

UWAL PLOTTING

Communication and File Structures

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OVERVIEW

The UWAL Plotting software uses a set directory structure to organize the data for a test. The data consists of at least an “online” data set and an optional “final” data set. Within each data set, the static pressure data collected with an electronic pressure scanning (EPS) system are stored in their own files, one per run. The other data (usually force and moment coefficients) are stored in their own files one per run.

The plotting software assumes a data organization of test, run, and testpoint. A run is defined as a set of data whereby only one parameter is being changed during the course of the test. For example, a pitch run is a run whereby only the angle of attack varies. Some tunnels also impose an additional level of organization called a “series” where a series is a collection of runs that have the same model configuration. The plotting software will use series numbers if available when appropriate.

The plotting software can communicate with a plot data server via a simple TCP/IP protocol that sends/receives text strings between the server and the plotting clients. The communication is required if one desired to have the plotting software plot the data real-time, point-by-point as the data becomes available.

DIRECTORY STRUCTURE

The directory structure required for the plotting software to operate is as follows:

TNxxxx (test directory where xxxx is a four-digit test number, and TN are replaced with the actual two-character facilities identifier)

ONLINE

drnames.lst – required file containing the data names

*.def – plot definition files (created by the plotting software), default = grids.def

REDUCED (optional)

datnames.xxx – required file containing the data names

connames.xxx – required file containing the run constant names

drconst.xxx – optional file containing the data values for the constants listed in connames.xxx for each run, useful for storing model configuration and control surface deflection angles.

where xxx are the last three digits of the four-digit test number.

The test directory must be unique within the path that contains the test directory. For example, one cannot have a C:\TESTS\TNxxxx (bla)\TNxxxx type directory structure. The TNxxxx must only exist once within the path.

FILE STRUCTURE

The online and final data sets have identical file formats for the pressure and non-pressure data files. The only difference is in the filenames.

Non-pressure filenames are of the format: run_yyyy.bin for the online data set, and dr_yyyy.bin for the final data set, where yyyy is the four-digit run number (e.g. run_0047.bin). Non-pressure data file format is as follows:

One testpoint per record.

Each record is either 200 or 500 IEEE 32-bit (4-byte) floating-point numbers, depending on how many data names are present in the ONLINE\drnames.lst file. A test must have all files of the same size, i.e. no mixing of 200 and 500 variable record lengths.

One data variable is stored in each of the 200 or 500 elements of the record. The parameters are indexed using the ONLINE\drnames.lst file, which contains a listing of what parameters are stored in each element.

Pressure data filenames are of the format: cp_yyyy.bin for the online data set, and pdr_yyyy.bin for the final data set, where yyyy is the four-digit run number (e.g cp_0047.bin). Pressure data file format is as follows:

One testpoint per record.

Each record has the following format:

14 single precision values (IEEE 32-bit, 4-byte, floating-point numbers) that are repeats of the data stored in the corresponding non-pressure data file. These values assist in identifying the data for this record.

The parameters are listed below (a value must be present for all parameters – optional parameters mean that the data does not need to be valid):

1. Test number (required)
2. Run number (required)
3. Testpoint number (required)
4. Secondary uncorrected angle of attack – typically measured by an encoder (optional)
5. Primary uncorrected angle of attack – typically measured by an accelerometer (optional)
6. Reference angle of attack – usually a repeat of either the primary or secondary. This angle of attack entry will be used for matching data from the non-pressure file, interpolations (if necessary), determining if a run is a pitch or yaw run, etc. (required)
7. Corrected reference angle of attack (optional)
8. Yaw angle (Ψ , either Ψ or β are required – including both is fine, too)
9. Yaw angle ($\beta = -\Psi$; either Ψ or β are required – including both is fine, too)
10. Dynamic pressure (lb/ft²) used to calculate the coefficient of pressures (required)
11. Unused (optional)
12. Corrected dynamic pressure (lb/ft²; optional)
13. Reference pressure code – not used by plotting (optional)
14. Unused (optional)

Either 1024 or 2048 pressure coefficients (CPs) – if the non-pressure data files are using 200 elements per record then there must be 1024 CP values, otherwise there must be 2048 CP values. These values are stored as IEEE 32-bit (4-byte) floating-point numbers.

The type of run is stored as a 16-bit (2-byte) number that is one of the following:

- 7 if the run is a pitch run (i.e. angle of attack varies more than yaw angle)
- 8 if the run is a yaw run (yaw angle varies more than the angle of attack).

Pressure reference description stored as an eight-character string. This is typically the data name of the reference pressure of the EPS modules such as PBMS (bellmouth static), TSS (test section static), etc. This entry is not used by the plotting software at this time.

Warning! You must have placeholder values for all of the parameters listed otherwise the record size will be incorrect and the plotting software will not function properly!

DATA NAMES

The data stored in the non-pressure plot data files are indexed by reading in a text file of the parameter names. The file is either the ONLINE\drnames.lst file for the online data set or the REDUCED\datnames.xxx file for the final data set.

Rules for the data names are as follows:

- Data names must be eight characters or less.
- Names are not case sensitive.
- Valid characters for data names are all A-Z, 0-9, _, -

Required data names include:

- Test number parameter must be called one of the following: TEST, TESTNO, TESTNUM
- Run number parameter: RUN
- Testpoint parameter must be one of the following: TESTPT, TP, TPA
- A parameter that begins with “ALPHA” – this will be used to determine an approximate angle of attack in units of degrees. If multiple parameters exist that begin with the word ALPHA then the plotting software

will pick one of the following to be used to represent the angle of attack: ALPBODY, ALPHABC, ALPHAC, ALPHAI, ALPHAU, ALPHA.

- A parameter that begins with either “BETA” or “PSI” – this will be used to determine an approximate yaw angle in units of degrees.

Optional names that will be used if available:

- Mach number parameter can be called one of the following: MACH, MACHC
- Dynamic pressure (lb/ft²) parameter can be called either QA or QC
- Series number parameter: SERIES
- Approximate coefficient of lift parameter can be called either CLSA or CLWA

An example of the drnames.lst text file is included below (notice that comments can be included on the same line). There must be an entry for each of the either 200 or 500 parameters, regardless of how many are actually being used. If a name has not been assigned yet, use the word “BLANK” as the parameter name. It is okay to have duplicate parameters entitled “BLANK” since that is a reserved variable name.

CODE	= 1	' Data Type Code
RUN	= 2	' Current Run Number
TP	= 3	' Number of this test point
TEST	= 4	' Test Number
QA	= 5	' Actual Dynamic Pressure (psf)
ALPHAI	= 6	' Indicated Alpha (angle of attack, deg)
PSI	= 7	' Indicated Psi (yaw angle), deg

The only other reserved variable name is anything with the form of “CPzzzz” where zzzz is a four-digit number. The pressure data variables are referred to as CPzzzz and cannot reside in the non-pressure data names list. Acceptable alternatives are CPz, CPzz, or CPzzz.

COMMUNICATION

The plotting software has features that allow it to connect to a plot data server. It will listen for text messages sent by the server instructing it what to do. The plot data server should communicate via TCP/IP on port 4000. The plotting software allows the user to choose what IP address it should use for finding the plot server. The plot server must have a static IP address.

Here are the supported commands that the plotting software will respond to:

PLOT – plot a single testpoint or an entire run. Usage: PLOT TESTxxxx, RUNxxxx, TPxxxx
xxxx need to be filled by actual numbers, e.g. run 1 is 0001. Sending over a testpoint of -1 will cause the entire run to be plotted, e.g. TP-0001

KILL – remove the specified run from all plots (if plotted). Usage: KILL TESTxxxx, RUNxxxx, TPxxxx

PRINT CURRENT PLOT

PRINT ALL PLOTS

Anything other than these messages will be interpreted as a message to be displayed in the status bar at the bottom of the main plot window. For example: if it received a string of "NOTICE: WE'RE HAVING A BLUE-LIGHT SPECIAL IN THE CONTROL ROOM - ALL DONUTS ARE 10 CENTS!", that would be relayed as a message to the user. When messages are received, the status bar is highlighted in yellow for a brief second to get the user's attention.