Loop Foundation

Making Loop R&D sustainable

LoopStructural WebApp

The aim of this demo is to demonstrate how to use the LoopStructural WebApp to build simple model and experiment with some of the modelling parameters. The WebApp is self-contained and runs a LoopStructural (flask) server and a javascript UI.

Download this manual, the WebApp and data from:

https://drive.google.com/file/d/1hpNyKjatbRFjBcO6bBXiklj8EQttgW-S/view?usp=sharing

- LoopStructuralServer.exe
- Simplemodel.csv

The data

We are going to use a csv file containing information related to the location of the data and information to build the model. Column names are restricted and some minimum information is needed.

- X,Y,Z: location of the data in 3D space
- nx, ny, nz: vector normal to structural information. These can be replaced by ("dip" and "dip_dir") OR ("strike and "dip" using RHR).
- val: is the value of the scalar field at that location. Usually this should be the cumulative thickness of a conformable series of horizons. This means that LoopStructural would interpolate the horizons' thickness.
- feature_name: a name given to the feature to be modelled with that datapoint.

	X	Y	Z	nx	ny	nz	val	feature_name
0	500	100	1500	-0.704416	-0.704416	0.087156	0	flt1
1	250	350	1500	-0.696364	-0.696364	0.173648	0	flt1
2	100	500	1500	-0.111619	-0.633022	-0.766044	0	flt1
3	1250	1250	1500	-0.936117	-0.340719	0.087156	0	flt2
4	500	500	2000	-0.150384	-0.086824	0.984808	1050	fm
5	500	500	1800	-0.224144	-0.129410	0.965926	850	fm
6	500	500	1550	-0.212012	-0.148453	0.965926	600	fm
7	500	500	1450	-0.212012	-0.148453	0.965926	500	fm
8	500	500	1200	-0.224144	-0.129410	0.965926	250	fm
9	500	500	950	-0.150384	-0.086824	0.984808	0	fm
10	1500	1500	2100	-0.212012	-0.148453	0.965926	1150	fm
11	1500	1500	1900	-0.224144	-0.129410	0.965926	950	fm
12	1500	1500	1650	-0.150384	-0.086824	0.984808	700	fm
13	1500	1500	1550	-0.150384	-0.086824	0.984808	600	fm
14	1500	1500	1300	-0.224144	-0.129410	0.965926	350	fm
15	1500	1500	1050	-0.212012	-0.148453	0.965926	0	fm

Fig.1: Example of data used to build 3D models directly in LoopStructural.

Fig.1 shows an examples of data and these are the data we are going to use for the modelling.

Fig.2 shows the data including the cumulative thickness (or val) and structural information regarding to the dip of the horizons to be modelled. The data are along two drill holes on in the NE corner of the bounding box and the other one in the SW corner. The horizons are dipping very gently to the SW with strike and dips varying within 5-10 degrees from one point to the other.

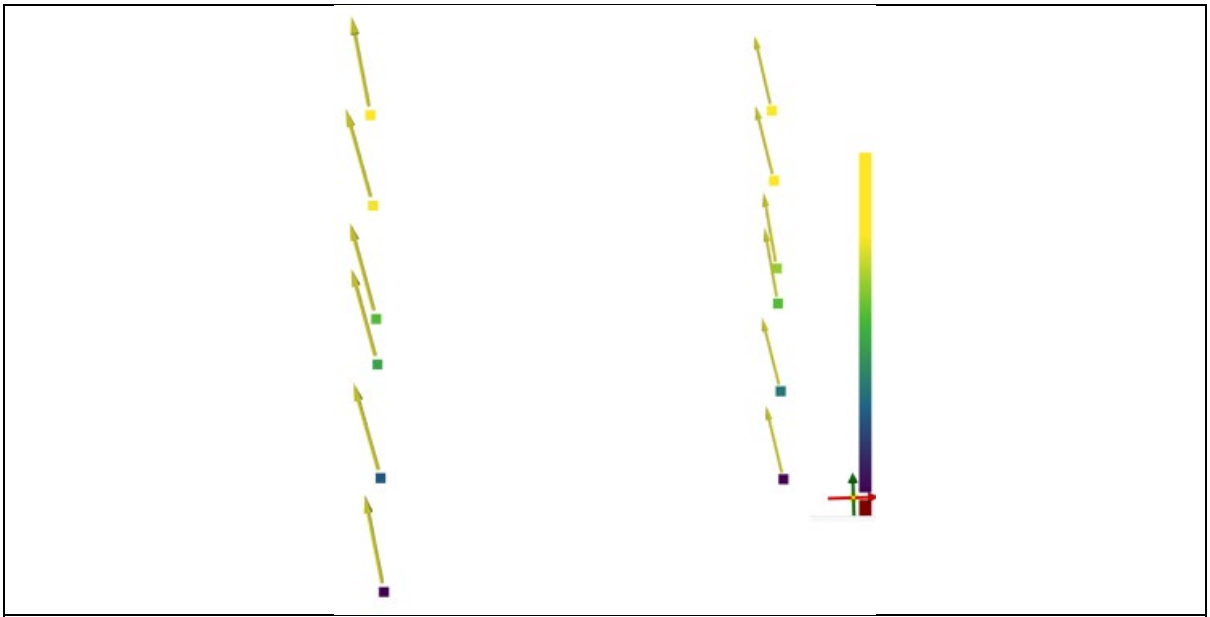

Fig.2: the data in EW cross-section showing the cumulative thickness as a colour and the normal to the horizons at the drill hole intersections.

The data also contains 3 structural points for fault "flt1" and one point for fault "flt2".

Starting the app

Double click on "LoopStructuralServer" and then CRTL+click on the local server address (see Fig.3).

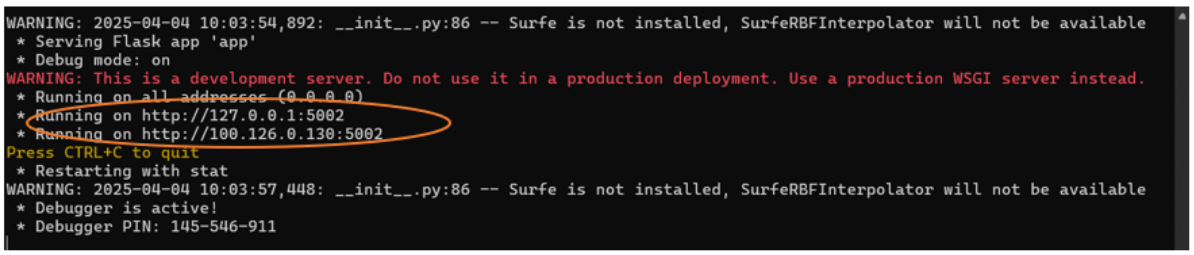

Fig.3: the server starts in a powershell and requires the user to CRTL + click on one of the local server address to start in a web browser.

The following page should open in your usual browser (Fig.4)

Fig.4: the LoopStructural interface at start-up

Visualising the data

Fig.5: Workflow to create a new model with the SimpleModel.csv data.
Bounding box should be set at 2000,2000,3000.

Click Create after filling in the "event 0" information.

Visualise the data following the workflow in Fig.6

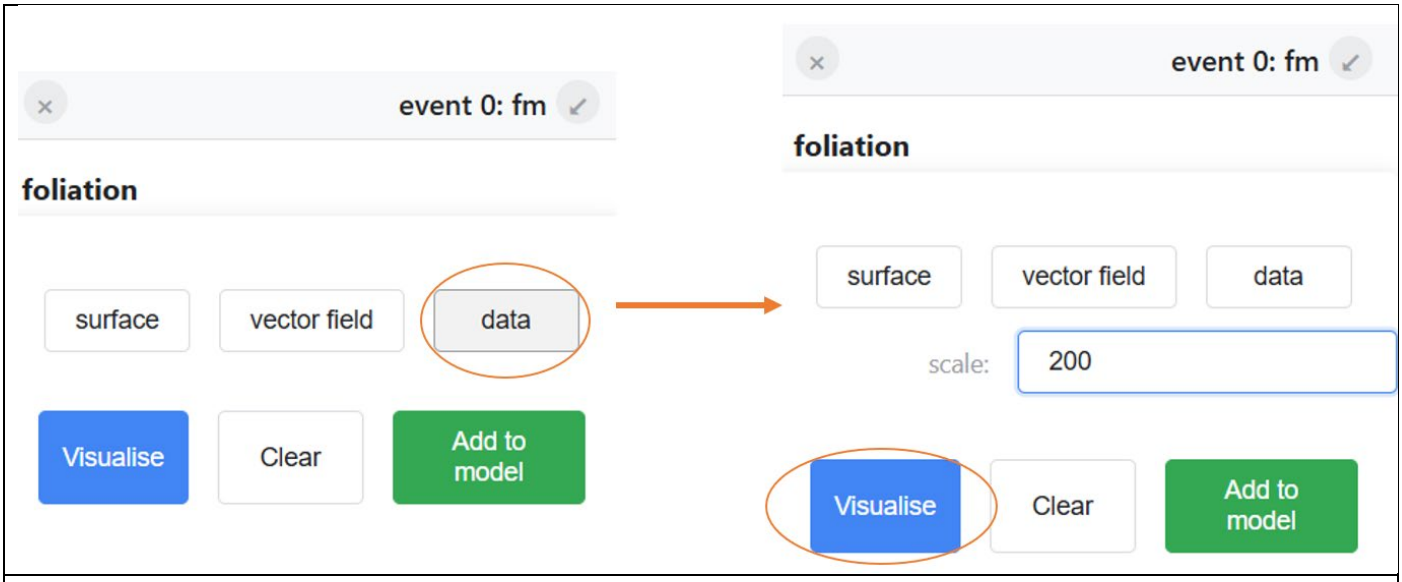

Fig.6: Data visualisation workflow

The app will allow to visualise and tweak parameters for each event individually and then add these elements to the model for visualisation all together. Example: try to change the regularisation to 0.8

Visualising the Model

The model will be visualised as a set of surfaces, representing the iso-values of a given scalar field (fault or formation). For the stratigraphy we will use the values from the "val" column as this is what the input data suggest. For faults the fault plane is the isovalue "0" of the fault scalar field. Fig.7 shows how to visualise the stratigraphy.

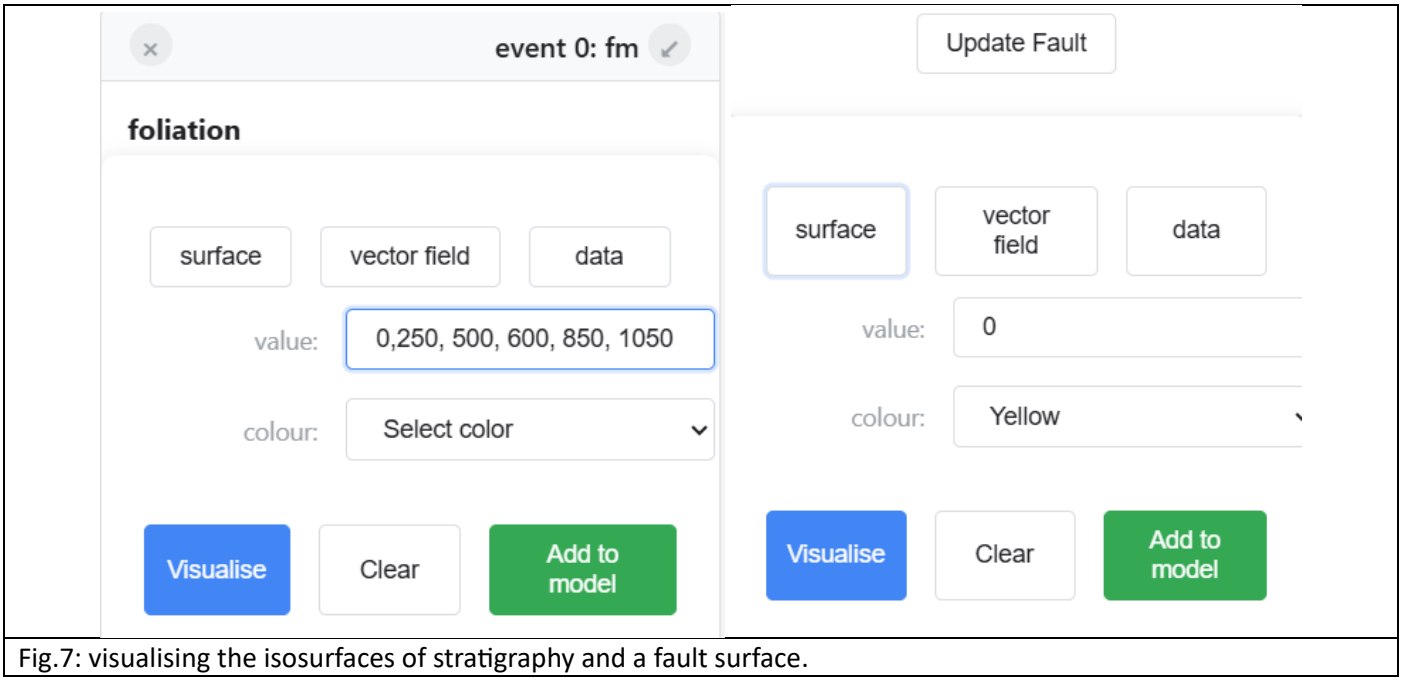

Fig.7: visualising the isosurfaces of stratigraphy and a fault surface.

Isosurface values: 0, 250, 500, 600, 850, 1050

At this stage, you could export to “geoh5” which will allow you to visualise the model in Geoscience Analyst (freeware from Mira Geoscience) – although this seems not to work properly at the moment.

Repeat the process:

- Unfortunately, at this stage you will have to quite the WebApp, kill the server (CRTL+C in the powershell window) and start again.
- Repeat with a regularisation of 0.9
- You could also repeat with different structural data

Model 2: Adding faults.

As you may know, LoopStructural is time-aware which means that the events have to be modelled in order from the youngest -> oldest. In that case, we will need to add “flt2”, then “flt1” then the stratigraphy to our model.

Re-start the server app and add the faults and the stratigraphy sequentially. Note, you could start by only adding one fault with given parameters and change these parameters to see the resulting effects on the model.

Let’s only add “flt2” and the formation.

Parameters for “flt1” and “flt2” should be:

Loop Displacement: flt2 = -500 ; flt1 = 750
Loop Fault_slip_vector:
Loop Major_axis: 2000
Loop Minor_axis: 2000
Loop Intermediate_axis: 2000

Play with parameters – see how the models change and please provide written feedback to laurent@loop3dfoundation.org about what you would like to see in the future in the App.