

Cross-modelling calibration experiments

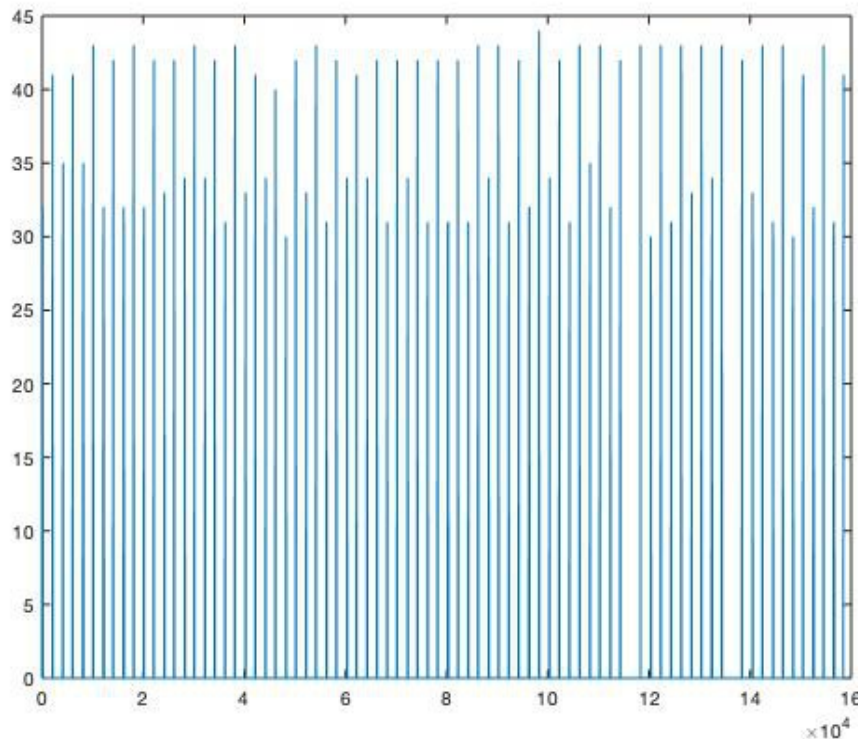
- 3 static experiments with dish angle variation
- 2 rotating experiments with signal elevation variation

Processing experiment data

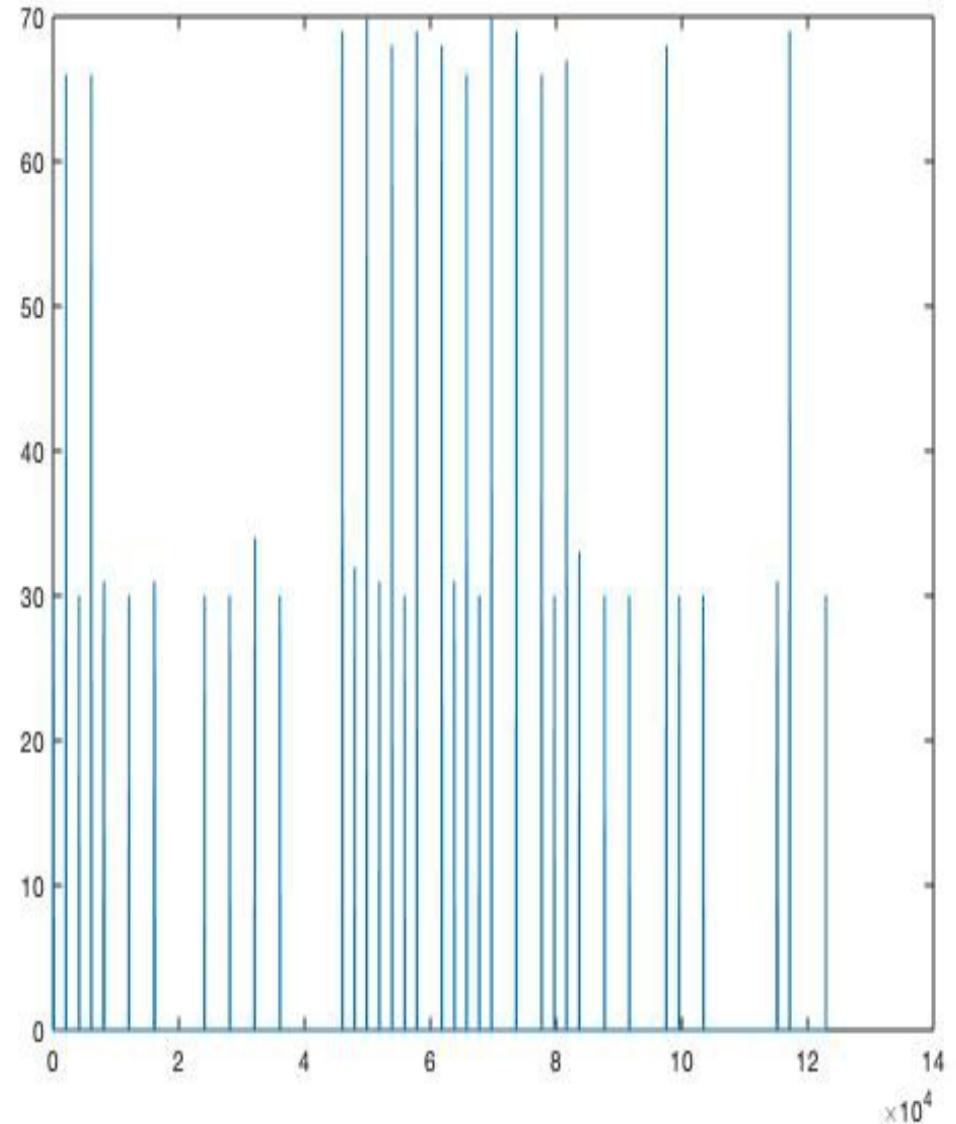
- Removing pulse envelop offsets
- Concatenating pulse data from different files for one sample
- FFT or not?
- Finding and retaining peaks
- Averaging across a sample
- Offsetting noise – normalising output between channels ?

Processing experiment data – rotating experiments

- Identifying interferences
- Retaining 'bee' signal



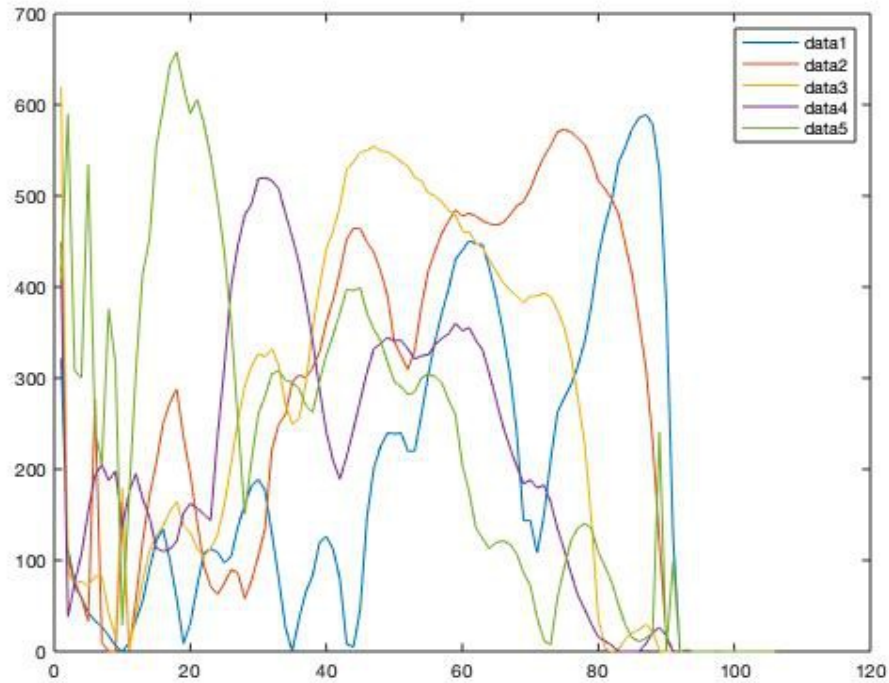
Exp 25



Exp 26

Summarising data

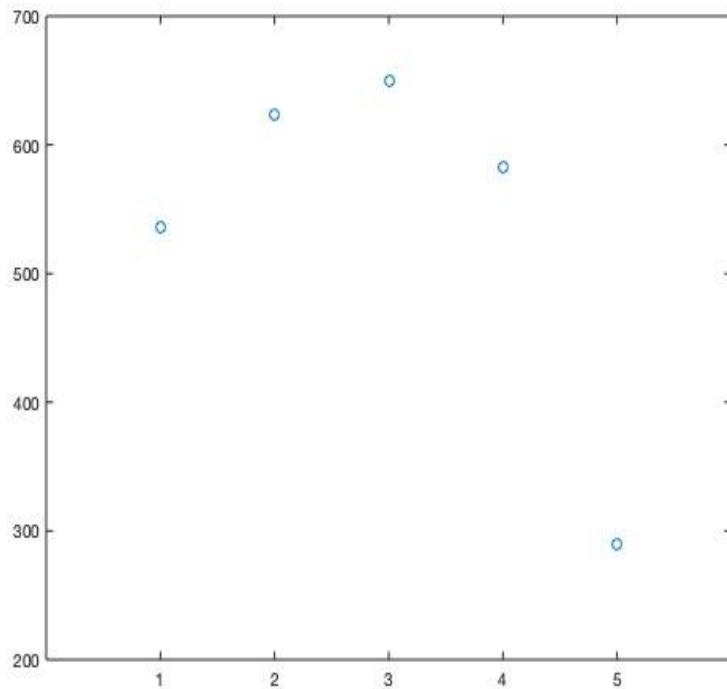
- integral



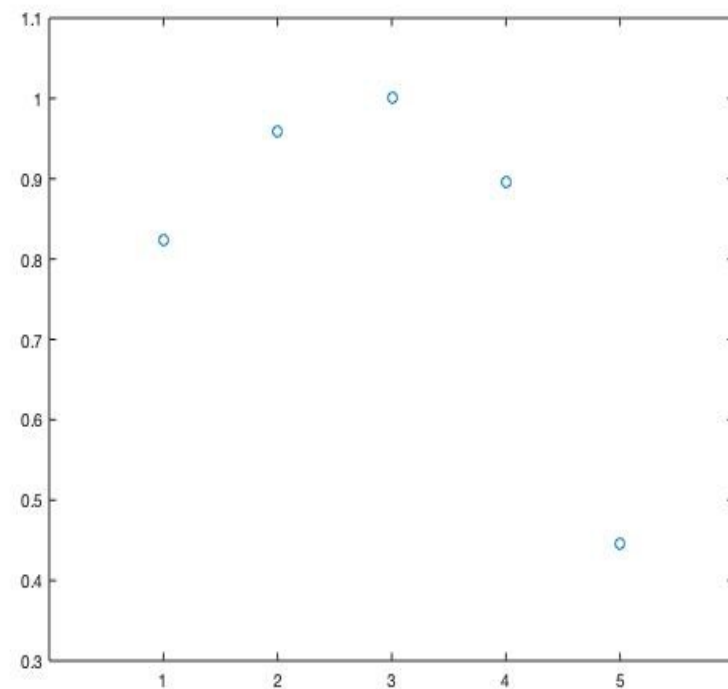
Normalising

Divide each quantuple by its maximum's absolute value

It keeps the ratios between values, normalising all values to the range [0,1]

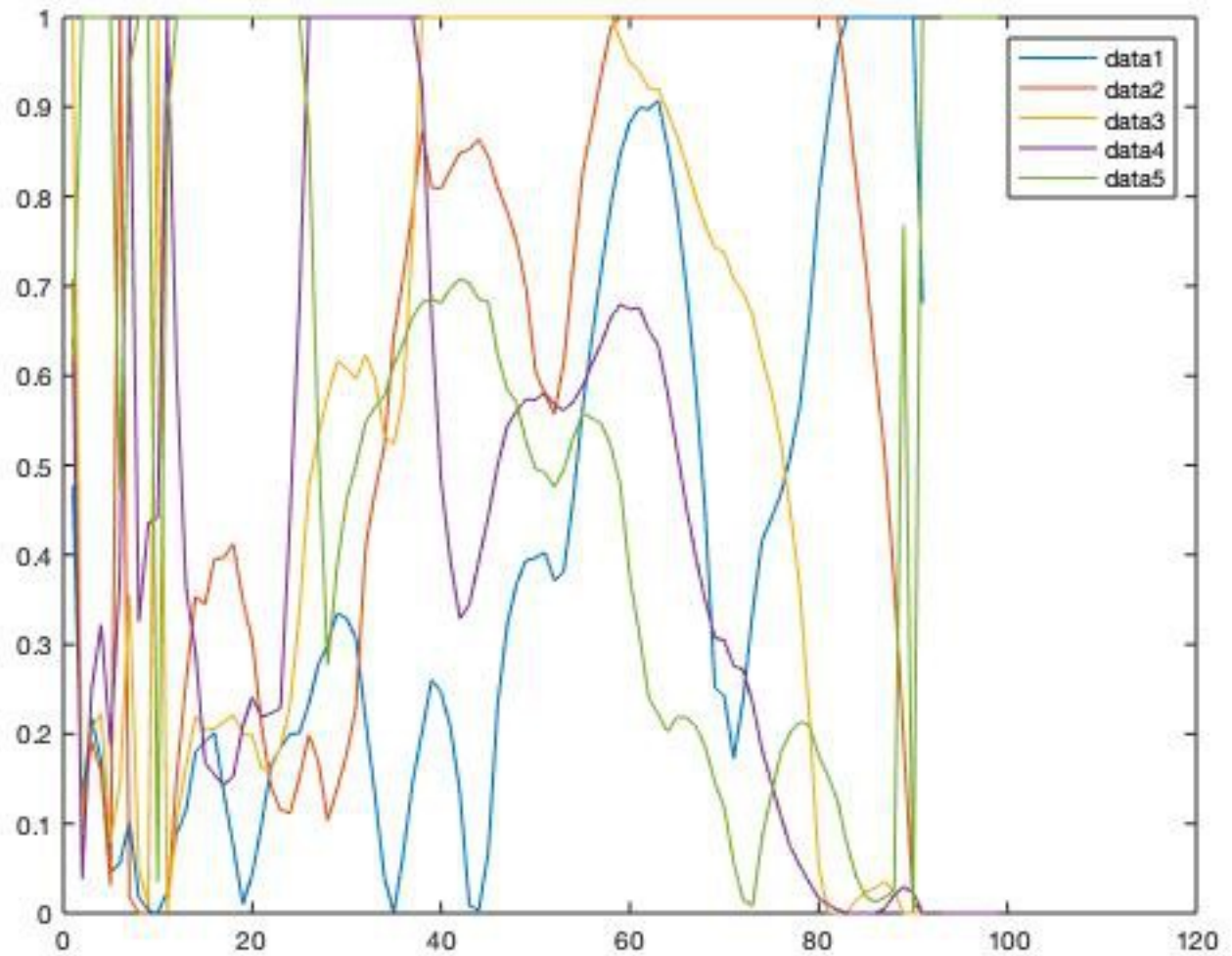


original

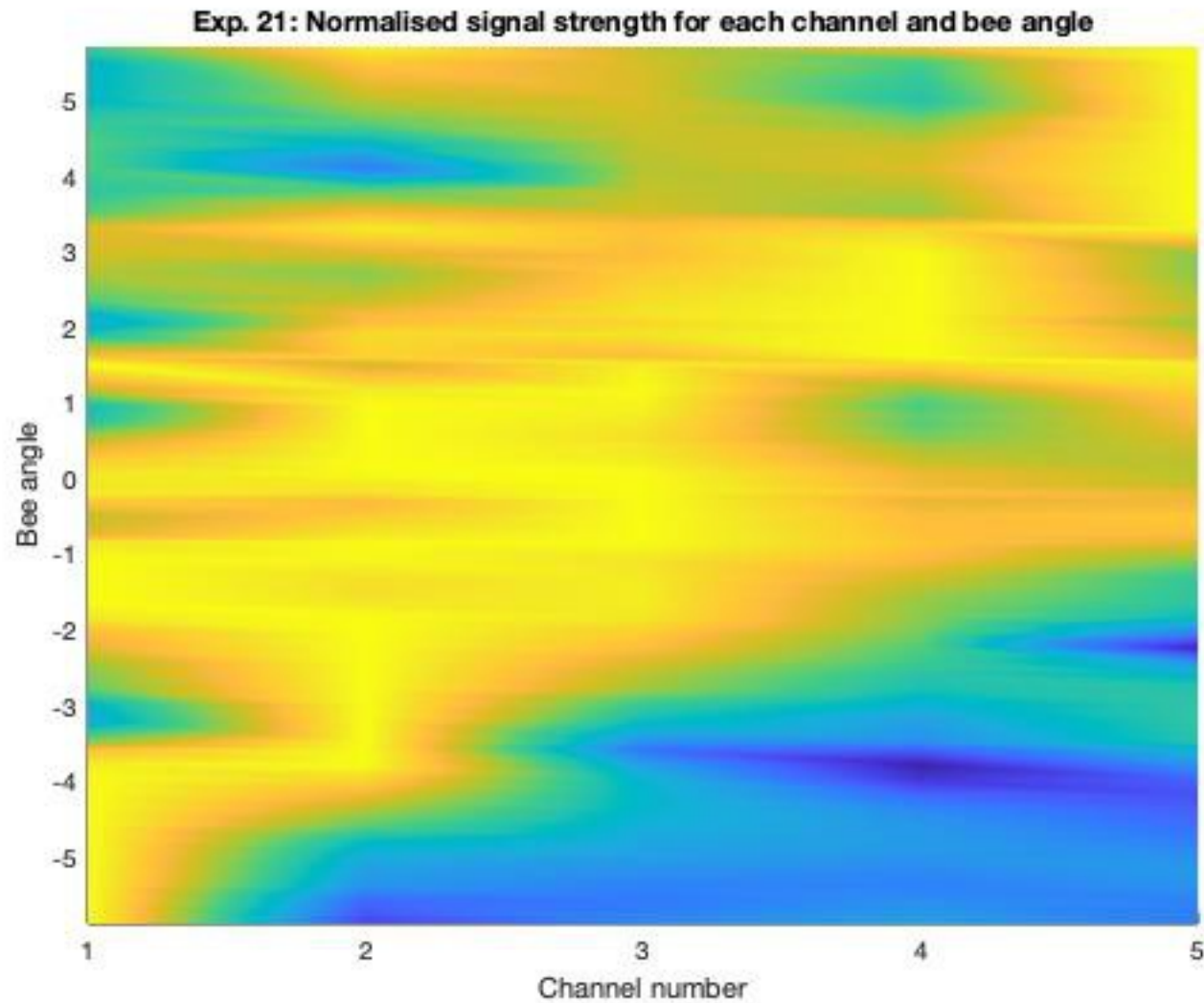


normalised

Normalised data



Normalised data



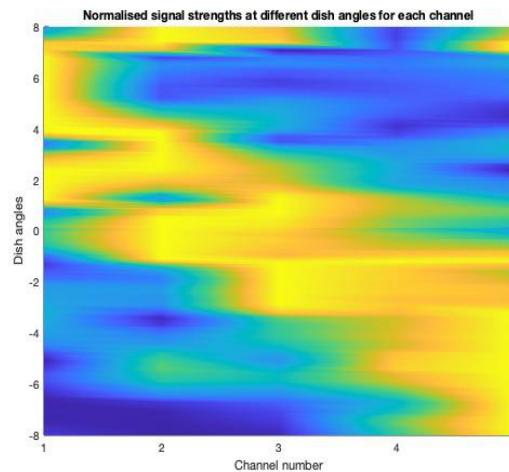
Modelling

Use existing data to predict elevation for new measurements

Measuring and predicting bee angle instead of elevation is independent of the distance

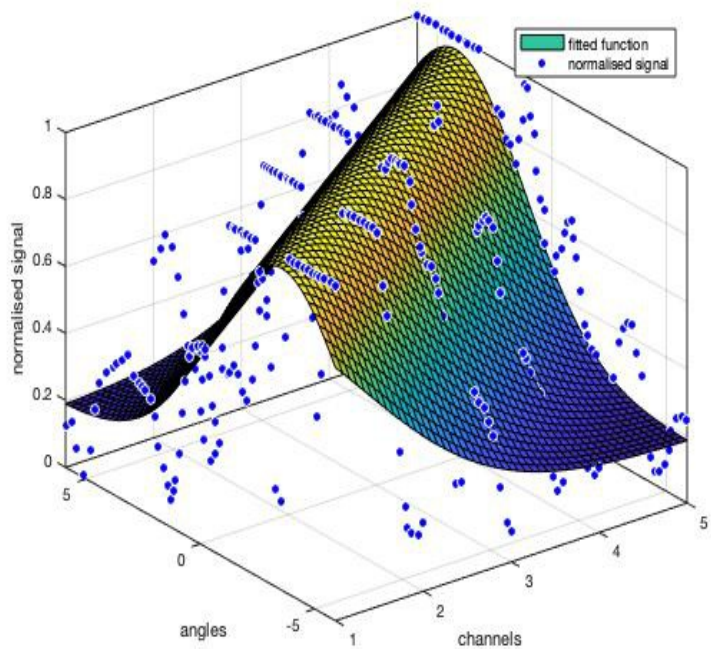
Lookup model

- Loookup model is a table of all quintuples seen in the experiment; modelling a new quintuple involves finding the one with the least square difference

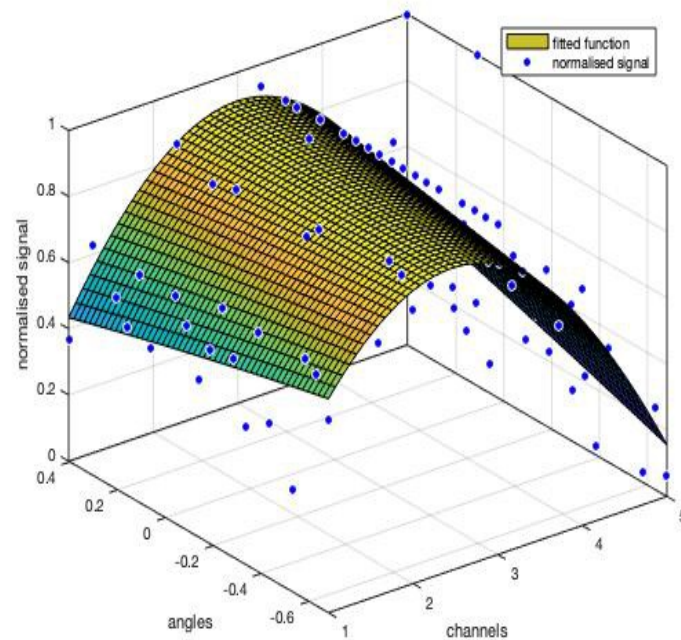


Gaussian model

Gaussian model is a Gaussian function with constraints that best fits the experiment data; modelling a new quintuple involves fitting it to the Gaussian surface



Exp 22 static

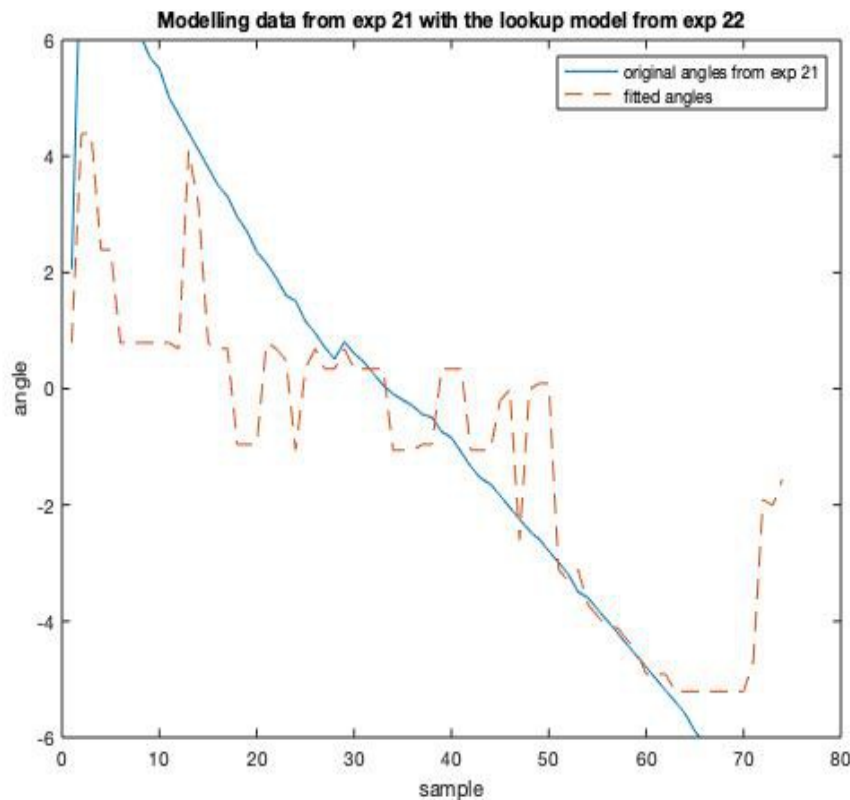


Exp 26 rotating

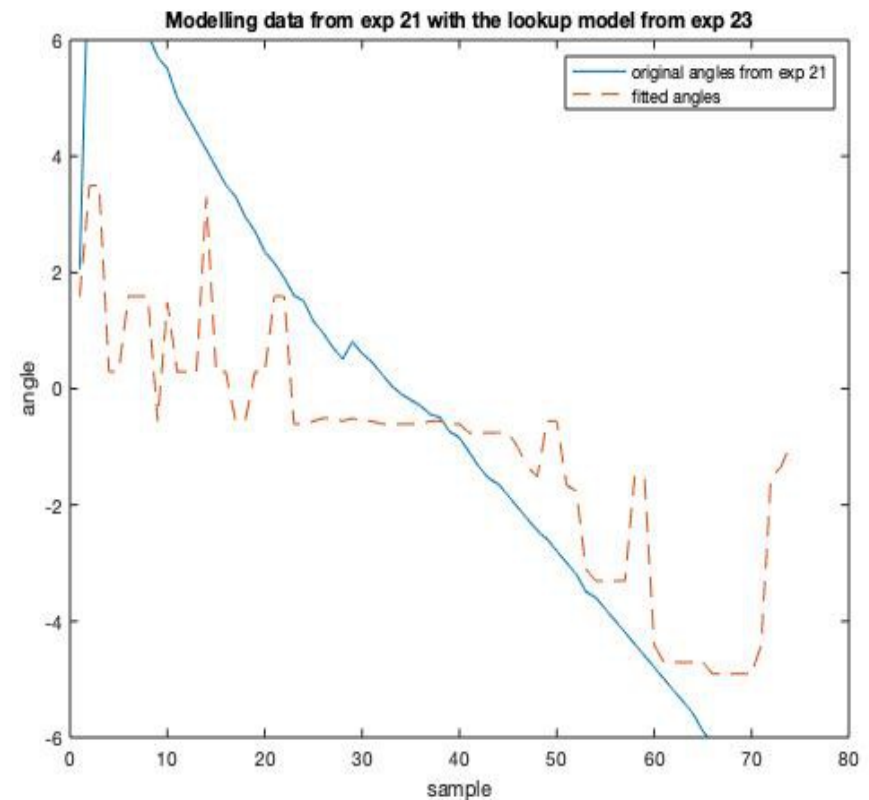
Cross-modelling static experiments

Lookup model

modelling exp 21



Model from exp. 22

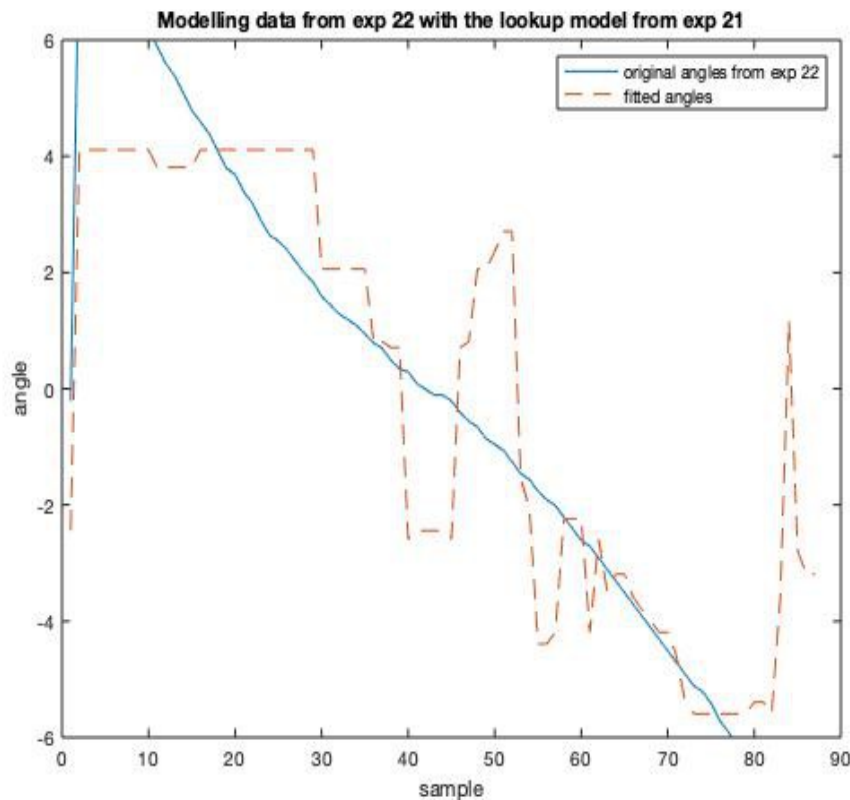


Model from exp. 23

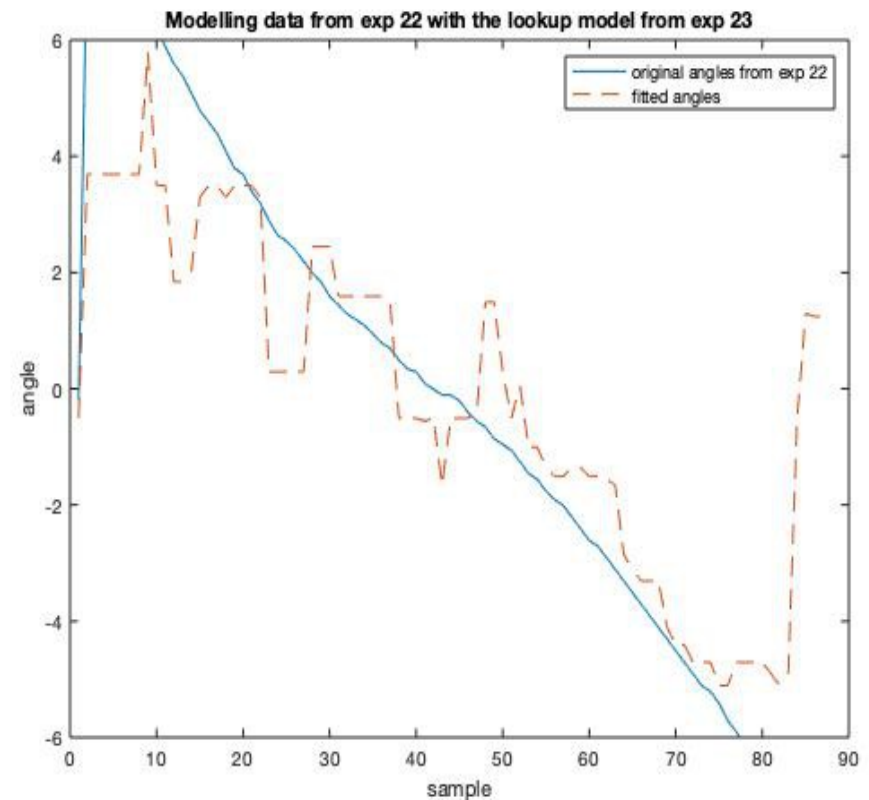
Cross-modelling static experiments

Lookup model

modelling exp 22



Model from exp. 21

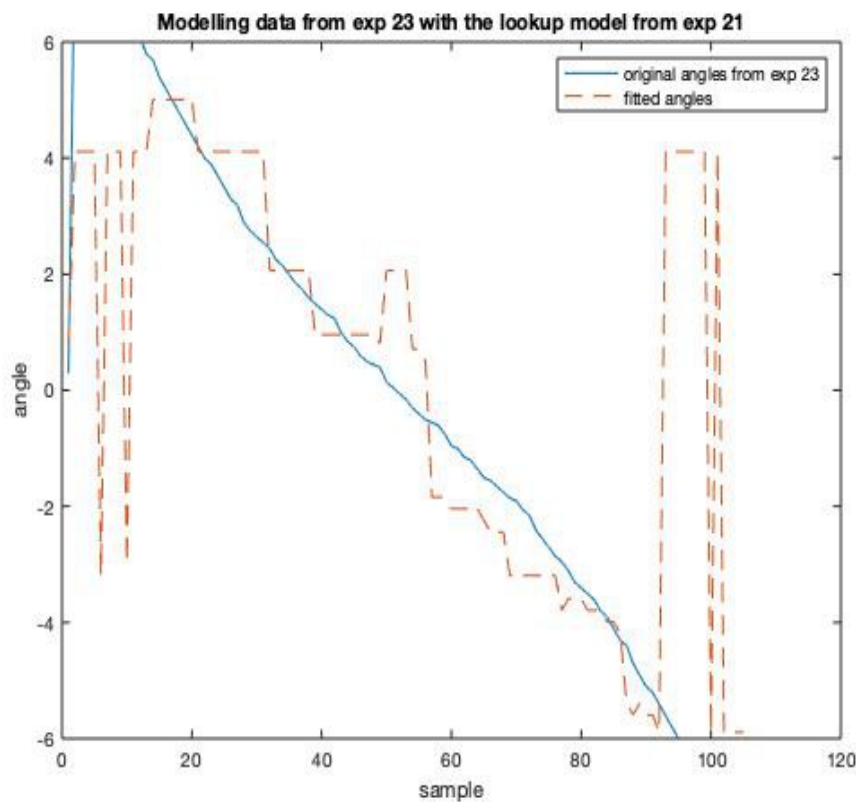


Model from exp. 23

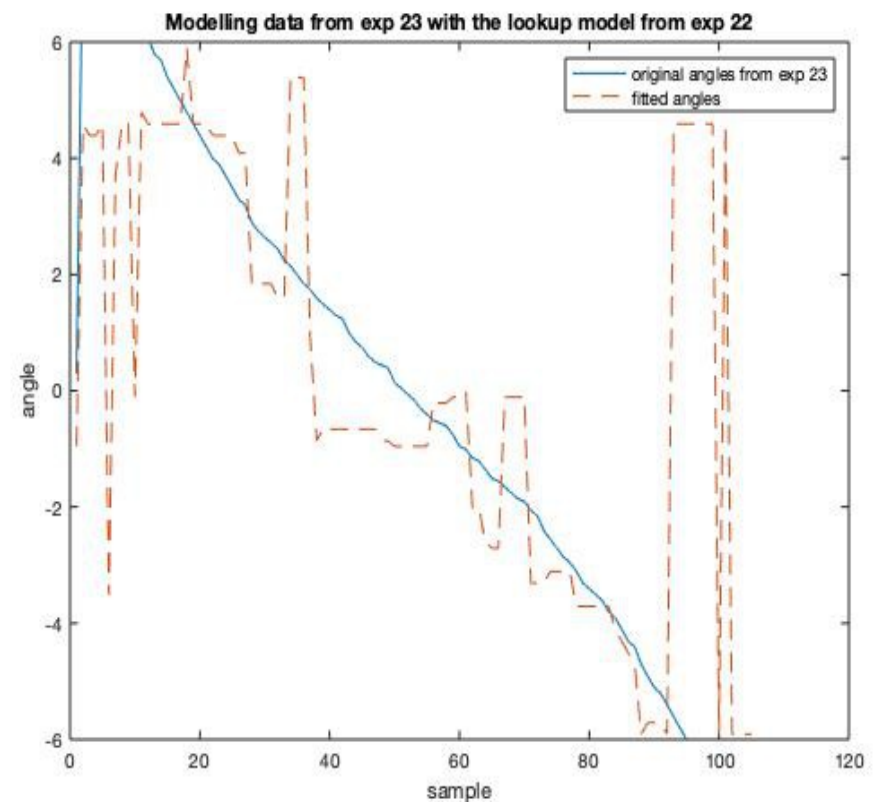
Cross-modelling static experiments

Lookup model

modelling exp 23



Model from exp. 21

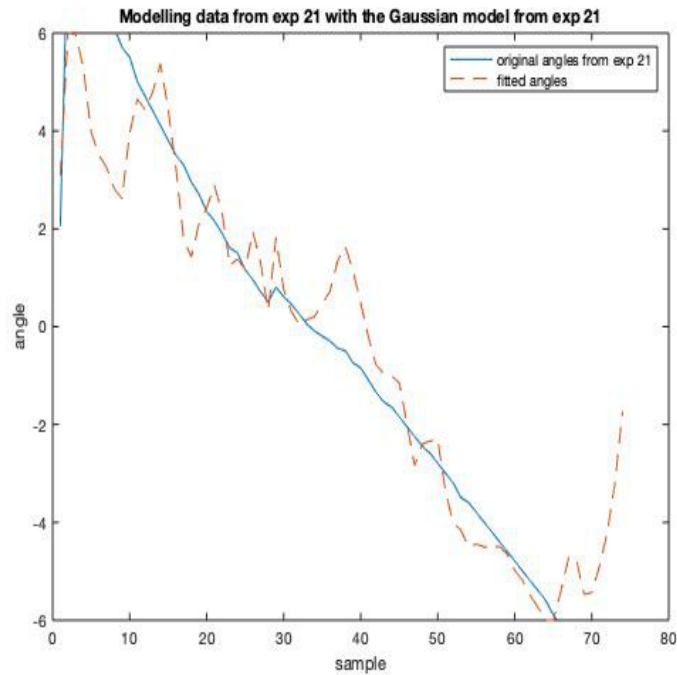


Model from exp. 22

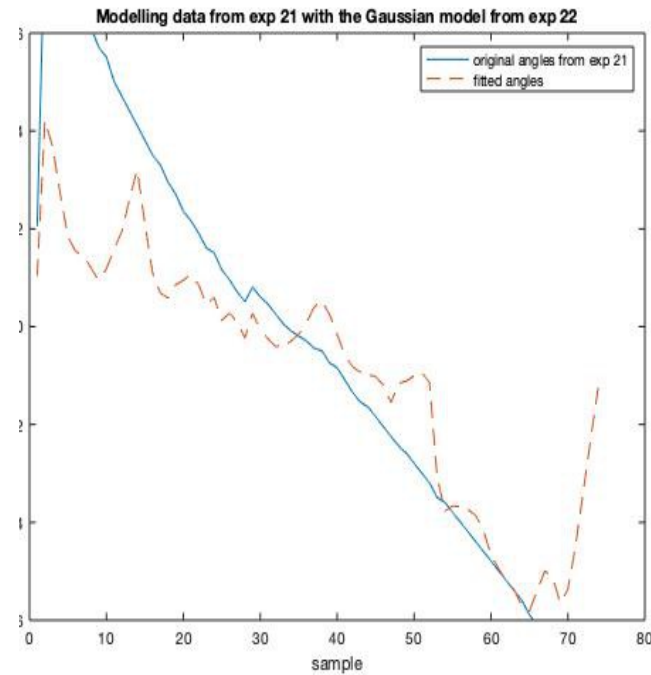
Cross-modelling static experiments

Gaussian model

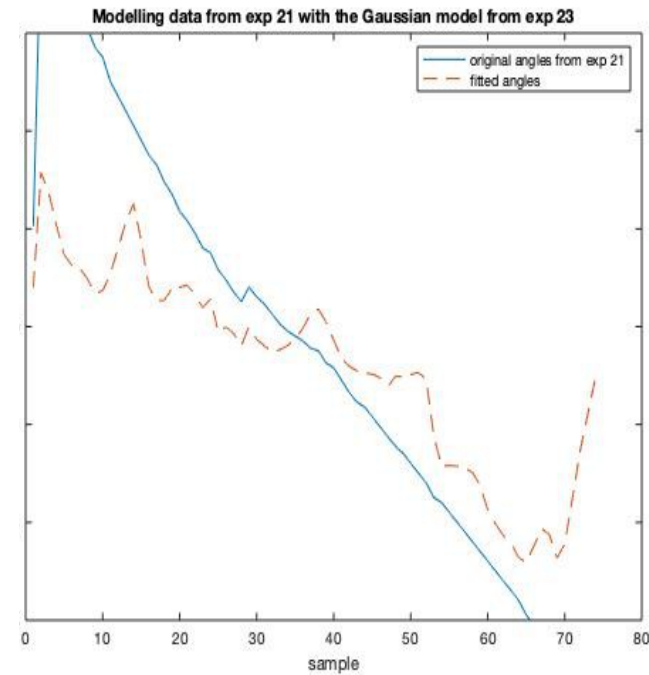
modelling exp 21



Model from exp. 21
- modelling itself



Model from exp. 22

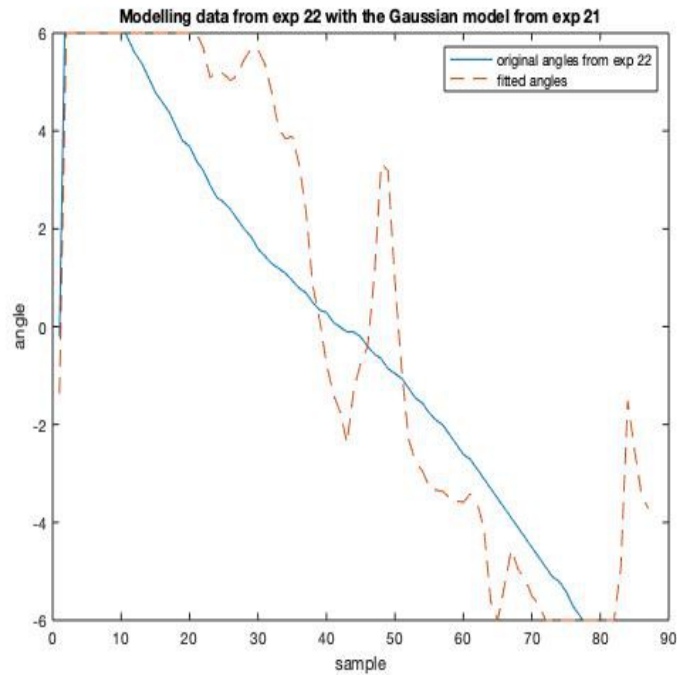


Model from exp. 23

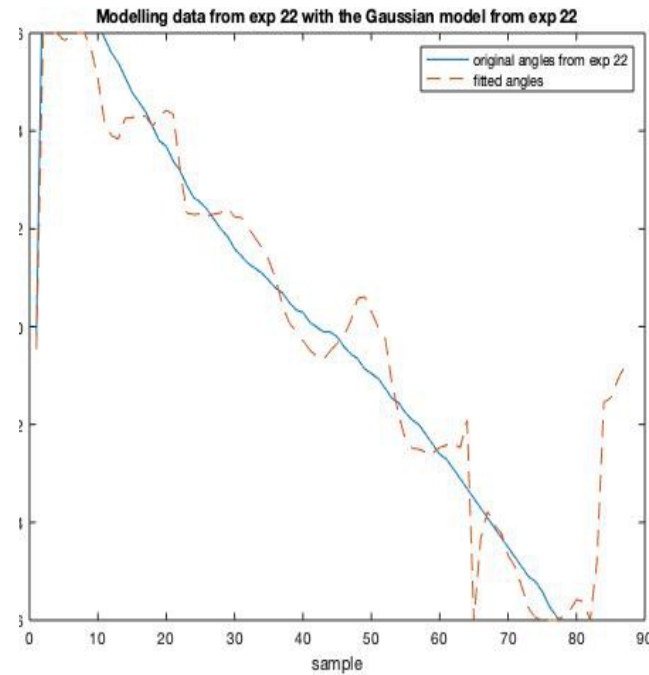
Cross-modelling static experiments

Gaussian model

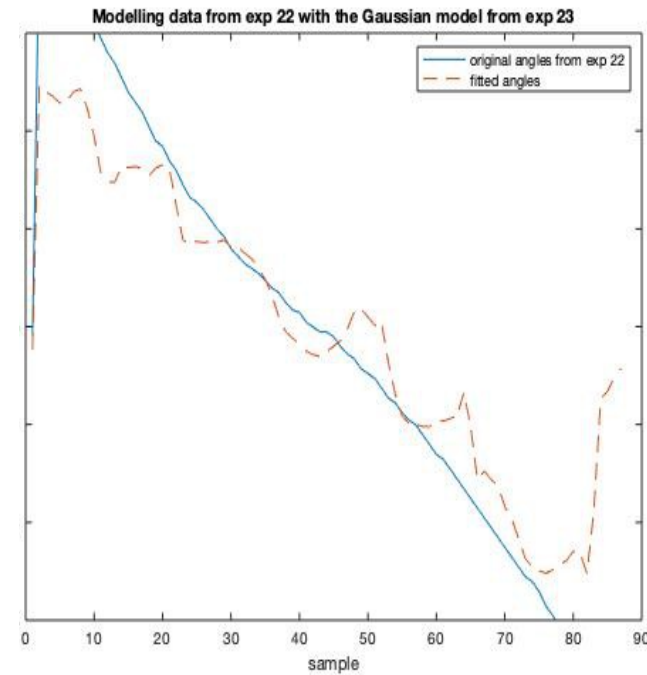
modelling exp 22



Model from exp. 21



Model from exp. 22
- modelling itself

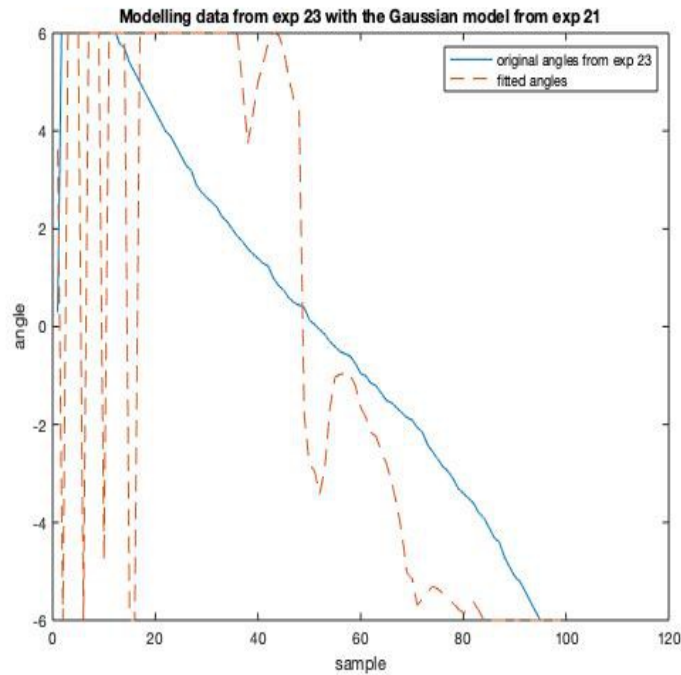


Model from exp. 23

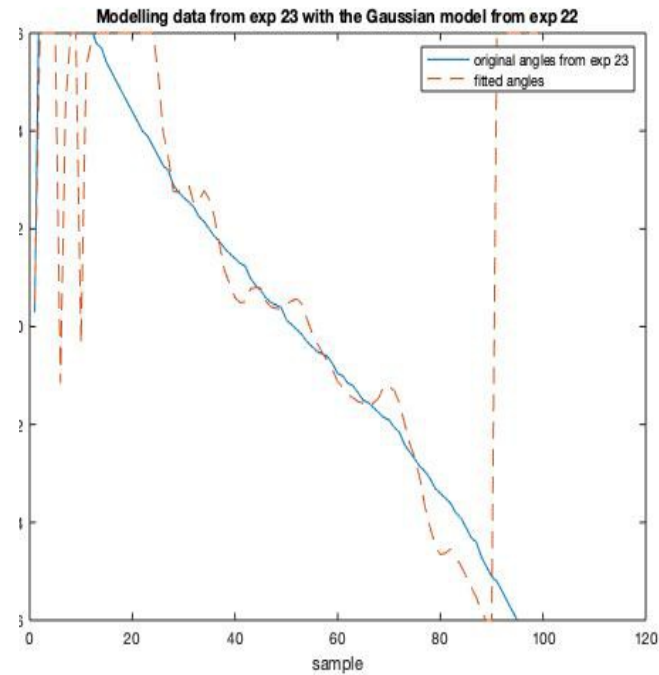
Cross-modelling static experiments

Gaussian model

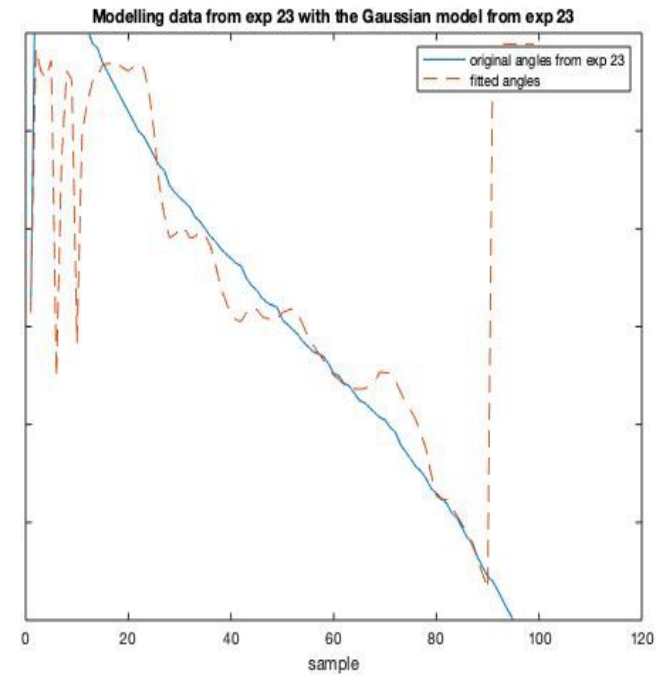
modelling exp 23



Model from exp. 21



Model from exp. 22



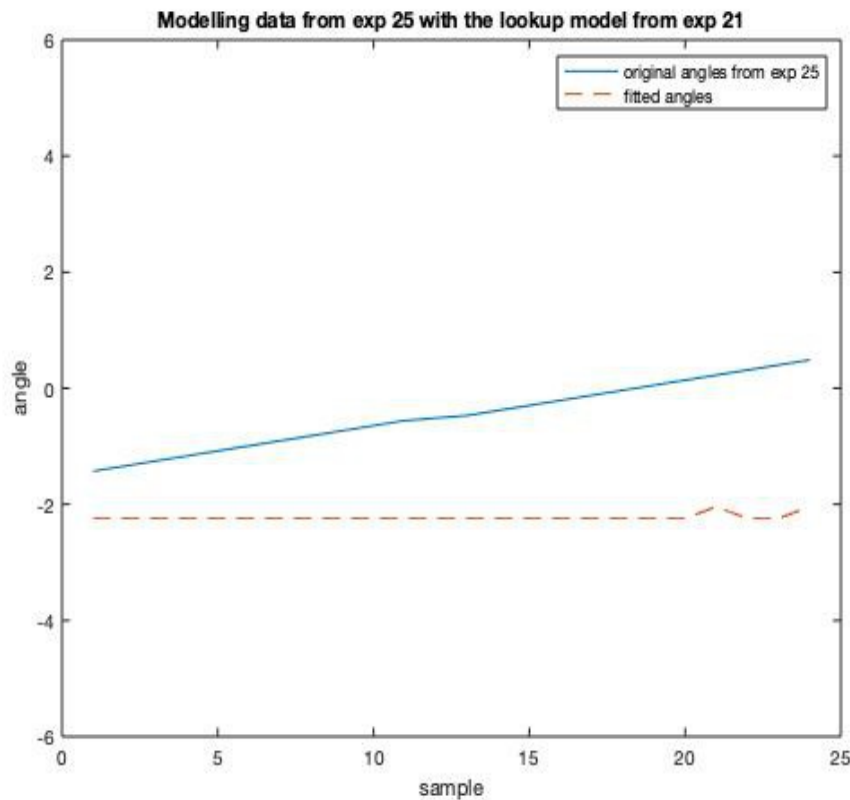
Model from exp. 23
- modelling itself

Takeaways from cross-modelling static experiments

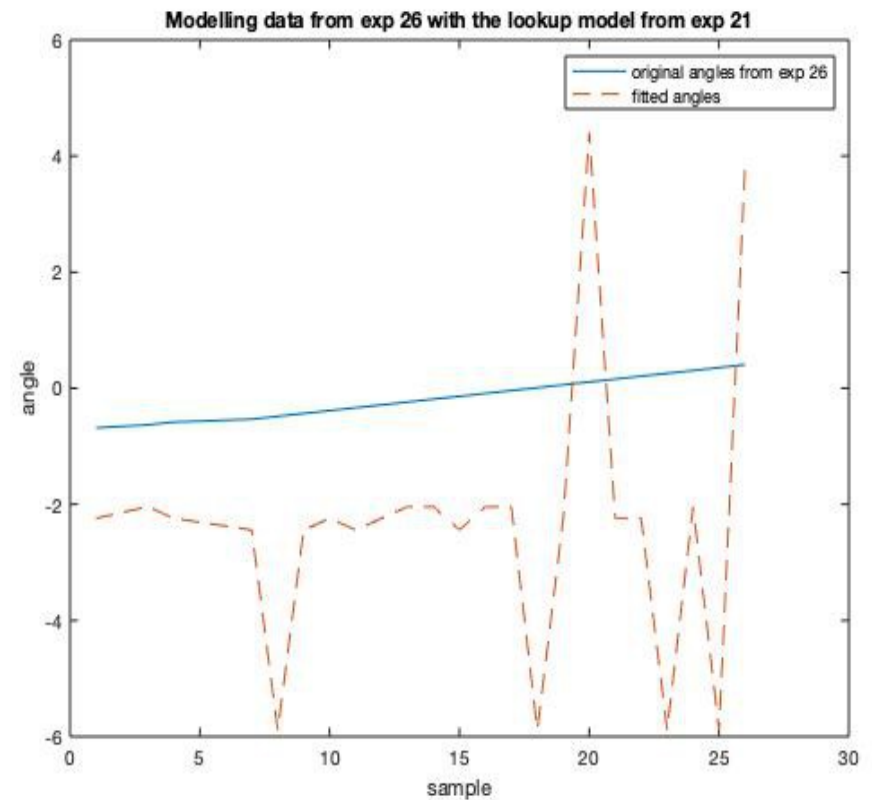
- General shape of the modelled data is correct
- It seems the data is more consistent between exp 22 and exp 23, exp 21 differs more
- Lots of errors around the edges of the models
- Where lookup models fail, the errors are quite large, whereas Gaussian models produce smaller errors

Modelling rotating experiments through static data

Lookup model from exp 21



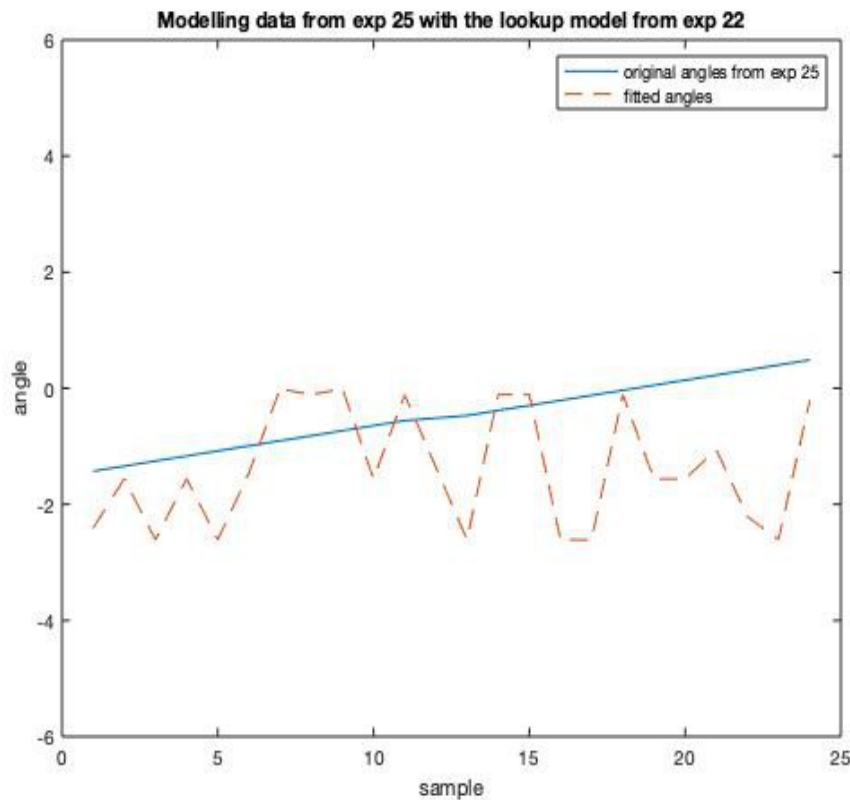
exp. 25



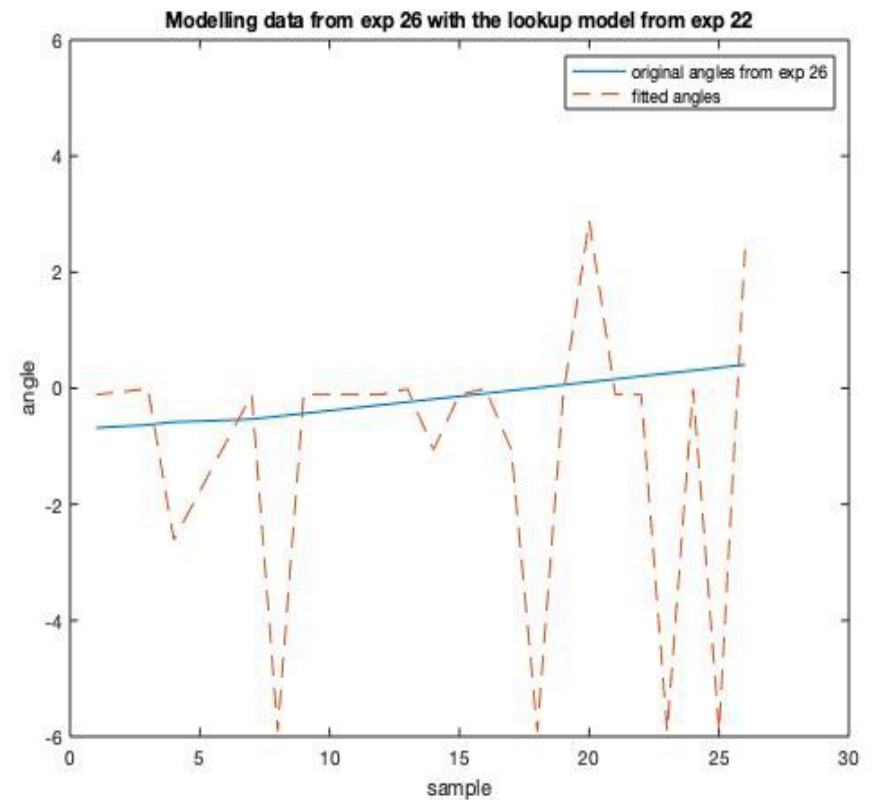
exp. 26

Modelling rotating experiments through static data

Lookup model from exp 22



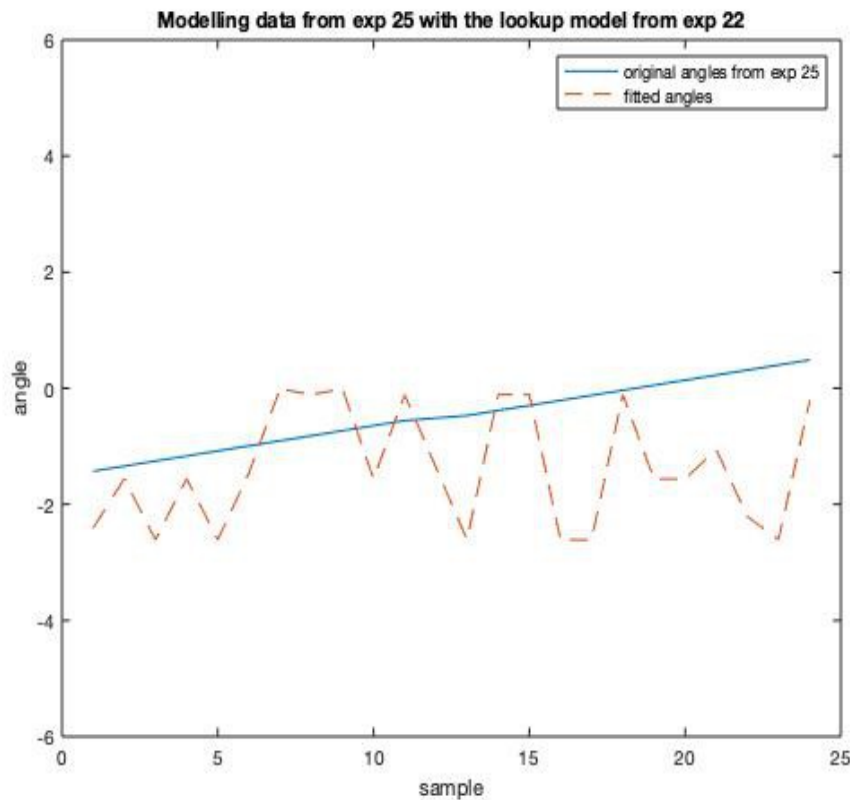
exp. 25



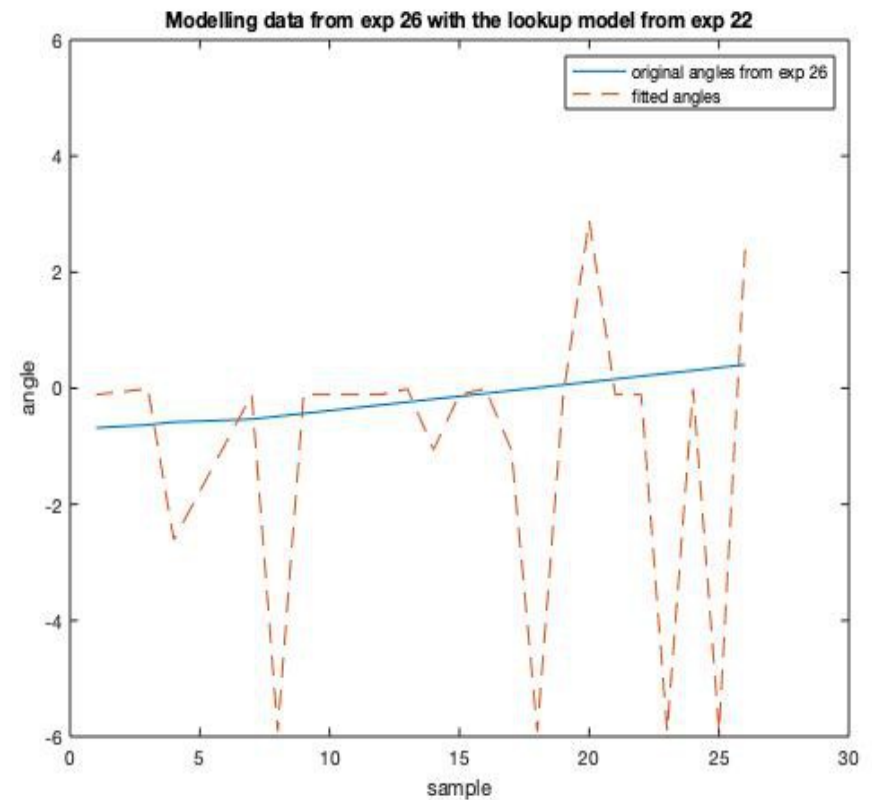
exp. 26

Modelling rotating experiments through static data

Lookup model from exp 22



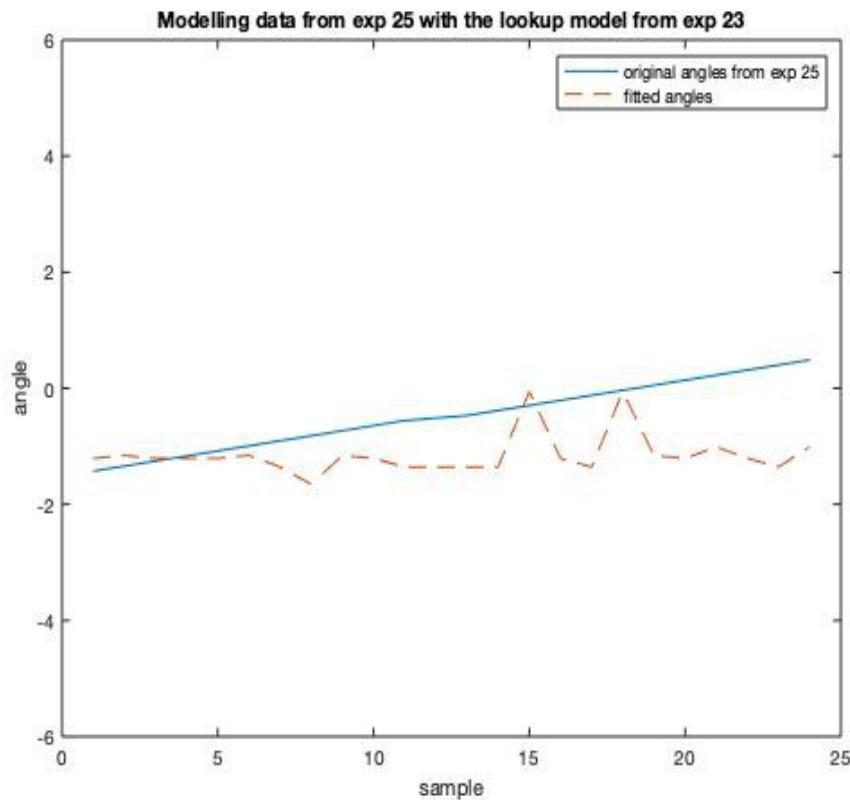
exp. 25



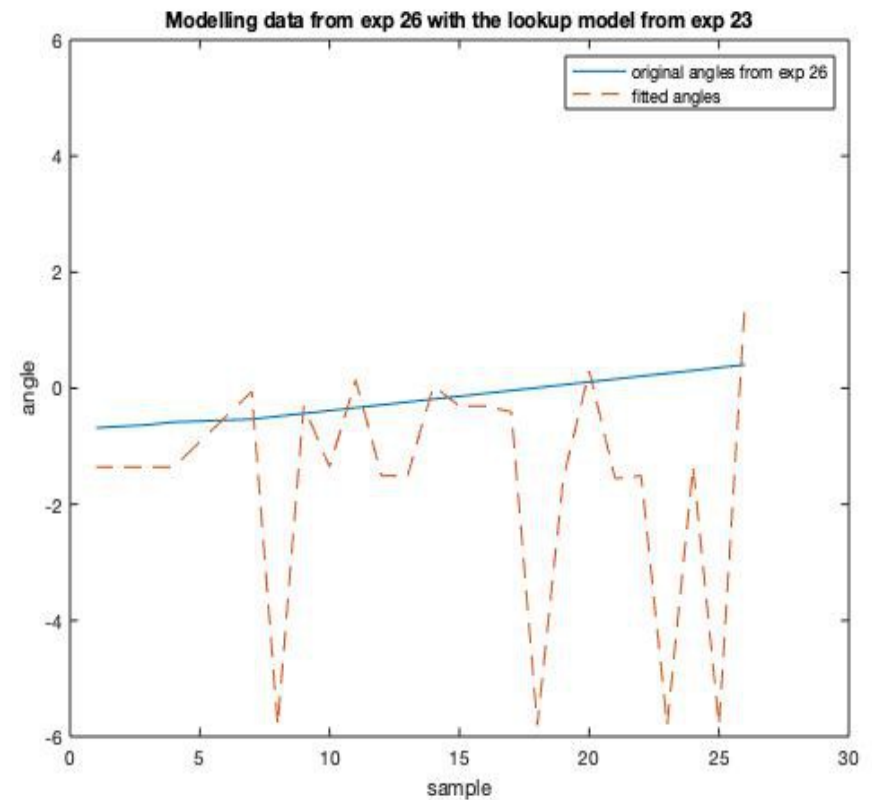
exp. 26

Modelling rotating experiments through static data

Lookup model from exp 23



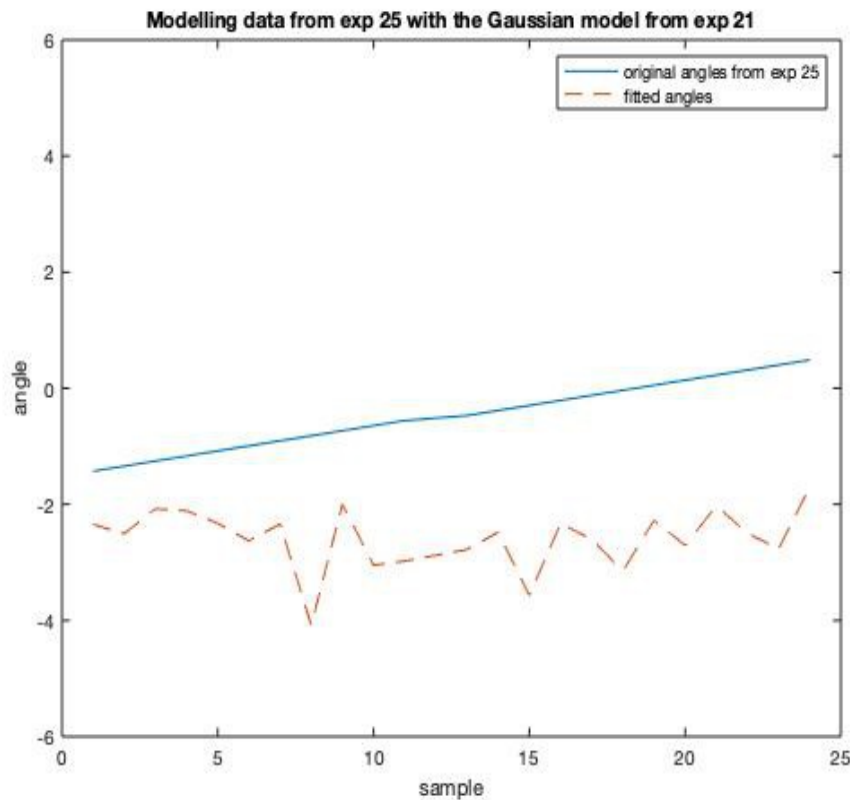
exp. 25



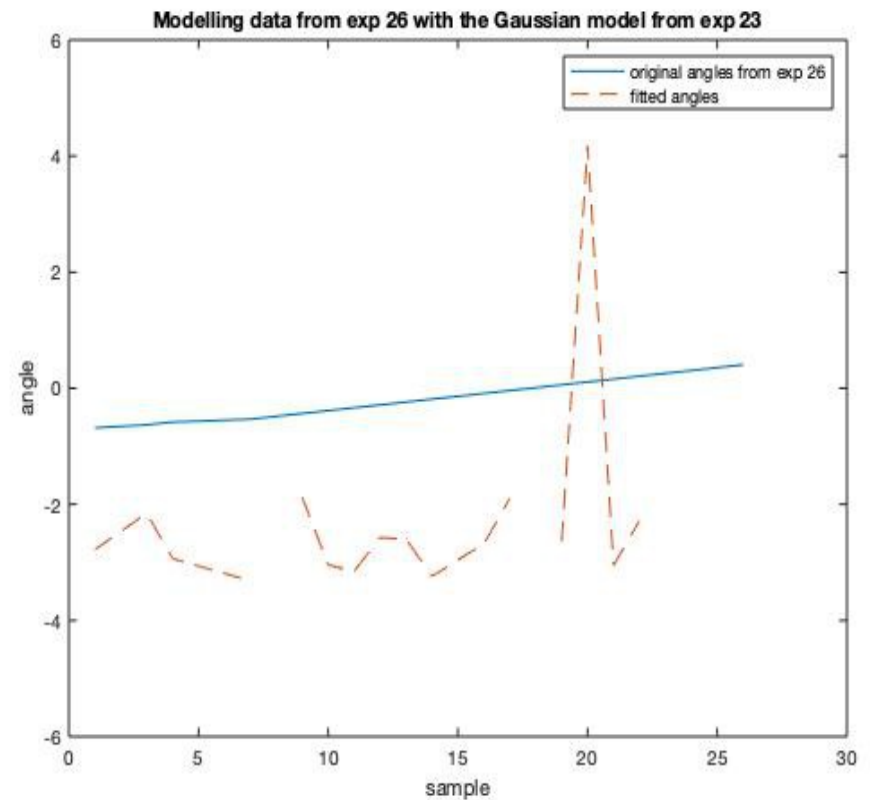
exp. 26

Modelling rotating experiments through static data

Gaussian model from exp 21



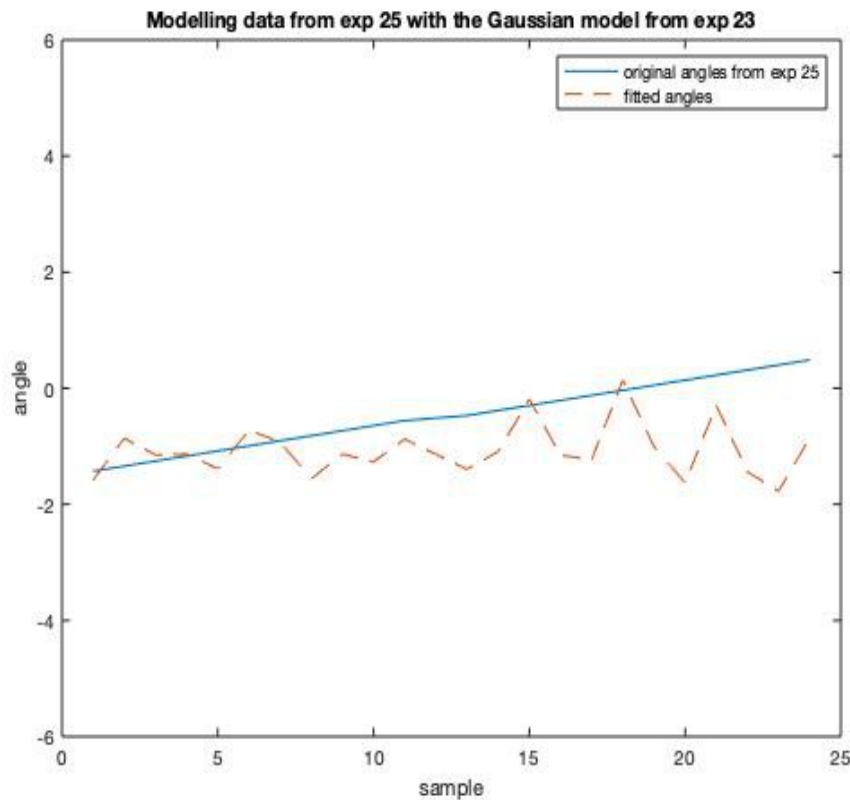
exp. 25



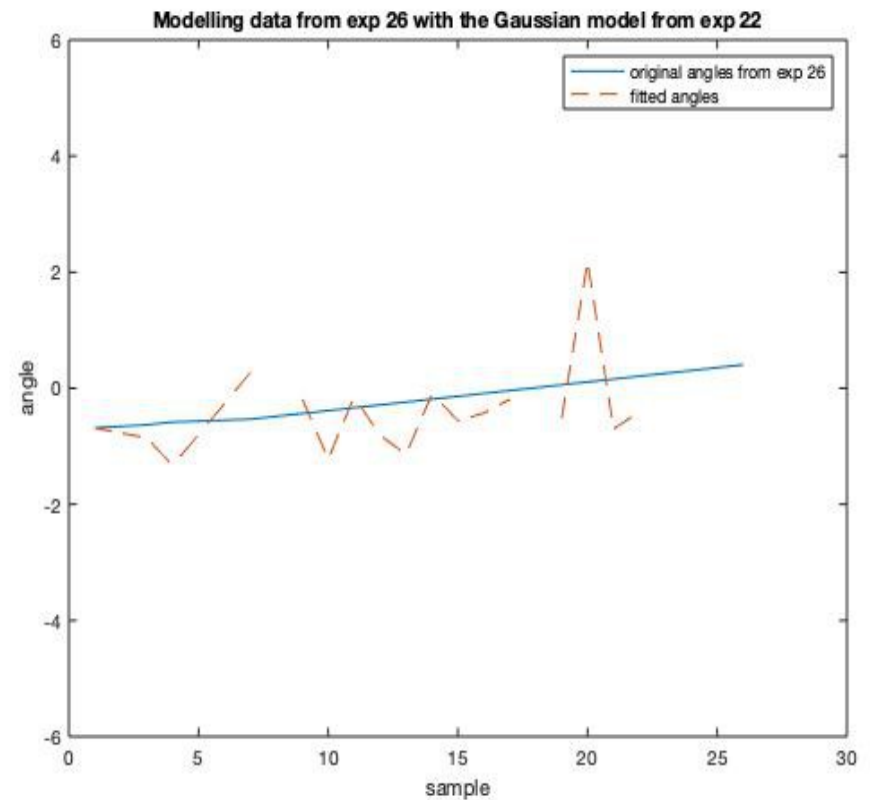
exp. 26

Modelling rotating experiments through static data

Gaussian model from exp 22



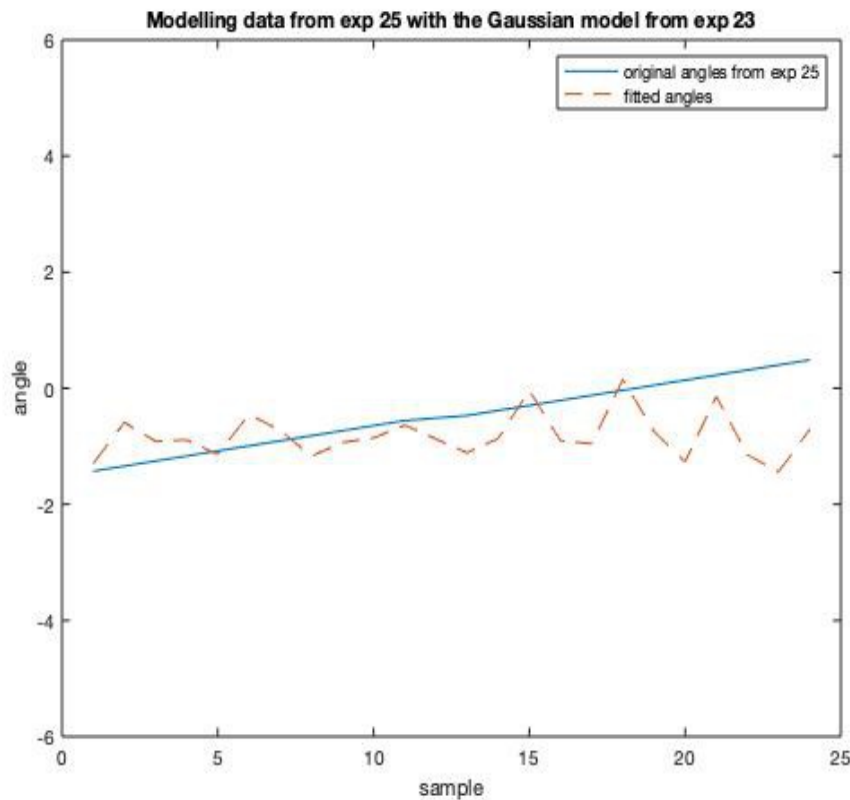
exp. 25



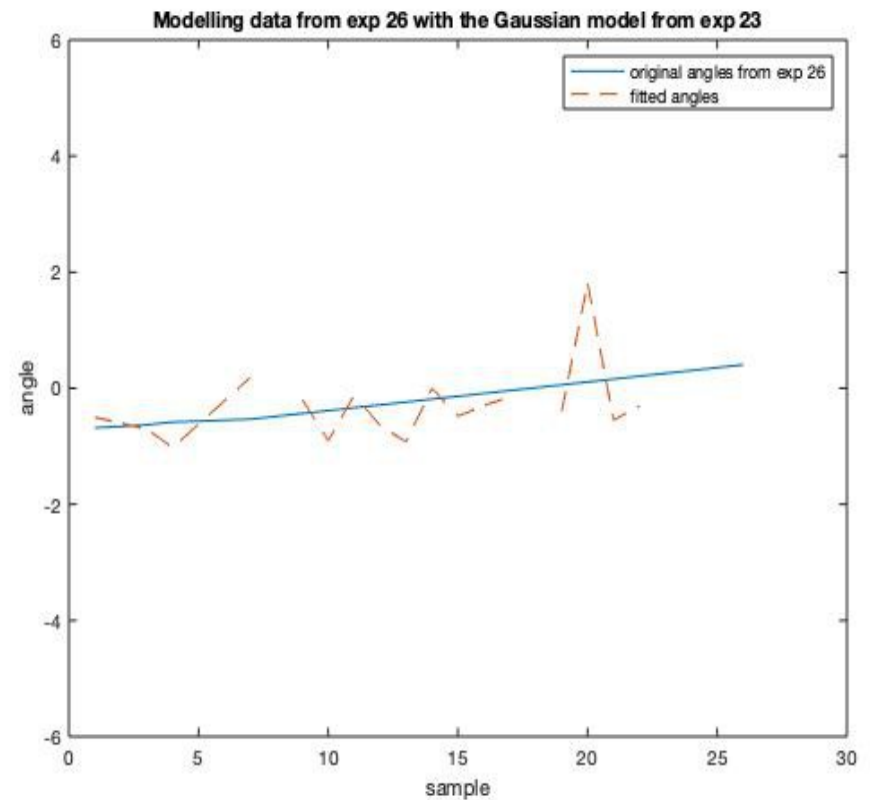
exp. 26

Modelling rotating experiments through static data

Gaussian model from exp 23



exp. 25



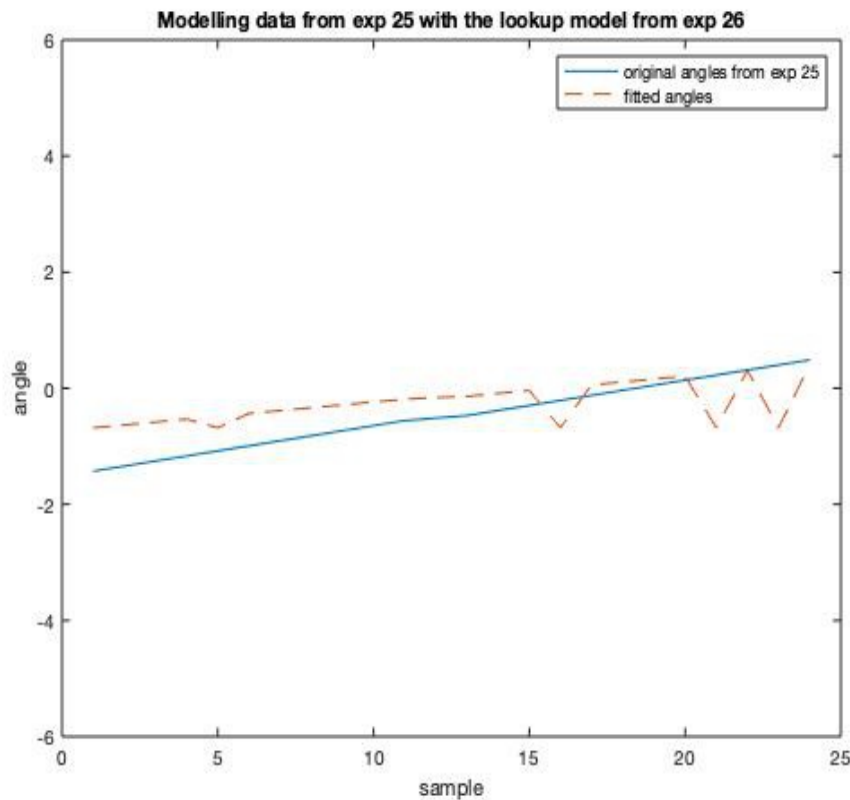
exp. 26

Takeaways from modelling rotating experiments through static data

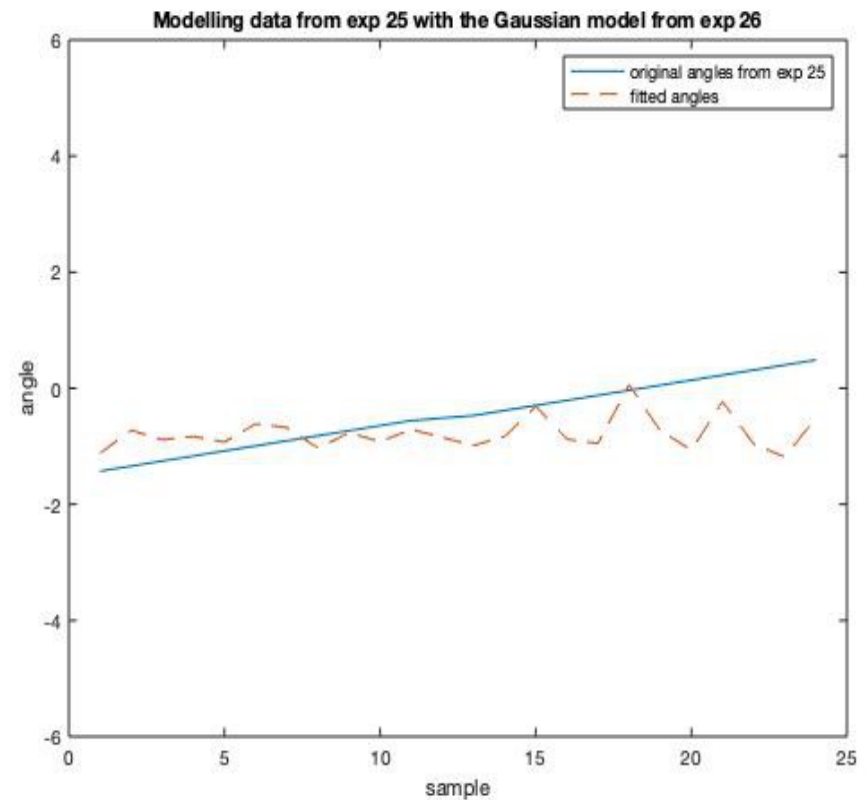
- Exp. 25 and 26 only cover a narrow range of angles
- While the test data is an ascending line, the overall shape of the predicted data is mostly horizontal: the change in angle is so small that the models do not really notice it
- Exp 25 seems to be easier to model than exp 26, the quality of the data is higher

Cross-modelling rotating experiments

modelling exp 25 with the models from exp 26



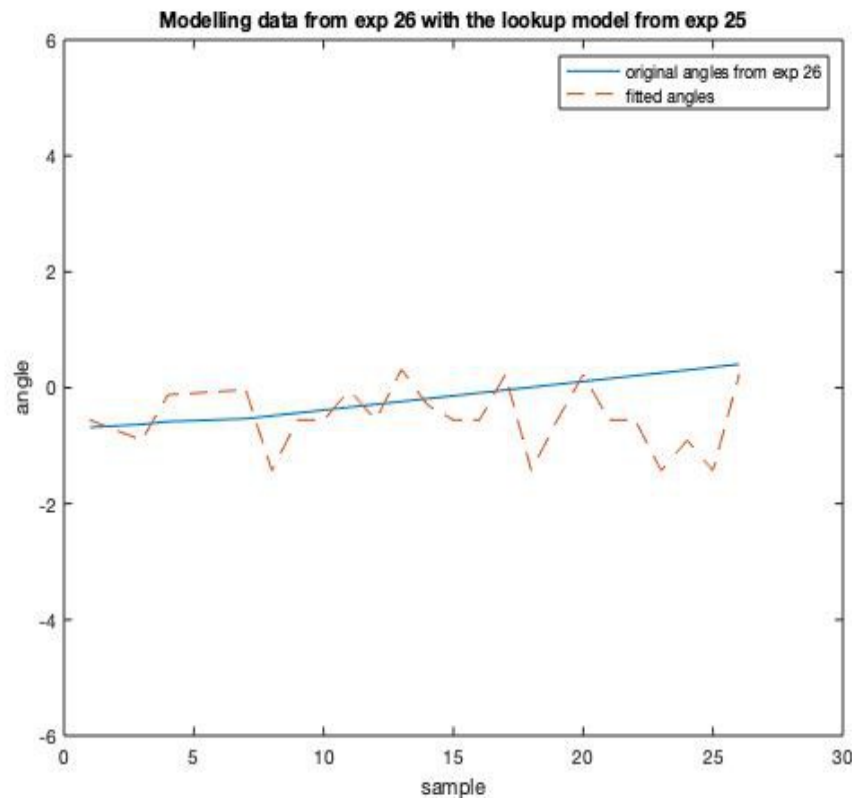
Lookup model



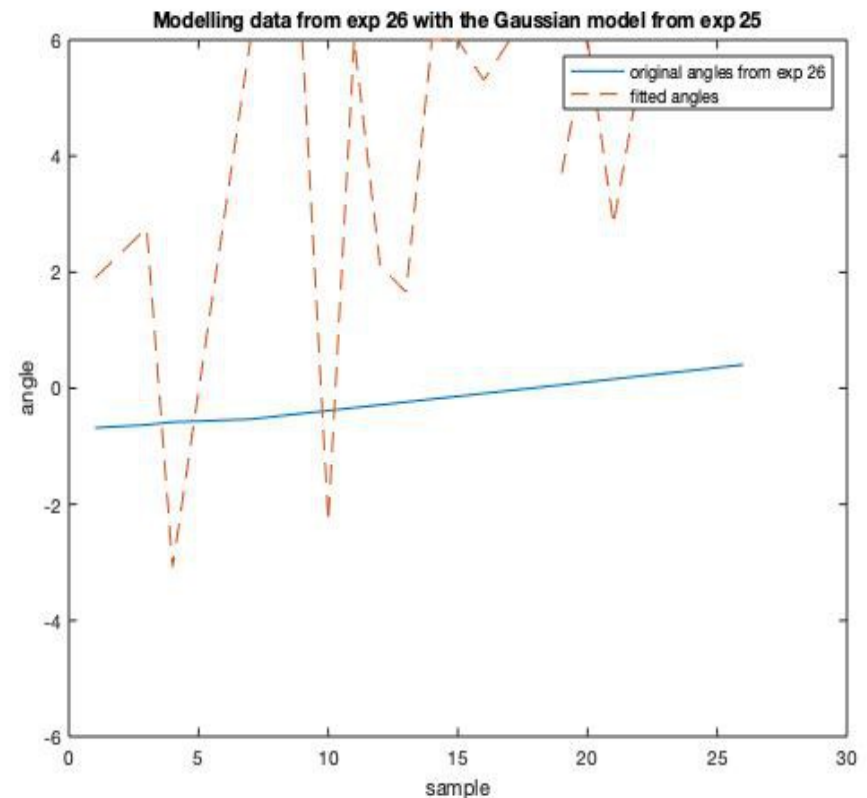
Gaussian model

Cross-modelling rotating experiments

modelling exp 26 with the models from exp 25

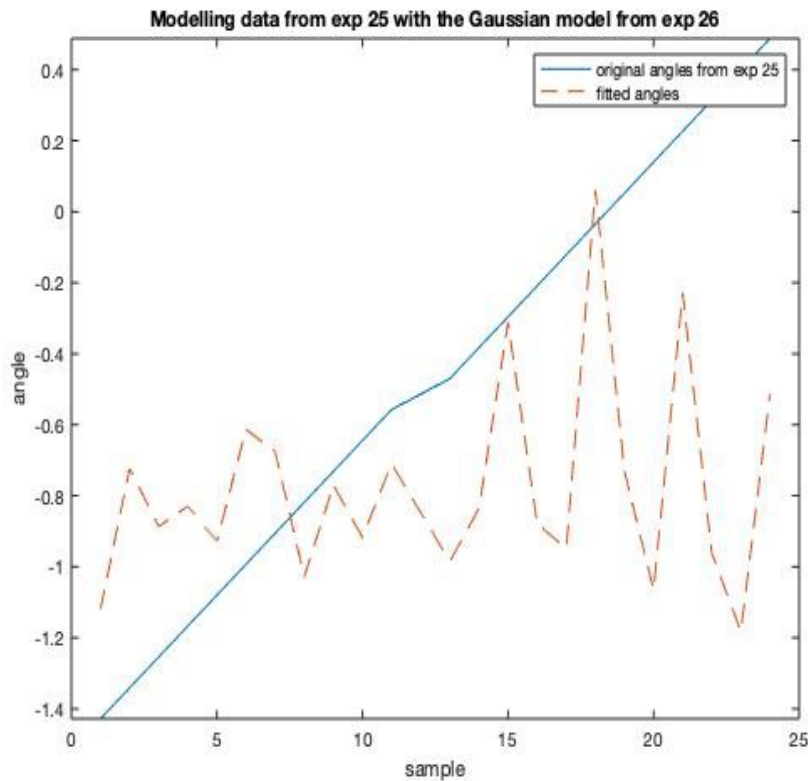


Lookup model



Gaussian model

Prediction error resolution



degree	1°	2°	3°
sin	0.017	0.035	0.052
100	1.75	3.49	5.23
200	3.49	6.98	10.47
300	5.24	10.47	15.70
400	6.98	13.96	20.93