |
|  | Heat flux, for z=L |
|  | Diffusion flux, for z=L |
|  | for z=0 |

Uz

Cell centre values

Wj, T,P,,P

Equation 12 and 13 in the pdf (model) is implemented in lines 112 and 115

Equation 20 in model pdf is implemented in lines 91 for the initial condition and lines 270 for the density update

The general form of the continuity equation is

………….from equation(9 from the PDF model) to get pressure variation

The continuity becomes

………………………..(4.1)

From equation (11)

……………………….(11 from the PDF model)

Equation 11 becomes

…………………………….(11.1)

Where is the same as ‘vel’ in the code

Introducing a constant , ……………(11.2)

Equation 11.2 is implemented in lines

…………………………………(11.3)

Equation 11.3 is used to implement line 117-119 for the initial condition and lines 260-262 for the velocity update

Substituting equation 11.3 into equation 4.1 yields

………………………..(4.1)

Equation (4.1) is now the new set of equation that represents equation (9 from the PDF Model)

This equation is what is discretized and used in the MATLAB code

The final form of the continuity equation before discretizing gives

; P=press;

Discretizing the above yields

=0

## For cell i

Discretizing the above yields

=0…………………..(4.11)

Equation 4.11 is implemented in the code from lines 209-214

## For cell 1

=0

LB=Left boundary which is the same as BW=West boundary

+

+

+……………………………………(4.12)

The above equation was implemented in lines 203-205 in TransportJuly1021

## For cell nz

=0

…………………(equation 4.3)

Equation 4.3 is implemented in lines 206-208 in Matlab transportJuly1021.

The yellow highlighted equation gives a diagonal matrix which is implemented in lines 216 -222 in Matlab.

# Temperature Equation

The general energy equation given by equation 14

……….(14)

; ; ;

The 2nd term on the right hand side is neglected for now.

From equation (16)

+

Simplifying further

+

Where the source term is

Simplifying further yields

Assuming

a=

## For cell i

……..(14.2)

The above equation is implemented in lines 239-244.

Where k is the thermal conductivity

## For cell 1

……………..(14.3)

**Equation 14.3 is implemented in lines 232-234**

## For cell nz

Using this boundary condition

At z=L,

At z=0, T=

Using the exit BC at z=L gives

……………….(14.4)

Equation (14.4) is implemented lines 235-237

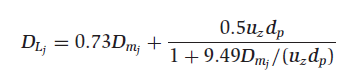
# Species Mass Fraction-Not yet implemented

From equation (4), the species equation is given as

The general form of the species equation is given by

Where as

Axial diffusion coefficient is given by



………………..(4.1)

Where the reaction source term,

Discretizing equation (4.1)

…

=+

Using the following boundary conditions

At z=L,

At z=0, w=

## For cell 1

Grouping liketerms

NB: Any parameter to the subscript 1-1 is the parameter value at the boundary .

## For cell nz

Grouping the above and applying exit BC

With BC, the above equation becomes