Example of inflow/outflow boundary conditions

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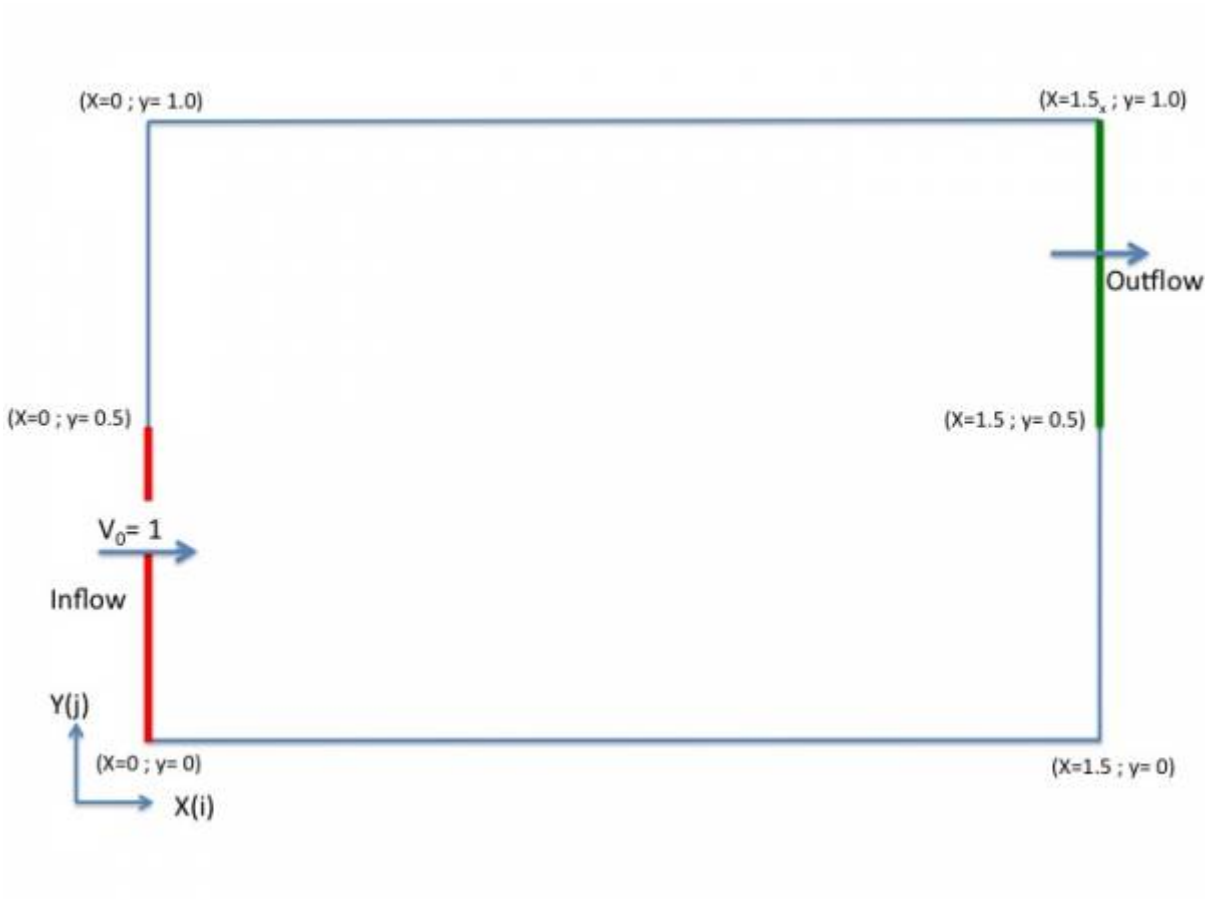
- This example is defined for a 2D geometrical configuration. The size of the domain is $1.5 \times 1.0.$
- The flow is homogeneous (no multi-species gas)
- An inlet is located at the down left side of the domain (red line on the figure).
- An outlet is located at the top right side of the domain (green line on the figure).
- Conditions are constant in time



(inlet in red line, outlet in black line, walls in green lines)

Inflow data

Example 1

- The flow is homogeneous (no multi-species gas)
- Conditions are constant in time

```
 &Inlet_Boundary_Conditions
 Type_of_BC= "INLET", Direction_Normal_Plan= 1 ,
 Plan_Location_Coordinate= 0.0   ,
 Start_Coordinate_of_First_Span = 0.0, End_Coordinate_of_First_Span = 0.5,
 Start_Coordinate_of_Second_Span= 0.0  , End_Coordinate_of_Second_Span= 0.0
,
 Flow_Direction= 1 ,
 Normal_Velocity_Reference_Value= 1.0  ,
 Temperature_Reference_Value= 293.0 ,
 Density_Reference_Value=  1.2,
 Define_Velocity_profile= 0 ,
 End_of_Data_Block= .true. /
```

Example 2

Not for the release SUNFLUIDH_EDU

- The flow is homogeneous (no multi-species gas)
- The temperature and the density are constant.
- The normal velocity component is time-dependent :
  - The function is sinusoidal. The mean value of the time function is given by “Normal_Velocity_Reference_Value”.
  - the frequency is 10 Hz
  - The magnitude is 40% of the mean inlet velocity

```
 &Inlet_Boundary_Conditions
 Type_of_BC= "INLET", Direction_Normal_Plan= 1 ,
 Plan_Location_Coordinate= 0.0   ,
 Start_Coordinate_of_First_Span = 0.0, End_Coordinate_of_First_Span = 0.5,
 Start_Coordinate_of_Second_Span= 0.0  , End_Coordinate_of_Second_Span= 0.0
,
 Flow_Direction= 1 ,
 Normal_Velocity_Reference_Value= 1.0  ,
 Temperature_Reference_Value= 293.0 ,
 Density_Reference_Value=  1.2,
 Define_Velocity_profile= 0 ,
 Time_Fct_Name= "Sinus" , Time_Fct_Threshold= 0.0 ,
 Time_Fct_Time_Scale= 0.1 , Time_Fct_Magnitude= 0.4 ,
 End_of_Data_Block= .true. /
```

Outflow data

Example 1

- The outflow is based on the mass flowrate conservation.
- The normal pressure gradient is zero (Neumann boundary condition).

&Outlet_Boundary_Conditions

```
 Type_of_BC= "OUTLET", Direction_Normal_Plan= 1 ,
 Plan_Location_Coordinate= 1.5   ,
 Start_Coordinate_of_First_Span = 0.5    , End_Coordinate_of_First_Span =
1.0 ,
 Start_Coordinate_of_Second_Span= 0.0    , End_Coordinate_of_Second_Span=
0.0 ,
 Flow_Direction= 1 ,
 End_of_Data_Block= .true. /
```

Example 2

Not for the release SUNFLUIDH_EDU

- The outflow is based on pressure conditions.
- The (dynamic) pressure value is given by “Pressure_Reference_Value”. It is imposed out of the domain and located at a distance “Length_Scale” from the outflow plan (Robin condition).
- Keep in mind that the pressure is here related to the dynamics, not to the thermodynamics of the flow. It is therefore defined from a reference value which can be null.

&Outlet_Boundary_Conditions

```
 Type_of_BC= "FREEBC", Direction_Normal_Plan= 1 ,
 Plan_Location_Coordinate= 1.5   ,
 Start_Coordinate_of_First_Span = 0.5    , End_Coordinate_of_First_Span =
1.0 ,
 Start_Coordinate_of_Second_Span= 0.0    , End_Coordinate_of_Second_Span=
0.0 ,
 Flow_Direction= 1 ,
 Pressure_Reference_Value       = 0.0    , Length_Scale= 0.2 ,
 End_of_Data_Block= .true. /
```

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