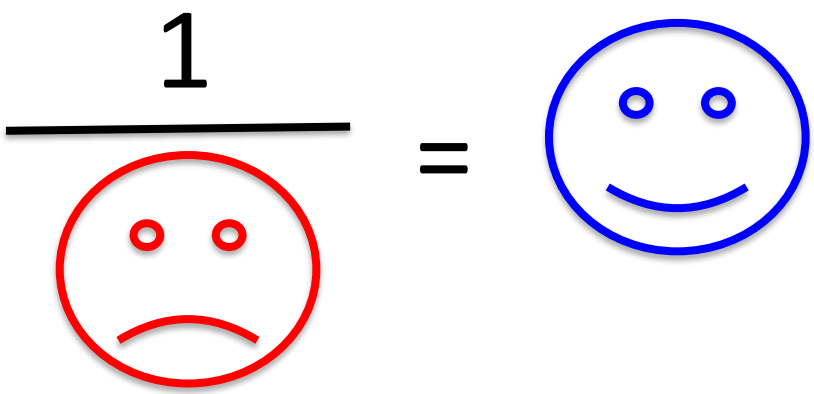

2.70/2.77 Week 5

Spring 2017

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Reminder of what we did last in Week 4
Laying out the design using FUNdaMENTALS

- *Continued using Axis error apportionment gives us "hunting license"*
- *Thought process:*
  - *FRDPARRC*
  - *PREP*
  - *Preliminary calculations of accuracy required for bearings and relaized we will need preload*
    - *Mechanics of preload*
- *Preliminary analysis of prelaod and how design can be achieved*

- *CONCLUSION: preload bearings if system made from wood*
  - *Compliant member or…*
    - *Something simpler?*
      - *REEFERENCES from frdpa**R**rc*
        - » *Vee and Flat bearings…. Old lathes….*

Week 5 Theme:

- **Week 5**
  - *Reading: PMD Chapter 7*
  - *Brainware:*
    - After building and testing your linear motion system designed last week, evolve your initial spreadsheets to predict performance.
      - This is closing the loop on your designs and helps to build design intuition
    - Layout concepts for the full machine
      - Create stick figures for concepts
      - Assign errors (error apportionment) and create preliminary error budgets for "best" concepts
      - *Make sure to DESIGN it (write the spreadsheet—predict performance and size elements)*
    - Design a simple system to test at least one idea you plan to use to preload bearings and actuators to eliminate backlash in your machine's bearings
      - *Make sure to DESIGN it (write the spreadsheet—predict performance and size elements)*
    - Seek & Geek Exploration
    - Update website
  - *Hardware:*
    - Make sketch models (foam core and/or wood) of your top concepts to get a feel for the performance, errors, etc.

Next Week 6 Theme:

- **Week 6**
  - *Reading: PMD Chapter 7*
  - *Brainware:*
    - Based on last week's hardware tests, evolve your full machine concepts
      - Select at most three top designs
      - Complete the geometric error budgets for each
      - Pick the "best" design to move forward with design details
    - Design a simple system to test at least one idea you plan to use to preload bearings and actuators to eliminate backlash in your machine's bearings
      - *Make sure to DESIGN it (write the spreadsheet—predict performance and size elements)*
    - Seek & Geek Exploration
    - Update website
  - *Hardware:*
    - Make a sketch model (foam core and/or wood) of your best design

Developing Concepts

- Thought process (ONCE AGAIN!):
  - FRDPARRC
  - PREP
  - Preliminary calculations to select potential components
- Concepts (must do first order analysis to sanity check each)
  - Wall mount
    - Overall Structure
      - One rail or two?
  - Vertical moving carriage and desk surface tilt
    - Structure
    - Bearings
    - Actuator
- Preliminary analysis of components for a concept can help determine if a concept is even feasible…

Reducing complexity from the start….

- Preload…
  - Gravity ☺
- Saint-Venant
  - Drive both sides with one motor and a shaft across?
    - For desk posts?
    - For precision, how does shaft windup affect things?

Next Step Error Budgets

- With Strategy chosen and one or more concepts feasible based on preliminary analysis…
- Its time to start a more formal error budget
  - First by yourself create spreadsheet for one axis system…
  - Then two axis system….
  - UGH, now you will be happy to have the big spreadsheet….