How to Subtract FE Data from DIC Data

This folder contains a DIC project (fe_project.z3d) from a composite tow buckling experiment. There are five stereo image pairs and five corresponding finite element results (fe_?.vtp). The finite element data was generated in ABAQUS and converted to VTP files. There is apython script available from Correlated Solutions, Inc. that can be used for exporting ABAQUS data. This script requires an ABAQUS license.

The script contained in this project (scripts/subtract_fe.py) can be used to subtract the finite element results from the DIC data. To accomplish this, the following steps have to be performed:

1. Coordinate system alignment. This has already been done and the Vic-3D project will produce data in the correct coordinate system. Make sure not to use any coordinate transformations during analysis or post-processing.

2. Correlation analysis. This step is accomplished by opening the project file (fe_project.z3d) in Vic-3D and clicking the 'Start analysis' button. Note: It is important not to activate the 'Best plane fit' option to obtain the correct coordinate system.

3. Data subtraction. The python script is used for this task. Note that the script requires the VicPy module, as well as the vtk module. The latter can be installed via anaconda if not already available (in the anaconda console, type: conda install vtk). The sklearn module is also required but should be pre-installed on most systems. To subtract the FE data from the DIC data, the script is used as follows:

```
> python scripts/subtract_fe.py image-0_0.out fe_0.vtp cmp_0.out
```

The script will print status information about how many point correspondences were successfully matched. This process needs to be repeated for the remaining DIC/FE data pairs:

```
> python scripts/subtract_fe.py image-1_0.out fe_1.vtp cmp_1.out
> python scripts/subtract_fe.py image-2_0.out fe_2.vtp cmp_2.out
> python scripts/subtract_fe.py image-3_0.out fe_3.vtp cmp_3.out
> python scripts/subtract_fe.py image-4_0.out fe_4.vtp cmp_4.out
```

4. Visualization. In Vic-3D, open the file fe_project.z3d if not already open. Create an iris project and select 'Add file sequence' from the 'Iris' menu. Select the cmp_?.out files and press 'Ok'. Add a description for the sequence in the pop-up window, e.g., 'Comparison'. Now, add a 2D or 3D plot and select the sequence as the data source in the property editor. The differences between the DIC and FE data can now be selected as the contour variable, e.g., ΔW.

If you have any questions or need help, please do not hesitate to call or email us at support@correlatedsolutions.com.