The recent study report

Yuan Hao ,Cao Chenhao
December 22, 2020

Email:2389370488@qq.com **Tel:**15820499342

This report is about the recent two-weeks work on the study of latex and the basics of Python. Because there were many exams in the previous month, we feel sorry for the slow progress of the task.

TODO LIST:

1. Watch the basic Python learning video on YouTube.(done)
2. Use the template to write a work report through latex.(done)
3. Learn about latex usage documents.(in progress)

1 The First LaTex Report

In the aspect of learning latex, we mainly study the basic knowledge of latex, such as latex terms and some commands. For example, write the first ”Hello world” in latex. Then we have some understanding of report-xi.cls.And we made some changes to the template ”energy budget of channel flow simulation”

1.1 insert picture function

First of all, we have a basic understanding of anaconda. We write ”Hello world” with the code in latex learning manual and compile the output. The results are as follows.(The letters in the presentation may be a little small)

Figure 1: Hello world

1.2 Writing formula function,N-S equation

This part is mainly used to test the written formula. The following mainly shows the N-S equation.

$$\frac{D\vec{U}}{Dt} = -\frac{1}{\rho}\vec{\nabla}P + \nu\nabla^2\vec{U} \tag{1}$$

$$\begin{cases} \dfrac{\partial u_1}{\partial t} + u_i \dfrac{\partial u_1}{\partial x_i} = -\dfrac{1}{\rho}\dfrac{\partial p}{\partial x_1} + \nu \dfrac{\partial^2 u_1}{\partial x_i \partial x_i} \\ \dfrac{\partial u_2}{\partial t} + u_i \dfrac{\partial u_2}{\partial x_i} = -\dfrac{1}{\rho}\dfrac{\partial p}{\partial x_2} + \nu \dfrac{\partial^2 u_2}{\partial x_i \partial x_i} \\ \dfrac{\partial u_3}{\partial t} + u_i \dfrac{\partial u_3}{\partial x_i} = -\dfrac{1}{\rho}\dfrac{\partial p}{\partial x_3} + \nu \dfrac{\partial^2 u_3}{\partial x_i \partial x_i} \end{cases} \tag{2}$$

Formula (1) can also be expressed as follows

$$\frac{\partial U_j}{\partial t} + U_i \frac{\partial U_j}{\partial x_i} = -\frac{1}{\rho}\frac{\partial P}{\partial x_i} + \nu \frac{\partial^2 U_j}{\partial x_i \partial x_i} \tag{3}$$

According to the continuity equation,the left side of Equation 3 can be expressed as

$$\begin{aligned} \frac{\partial U_j}{\partial t} + U_i \frac{\partial U_j}{\partial x_i} &= \frac{\partial U_j}{\partial t} + \frac{\partial U_i U_j}{\partial x_i} - U_j \frac{\partial U_i}{\partial x_i} \\ \frac{\partial U_i}{\partial x_i} &= 0 \\ \frac{\partial U_j}{\partial t} + U_i \frac{\partial U_j}{\partial x_i} &= \frac{\partial U_j}{\partial t} + \frac{\partial U_i U_j}{\partial x_i} \end{aligned} \tag{4}$$

The instantaneous value is equal to the average value plus the fluctuation value,As shown below.

$$\begin{aligned} U_i &= \langle u_i \rangle + u_i \\ P &= \langle P \rangle + p \end{aligned} \tag{5}$$

Put the result of equation 4 into equation 3, and then average.

$$\begin{aligned} \langle \frac{DU_i}{Dt} \rangle = \frac{\partial \langle U_j \rangle}{\partial t} + \frac{\partial \langle U_i U_j \rangle}{\partial x_i} &= -\frac{1}{\rho}\frac{\partial \langle P \rangle}{\partial x_i} + \nu \frac{\partial^2 \langle U_j \rangle}{\partial x_i \partial x_i} \\ \frac{\partial \langle U_i U_j \rangle}{\partial x_i} = \frac{\partial \langle U_i \rangle \langle U_j \rangle}{\partial x_i} + \frac{\partial \langle u_i u_j \rangle}{\partial x_i} &= \langle U_i \rangle \frac{\partial \langle U_j \rangle}{\partial \langle x_i \rangle} + \frac{\partial \langle u_i u_j \rangle}{\partial x_i} \end{aligned} \tag{6}$$

2 The Basics of Python

Over the course of these two weeks, we learned some of the basics of Python on YouTube. For example:Strings, Integers, Floats, Lists, Tuples, Sets and so on. Note details in another document.