`ConvertHistoryFiles`
Converting Nektar output files to Matlab ® format

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Abstract.

This report presents `ConvertHistoryFiles`, a Matlab ® script for converting *.his* files containing *Nektar* simulation data into Matlab ® format.

1. Summary

The pulse waves produced by *Nektar* simulations are stored in *.his* (or history) text files. The data from these files are usually imported into Matlab ® for analysis. This report presents `ConvertHistoryFiles`, a Matlab ® script for importing data from *.his* files. It imports data from one or more *.his* files, and saves the data in one large Matlab ® file, grouped according to simulation name.

2. Running `ConvertHistoryFiles`

`ConvertHistoryFiles` can be used to import data from any number of *.his* files contained within a single directory. `ConvertHistoryFiles` can be called using

```
ConvertHistoryFiles(up);
```

where `up` is an optional input argument, a structure of input parameters containing the following optional inputs:

- `up.dir` : the directory containing .his files. If this is not specified then the user is prompted to select the directory manually.
- `up.filename` : a cell containing the filename(s) of .his files to be imported. If this is not specified then all .his files within the chosen directory are imported.
- `up.all_beats` : a logical (true or false) indicating whether to export data from the entire simulations (*i.e.* all beats, true), or only the final complete beat (false). The default is to export all data parameters. If this is set to true, then
- `up.all_data` : a logical (true or false) indicating whether to export all data parameters (true), or only selected commonly used parameters. The default is to export data from the entire simulation.

- `up.required_domains` : a vector of the numbers of domains to be exported. The default corresponds to the numbering in the 116-artery model: 1 - ascending aorta; 15 - left carotid; 21 - left brachial; 22 - left radial; 42 - left common iliac; 46 - left femoral; 49 - left anterior tibial; 84 - left superior thyroid; 87 - left superior temporal; 112 - digital. Only used if `up.all_data` is true.
- `up.distance_els` : a cell containing a list of the distance elements from which data should be extracted at each of the required domains. The defaults are: inlet (1) of the ascending aorta; mid-point (2) of the carotid; mid-point (2) of the brachial; outlet (3) of the radial; mid-point (2) of the iliac; inlet (1) of the femoral; outlet (3) of the anterior tibial; outlet (3) of the superior thyroid; mid-point (2) of the temporal; outlet (3) of the digital. These numbers were based on the assumption that three history points are specified to *Nektar*, corresponding to the inlet, mid-point and outlet of the arterial segments. Multiple distance elements can be prescribed for a particular segment by specifying a vector rather than a single number. Only used if `up.all_data` is true.
- `up.required_signals` : a cell containing the signal types to be exported. The default is: P, U, Q and A. Other signals of possible interest include P_e (the elastic component of the arterial pressure) and P_{ext} (the external pressure acting on the arterial wall). Only used if `up.all_data` is true.

For instance, to extract data from all of the *.his* files saved on the Desktop, one might use:

```
up.dir = '/Users/petercharlton/Desktop'; ConvertHistoryFiles(up);
```

If only interested in two particular files, then the following could be used:

```
                up.dir = '/Users/petercharlton/Desktop';
up.filename = {'M116art_0000-0000_1.his', 'M116art_A000-AAAA_1.his'};
                        ConvertHistoryFiles(up);
```

3. The output data file

The output data file, called *simulation_data.mat*, contains a single variable called *data*. This structure contains the data from the last complete beat of each simulation. If the chosen directory contains only *.his* files from a single simulation (one file per arterial domain of interest), then the data are grouped in a single field (*e.g.* `data.M116art`). If, on the other hand, the directory contains *.his* files from several simulations, then the data are grouped into multiple fields, one per simulation (*e.g.* `data.M116art_0000_0000`, `data.M116art_A000_AAAA`, and `data.M116art_Z000_ZZZZ`. Within each field are several items:

- `domain_no` : The number of the arterial domain
- `distances` : A vector of distances from the central end of the arterial domain, at which the measurements were taken.

- `fs` : The sampling frequency
- `P` : The arterial pressure *
- `U` : The flow velocity *
- `Q` : The volume flow rate *
- `A` : The luminal area *

Each of the items marked by * are a matrix of values, with each column denoting the values over time for a particular measurement point. The columns correspond to the measurement points specified by `distances`.

4. Acknowledgment

`ConvertHistoryFiles` is an adaptation of scripts originally written by Marie Willemet.