ransX framework

User Guide

Date	Version	Person	Change
30/March/2019	1.0	Miroslav Mocak	Initial instructions

This guide provides instructions for ransX users and description of all parameters in the ransX framework contained within following available parameter files:

- param.ransx (control file for plotting of RANS equations using script ransx.py)
- param.tseries (control file for time-averages over specific time range with ransx_tseries.py)
- param.single (control file for plotting data from a single ransdat file with ransx_single.py)

Installation and Usage

Installation and usage instructions are described in DOCS/ransXinstallationGuide.pdf

- to change plotting output, modify parameters in param.ransx and re-run ransx.py

Parameters description of param.ransx

param.ransx has virtually two main parts.

The first part (up to line 11) contains:

## Input data

Source of input data. Path to npy file produced by ransX_tseries.py relative to location of your ransX folder or full path.

## Filename Prefix For Plots

Prefix for output plot files, which should be unique per model you analyse. The output plot files are written to RESULTS folder by default.

*## Geometry; ig =1 Cartesian, ig =2 Spherica*l

Geometry of your simulation influence calculus operators as for example divergence, hence it is crucial to set it properly. For now, this setting does not influence RANS equations plot labels. This still needs to be coded.

## Central Time Index

Index of central time around which you performed statistical averaging with ransX_tseries.py. More details can be found in ransXimplementationGuide.pdf, Figure 5. You get an error, if you set it to a number bigger than maximum number of statistically averaged mean-fields.

## Limit Axis

This parameter accepts three values 0, 1 or 2:

If you set it to 0, it will show all the RANS equation plots without any axis limitation i.e. the X axis will be limited by size of your x (r) computational domain and Y axis by min/max value of fields you plot across the domain.

If you set it to 1, it will force all the RANS equations to be plotted with X axis limitation as defined by third and fourth parameter in the second part of the param.ranx. For example, in case of Continuity Equation and our oxygen burning case, the X axis will be limited to range between (4.e8,9.8e8)

## Continuity Equation .... ## [conteq,True,4.e8,9.8e8,1.e2,-1.e2,0]

If you set it to 2, it will force all the RANS equation plots to obey limitation to X and Y axis as well, based on the third, fourth, fifth and six parameter in the second part of the param.ransx. For example, in case of Continuity Equation and our oxygen burning, model the X axis will be limited to range between (4.e8,9.8e8) and Y-axis will be limited to range of (1.e2,-1.e2)

## Continuity Equation .... ## [conteq,True,4.e8,9.8e8,1.e2,-1.e2,0]

## X and Y axis Right boundary for properties

Boundaries for X-axis for properties calculated by Properties.py from region enclosed by this limitation. If all is good, these boundaries can be the same as plotting boundaries in the second part of the parameter file, but in case of low-resolution run or nasty unphysical boundary artefacts, it is good to set these property boundary limitation just outside the convection zone.

## Nuclear Network

Definition of the nuclear network used in analysed hydrodynamic simulation. The first element should already follow first parameter "network" of the network list

## Nuclear network .... ## [network,neut,prot,he4,c12,o16,ne20,na23,mg24,

Do not change first two parameters in the lists after ## [e.g. [prop,eht_data ..] or [prop,prefix ..]. They serve as parameter handles!

The second part is the rest of the param.ransx and controls parameter handles in ransX.py and MasterPlot.py, for example what to plot, how to limit the X and Y axis of the plots and where to place plot legend.

Let us look at the Continuity Equation parameter list.

## Continuity Equation .... ## [conteq,True,4.e8,9.8e8,1.e2,-1.e2,0]

First parameter is list's parameter handle for ransX.py. Do not change this. This holds true also for the rest of the parameters.

Second parameter is logical variable, that controls whether the equation or any background stratification should be plotted or not. True means to plot, False means not to.

Third and Fourth parameters control X axis limitation in case the ##Limit Axis parameter "laxis" is set to 1.

Fifth and Sixth parameters control additionally Y axis limitation in case the ##Limit Axis parameter "laxis" is set to 2.

The seventh parameter controls position of pyplot legends. Possible values 0-10. 0 is best position. 1 is upper right, 2 upper left, 3 lower left, 4 lower right, 5 right,6 center left, 7 center right, 8 lower center, 9 upper center, 10 center.

All the other parameter lists in the second part of the param.ransx work the same.

- to perform statistical averaging i.e. to calculate time-averages over different time span, modify parameters in param.tseries and run ransx_tseries.py

Parameters description of param.tseries

## Input Data Directory

Source directory with ransdat and ranshead files, that you obtain during run-time of hydrodynamic simulation, whose storage structure is the same as shown in our Fortran subroutines in UTILS/FOR_YOUR_HYDRO. Read README file there for more details.

## Input Data Endianness

Endianness of your input data, either little_endian or big_endian.

## Input Data Floating Point Precision

Input Data Floating Point Precision, either single or double.

## Output-File

Location and name of your output npy file (to be used later with script ransX.py and specified in one of the parameters of param.ranx)

## Time-Range (in s)

Time-Range over which you want to perform statistical averaging. The difference of the range values should be more than the Averaging Window to be set next.

## Averaging Window (in s)

Averaging Window over which you want to obtain statistical average. For robust statistical average, you need to set it optimally to 3 convective turnover timescales or more.

- to check statistical averages from a single ransdata file, modify parameters in param.single and run ransx_single.py

Parameter description of param.single

## Input-Data Directory

Input data directory with ransdat and ranshead file you want to examine.

## Input Data Endianness

Endianness of the data, either little_endian or big_endian

## Input Data Floating Point Precision

Input data floating point precision.

## Limit X-grid

Limit X-grid. It is good if you don’t want to be bothered by some grid boundary noise or non-physical numerical artefacts.

## List of Mean Fields to Plot

List of quantities to plot. For example, if you want to plot velocity, density and gravitational acceleration, write to the third, fourth and fifth parameter ux,dd,gg as shown in the example below. The list can contain as many quantities as you want.

## List Of Mean Fields To Plot .... ## [single,toplot,ux,dd,gg]

Do not change first two parameters in the lists after ## [e.g. [single, datafile ..] or [single,endian ..]. They serve as parameter handles!

Related Documents

RansXtheoryGuide.pdf

RansXinstallationGuide.pdf

RansXimplementationGuide.pdf

RansXdevelopersGuide.pdf

RansXuserGuide.pdf