Pavement Data Collection and Analysis at Pavement Evaluation Conference and RPUG May 6, 2014

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Outline

- Pavement Evaluation Conference and RPUG
  - Edgar's slides
- Pavement Data Collection and Analysis
  - John's slides

Calibration Traceable to Ground Truth or Guilty Until Proven Innocent

John Ferris, VirginiaTech

Philosophy

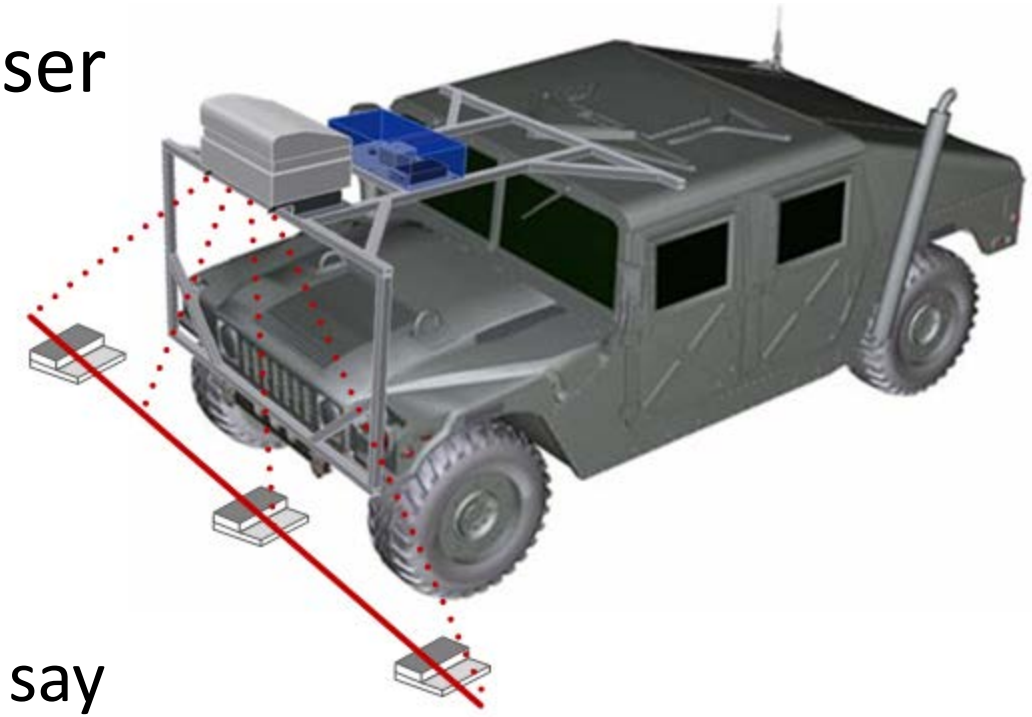
When possible, create calibration standards that are ***traceable to ground truth***

- Ultimately, must *prove* system accuracy
  - Progression of logical tests
- ISO 17025
  - US Army TARDEC requirement
  - Same concept
  - Difference is only in scale and equipment used
    - 100mm bumps with 1mm accuracy
    - 10mm bumps with 0.1mm accuracy

Laser Accuracy

Static validation of laser

- Gauge blocks
  - ASTM certified to 0.01mm accuracy
  - Use gauge blocks to verify Laser to, no better than, say 0.03mm

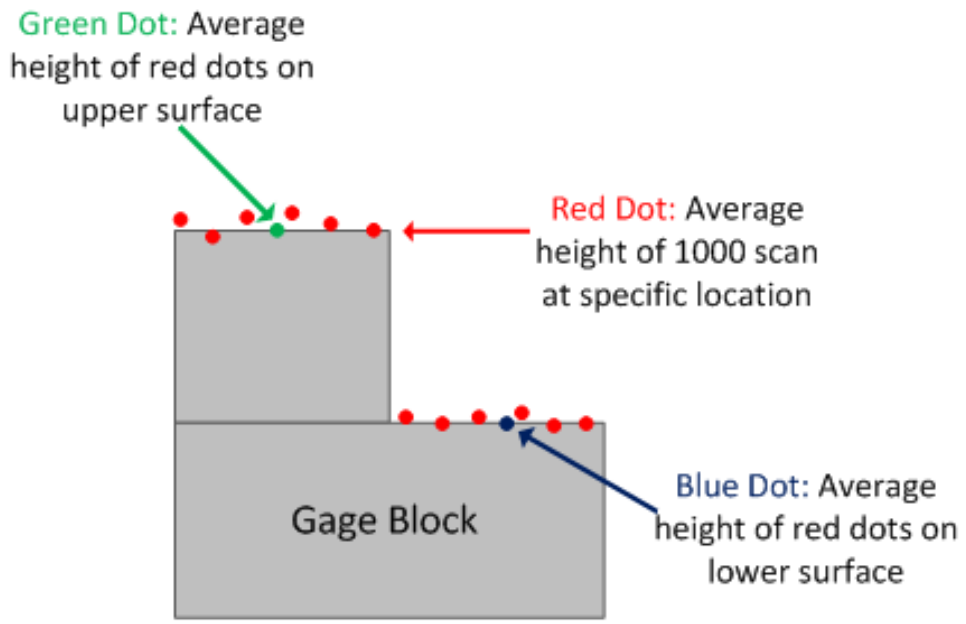


- Cannot be more accurate than gauge!

Laser Accuracy

Verify laser using gauge blocks

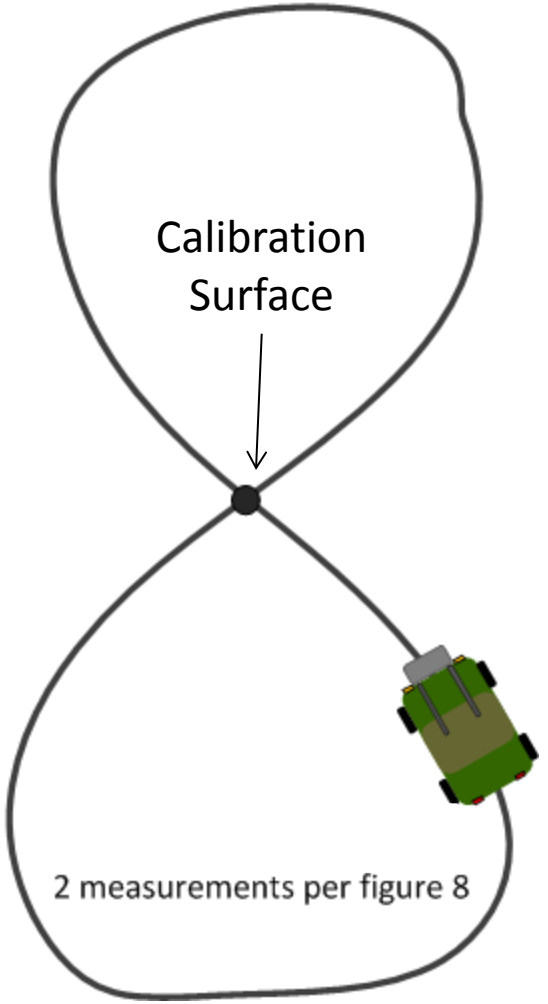
- Gauge blocks
  - Multiple locations
  - Multiple heights
  - Averages
    - Calibration, Gain
  - Standard Deviations
    - Accuracy



INS Accuracy

INS Drift Calibration using laser

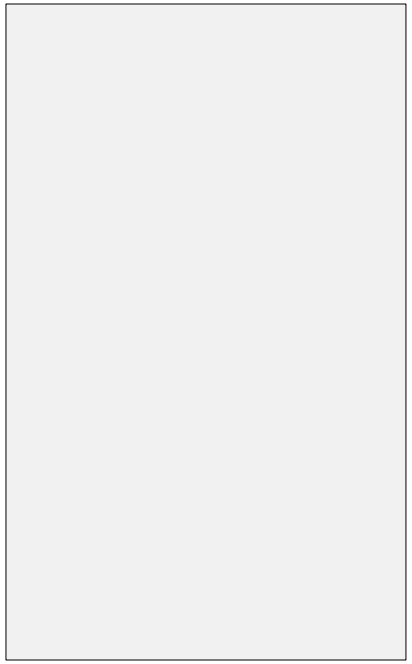
- INS = GPS + IMU
  - INS: Inertial Navigation System
  - DGPS: Differential GPS (base station + rover)
  - IMU: Inertial Measurement Unit (fancy gyro)
- Drift is a function of time



INS Accuracy

INS Drift Calibration

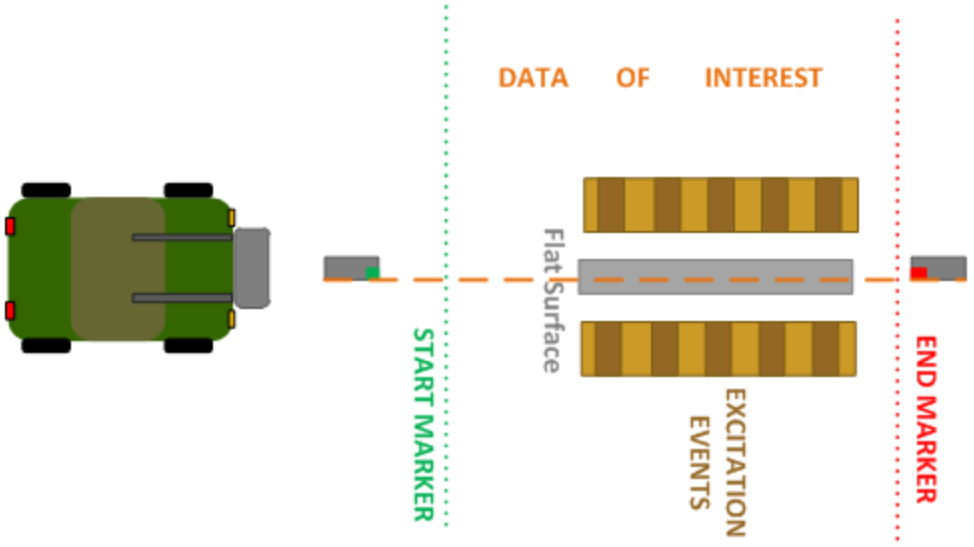
- Drive over Calibration Surface multiple times
- We know dimensions of plate and that it is not moving



System Accuracy

Dynamic Excitation

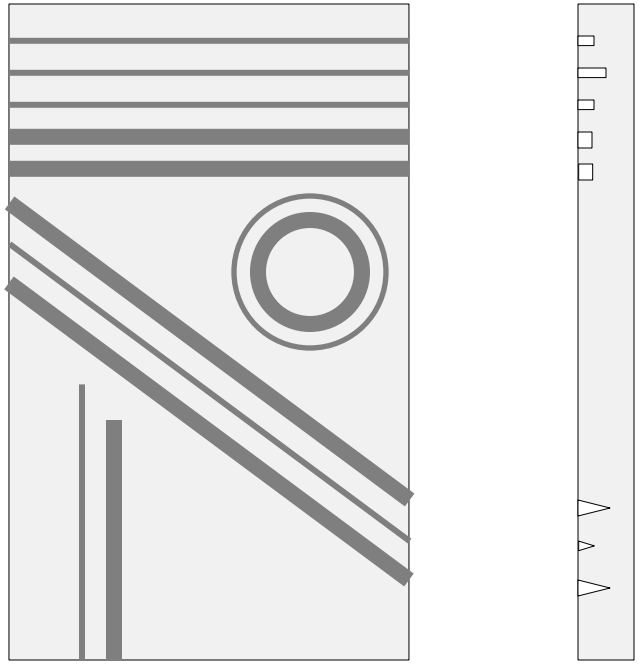
- Accuracy when vehicle is moving



System Accuracy

Dynamic Laser Verification

- Drive over Calibration Surface multiple times
- What should surface look like?



System Accuracy

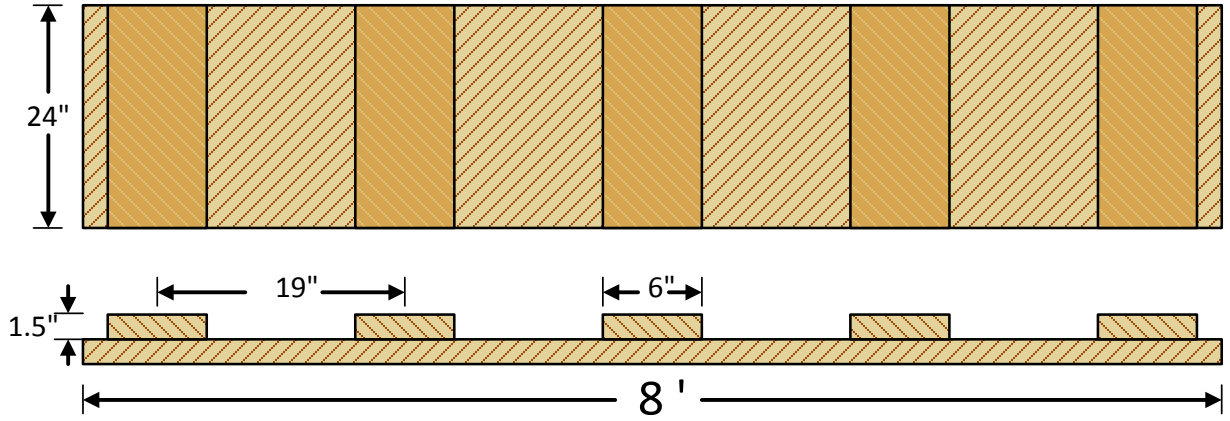
Types of calibration surfaces

- Material (Al, Fe, non-pavement), reflectivity
- Rut and cracking patterns (back to ASHTO provisional standard (smallest is 1 mm)) , angles, widths, lengths
- Sizes

System Accuracy

Dynamic Excitation

- Excite vehicle at primary and secondary ride frequencies (body heave and wheel hop)



INS Accuracy

Accuracy requirements

- What is the end result?
- In the end, what do you want to know?
- How accurately can you *prove* that you know it?