

Reflections on the Data Collection Experience

*SAMSI / CRSC
Undergraduate Workshop 2006*

Presented by Lisa Denogean

1. Goal

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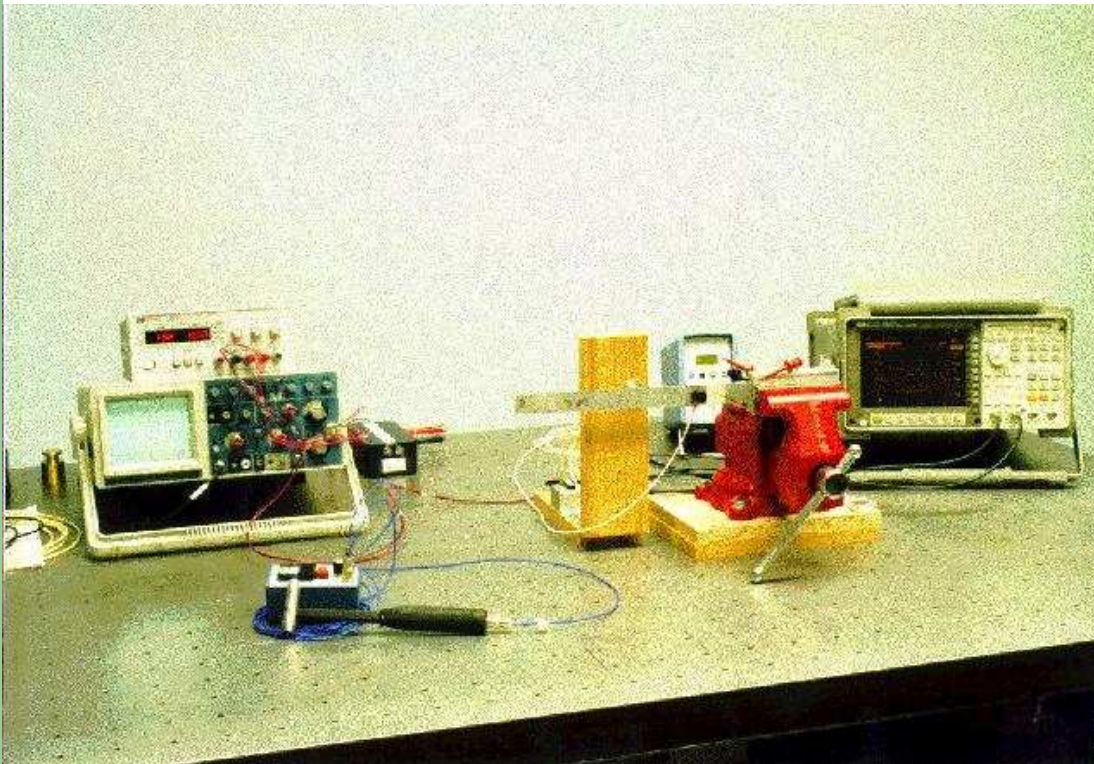
What does “enough” and “accurately” mean?

2. Experiment

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- Apparatus?
- Variables measured?
How?
- Units of measurement?
- Number of repeated experiments?
- Problems during the experiment?

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- Our parameter estimates are applicable to all vibrating beams that had the same manufacturing specifications, excited at the same frequency that we used, and only under identical laboratory conditions **We'd like it to be true...**

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If you repeated the experiment a number of times (under similar conditions), do you think that the observed displacement measurements would be identical in all repetitions?

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No. There is experimental and measurement error that may slightly affect the observed displacement.

5. Displacement Differences



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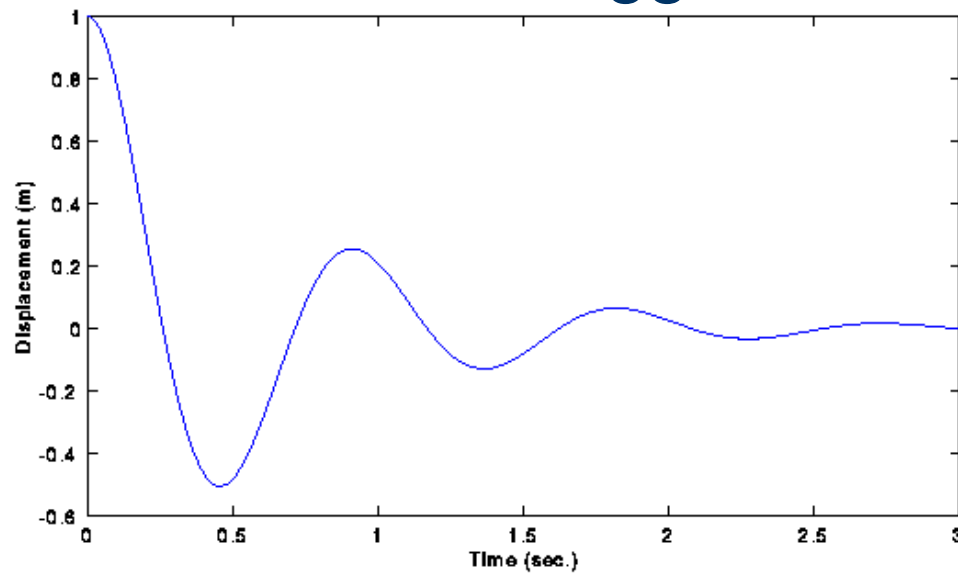
Slightly different inputs, errors in accurately driving the vibrations or in accidentally adding outside vibrations

Measurement errors in reading or recording displacement (machine error)

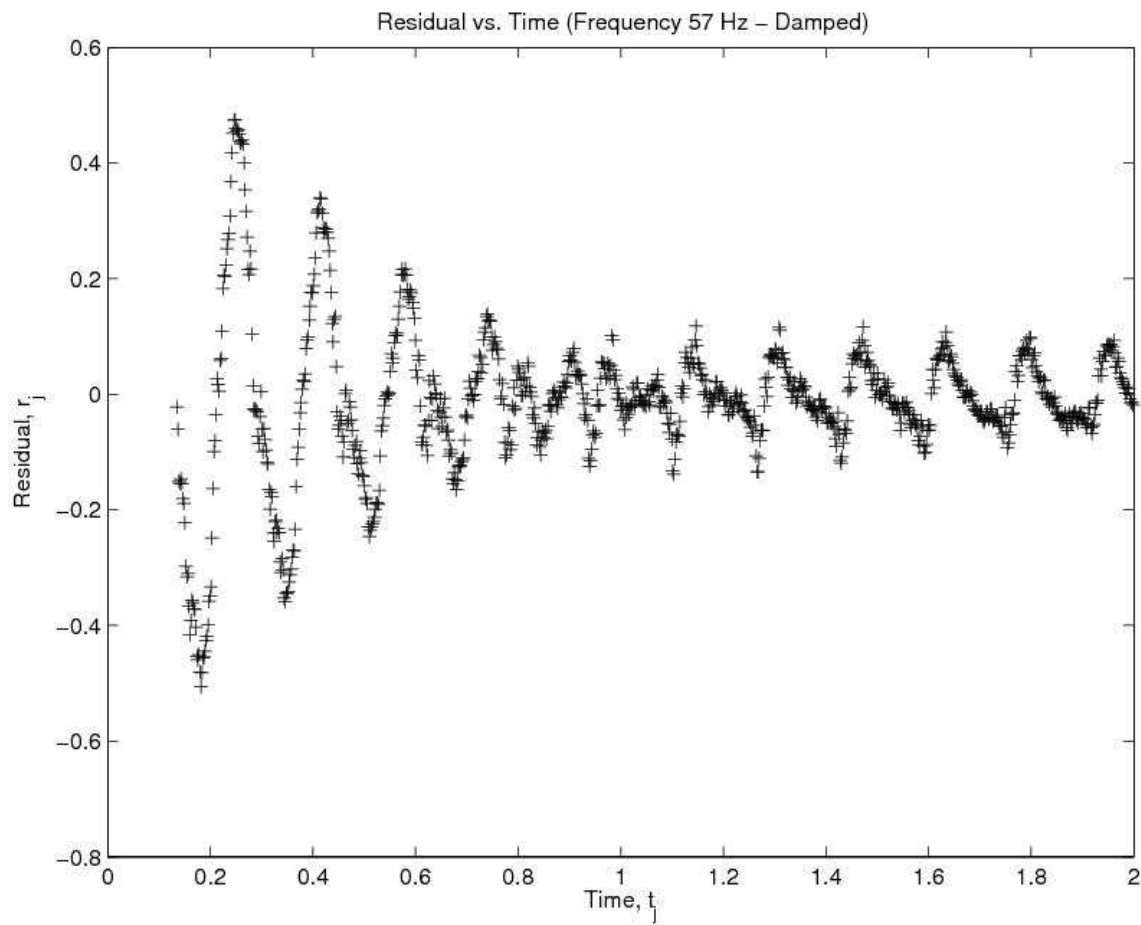
Human error

6. Model Fit

Graphs based on the model show displacement $y(t)$ changing smoothly over time. When you plot the data you collected, will it look as smooth as the model suggests?



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Not likely!

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$$y_{obs}(t) = y_{pred}(t) + \varepsilon_t,$$

$$\varepsilon_t \sim \text{mean } 0$$

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- Which statement would be more accurate:
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 - We estimate that the parameter C for the CRSC beam excited at 6.15 Hz is between 0.97 and 0.99
 - A plausible range of values within a 10% maximum likelihood contour for C for the CRSC beam excited at 6.15 Hz is between 0.97 and 0.99

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Run the experiment again with different beams
Consider resulting parameter estimates across
beams