

SSI

Surface Systems & Instruments, Inc.

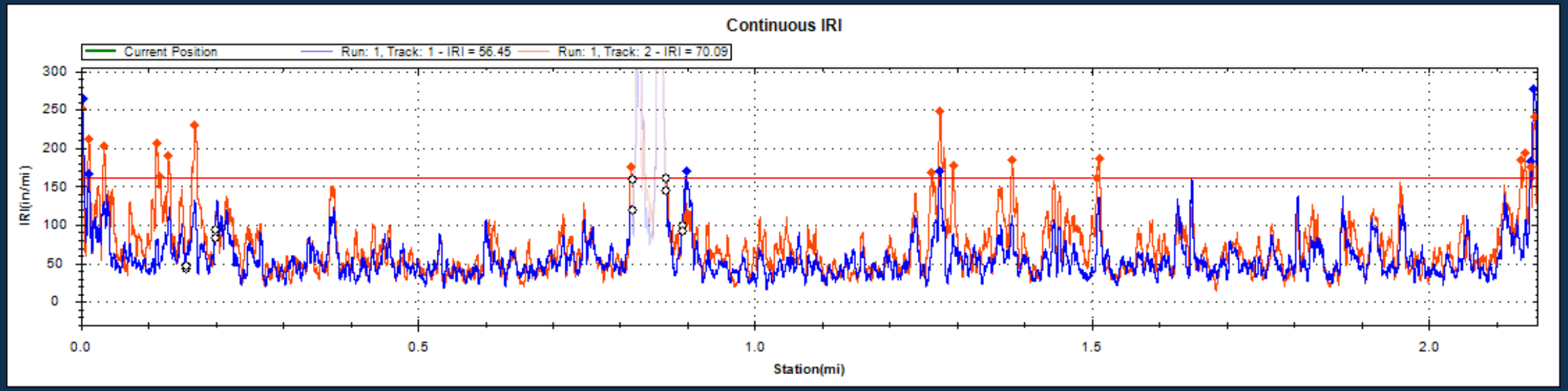
Inertial Profilers • Survey • Walking Profilers

Road Profiling Technology

Florida DOT Profiler Roundup
10/29/2026

What is an Inertial Profiler (IP)

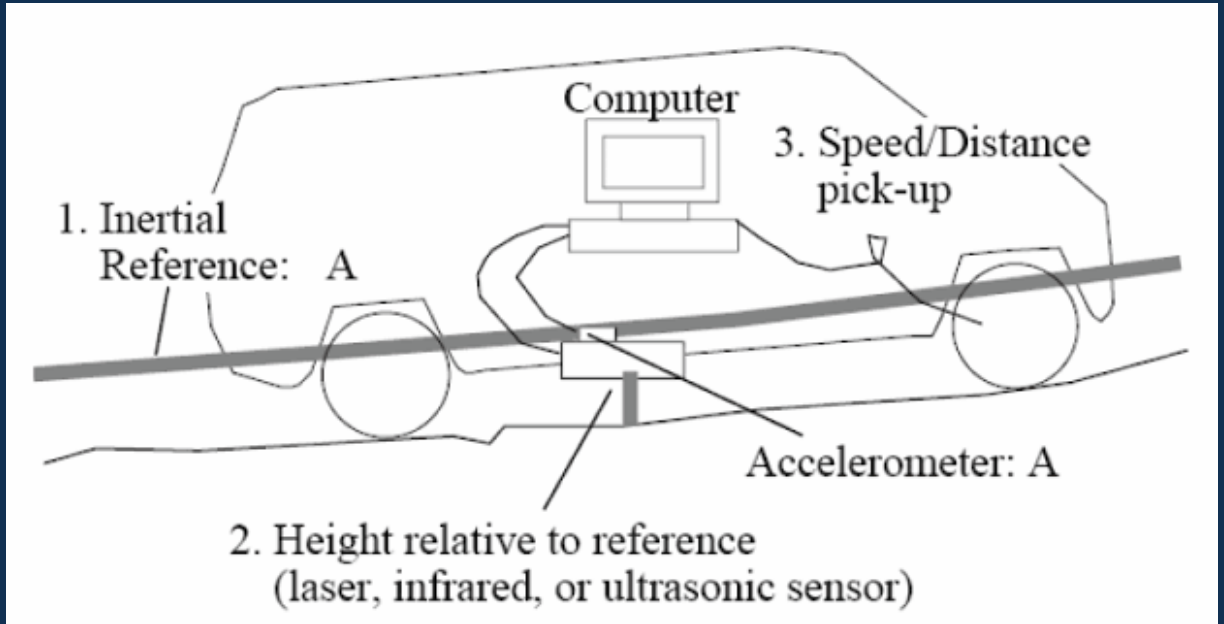
- Relative elevation measurement
- GPS only for position, not elevation
- Uses accelerometer to cancel vertical vehicle motion
- Typical 1-inch sampling interval to create 2D profile



What is an Inertial Profiler

Original Design of Inertial Profiler

1. Accelerometer (vehicle dynamics)
2. Height Sensor (laser)
3. Distance Measurement Instrument (DMI)
4. Processing (computer)



Typical Laser Sensor

- Pros – Durable, IP67, fast, configurable
- Cons – Only collects the wheelpath area, low to the ground



Benchmark Sensor

100mm wide
1280 points
Up to 5000 Hz
Macrotexture Capable
0.002-inch accuracy

Does the Vehicle Matter?

All Vendors Provide Compliant Equipment







http://s.hswstatic.com/gif/smart-car-3.jpg

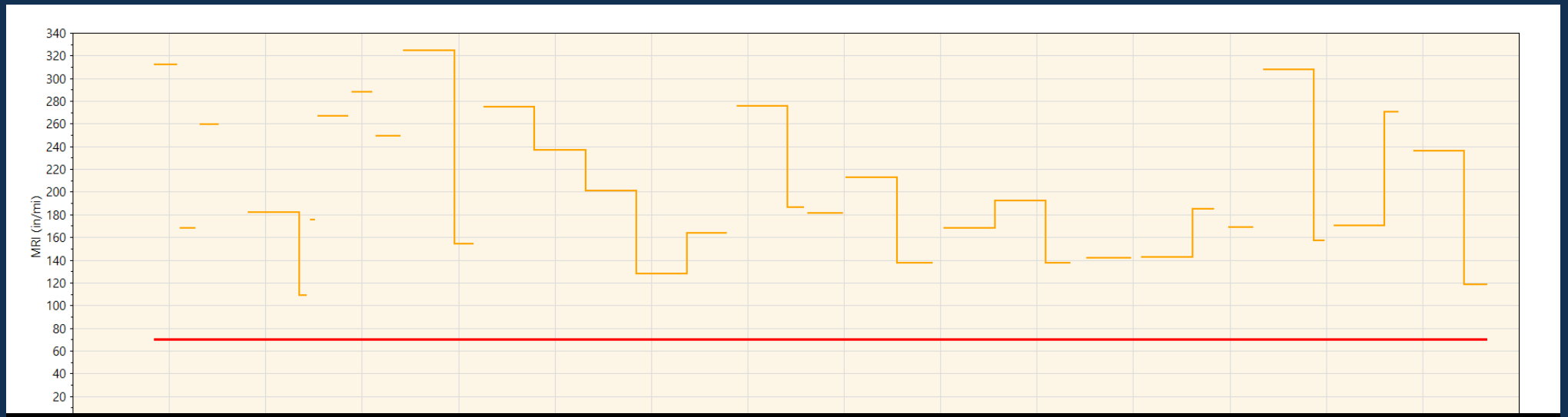


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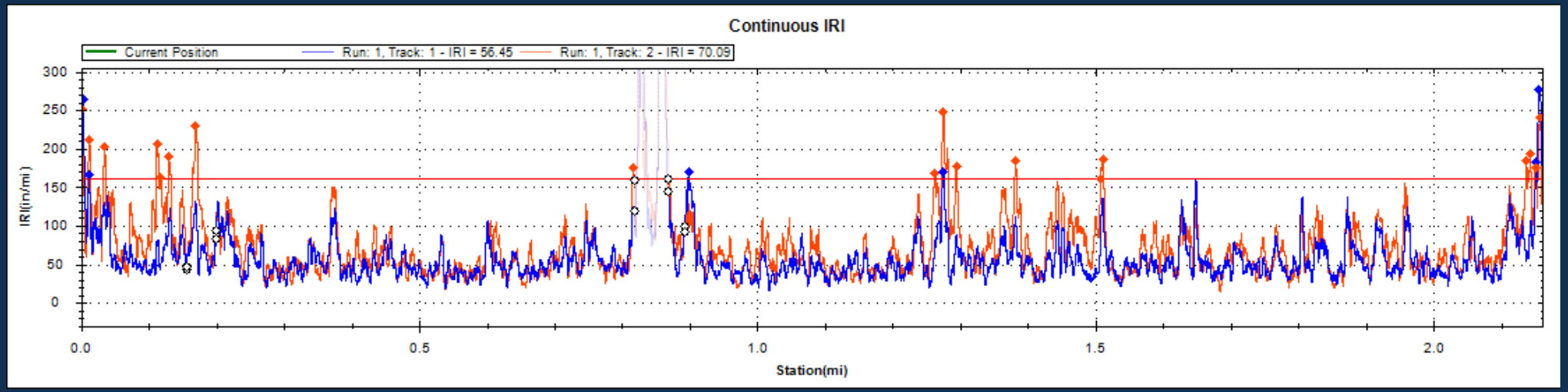


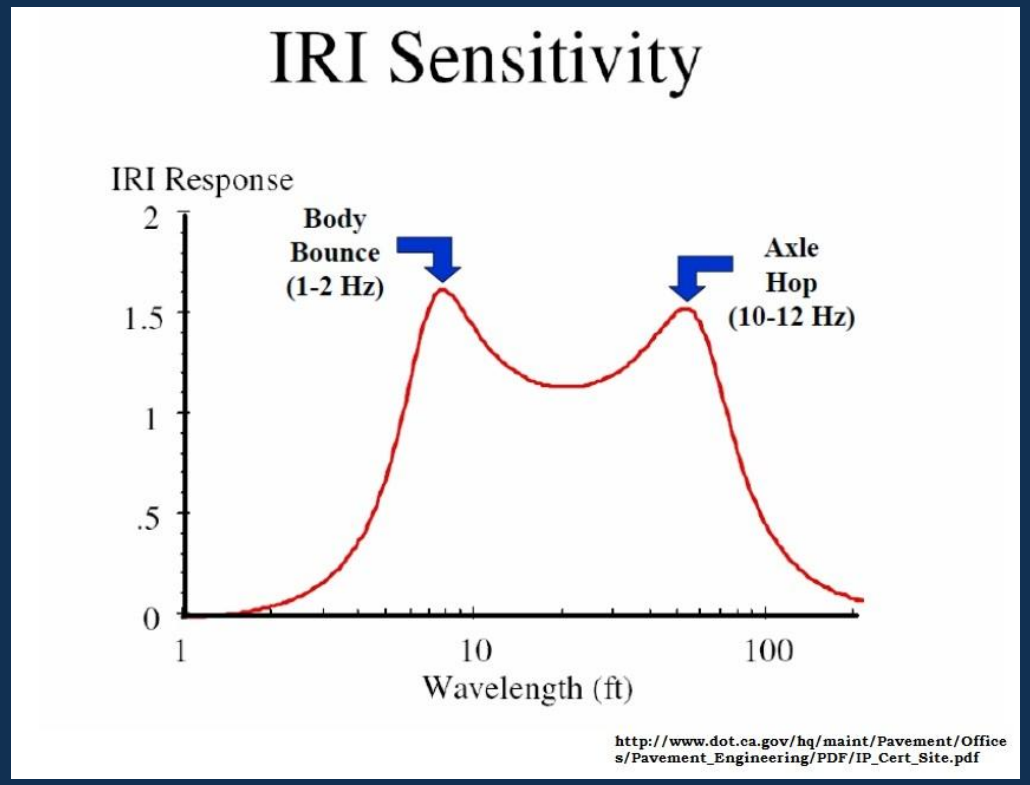
Why be Accurate?

MRI and Short Continuous IRI



Small Elevation Changes Create Large IRI Differences





7 AND 50 FEET ARE THE PEAK SENSITIVITIES

VS



ONLY SENSITIVE WITHIN ITS WHEELBASE

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What Do You Need to Collect Roadway Elevations?

Original Design of Inertial Profiler	New(er) Technology
1. Accelerometer (vehicle dynamics)	INS/IMU/Gyro
2. Height Sensor (laser)	Lidar, photogrammetry
3. Distance Measurement Instrument (DMI)	GPS-DMI, non-contact
4. Processing (computer)	Cloud Processing
5. GPS (position)	GPS Corrections (CORS, NTRIP)

Profiling Classification and Test Methods

ASTM E950 changes

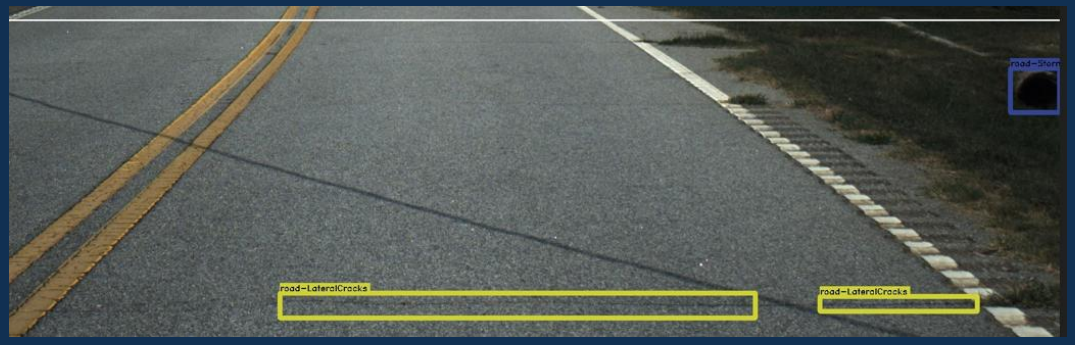
- Any device compliant can be used to collect smoothness data
- If it can certify, it can be used
  - AASHTO r56 references for accuracy and repeatability
- Focus on comparing profile elevations, not IRI values
- New technology with stop-and-go or lidar challenging the traditional profiler specs

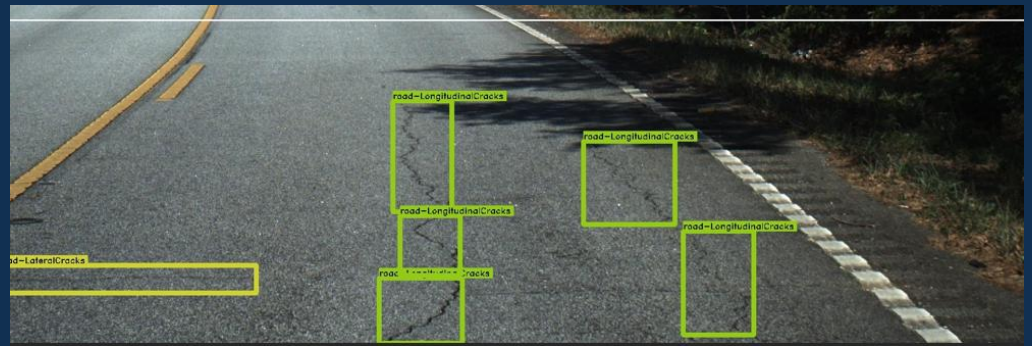


Sensor Technology is Changing

- Can we get the same accuracy as Gocator lasers?
- New height sensors could be cameras, lidar, IMU, or laser
- More information, but commonly requires additional processing
  - Do you need immediate IRI value results?

- AI is being used for distress detection and other manual tasks like classification and identification of assets.
- Cost and processing time are considered with these systems





Distance Measurement Instrument

- Wheel Encoder DMI
- GPS-DMI
- INS-DMI
- Non-Contact DMI

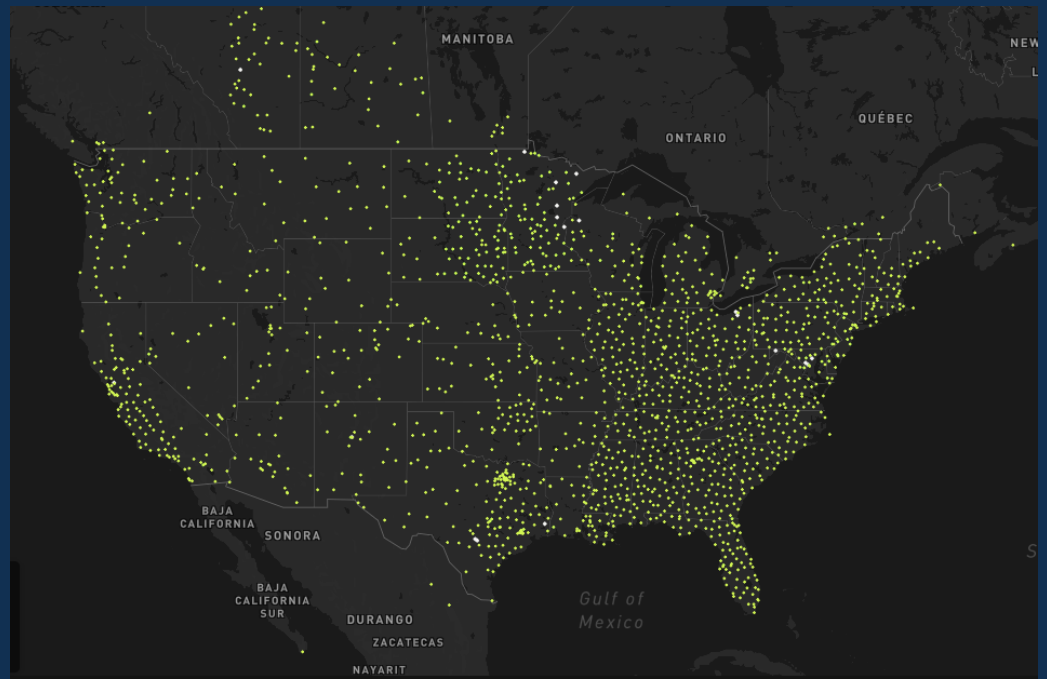
Wheel Mounted Encoders:

- Rely on tire circumference
- Calibrations change with speed, temperature
- Aligning collections over time
- Certification allows 0.1% error, 5.28ft/mile
- Error from path drift with any method



Information Transfer is Improving

- All profiler sensors are changing rapidly. Especially GPS and INS.
- More height sensors capable of profiling that 5 years ago. Next 2 years will release more
- GPS corrections from NTRIP, CORS in real time. Cost is coming down, more availability
- Cloud-based monitoring and project data



New Sensor Technology

- Faster, wider lasers
- Can collect full lane width with 1 or 2 sensors
- Extract linework anywhere in the lane for IRI
- Cheaper costs
- Profiling industry gets what is left over from automation and vehicle autonomy

<u>Development Questions</u>

- Does it work in sunlight?
- Is it as accurate as the benchmark device (Gocator 2342)?



Thank You

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SSI's Catalogue



Inertial Profilers



Zero-Speed® Profilers



Walking Profilers



Specialty Profilers



GPS-DMI



Survey Scanners

SSI is Pavement Focused



Targeted Software for Smoothness Testing



Simple Operation



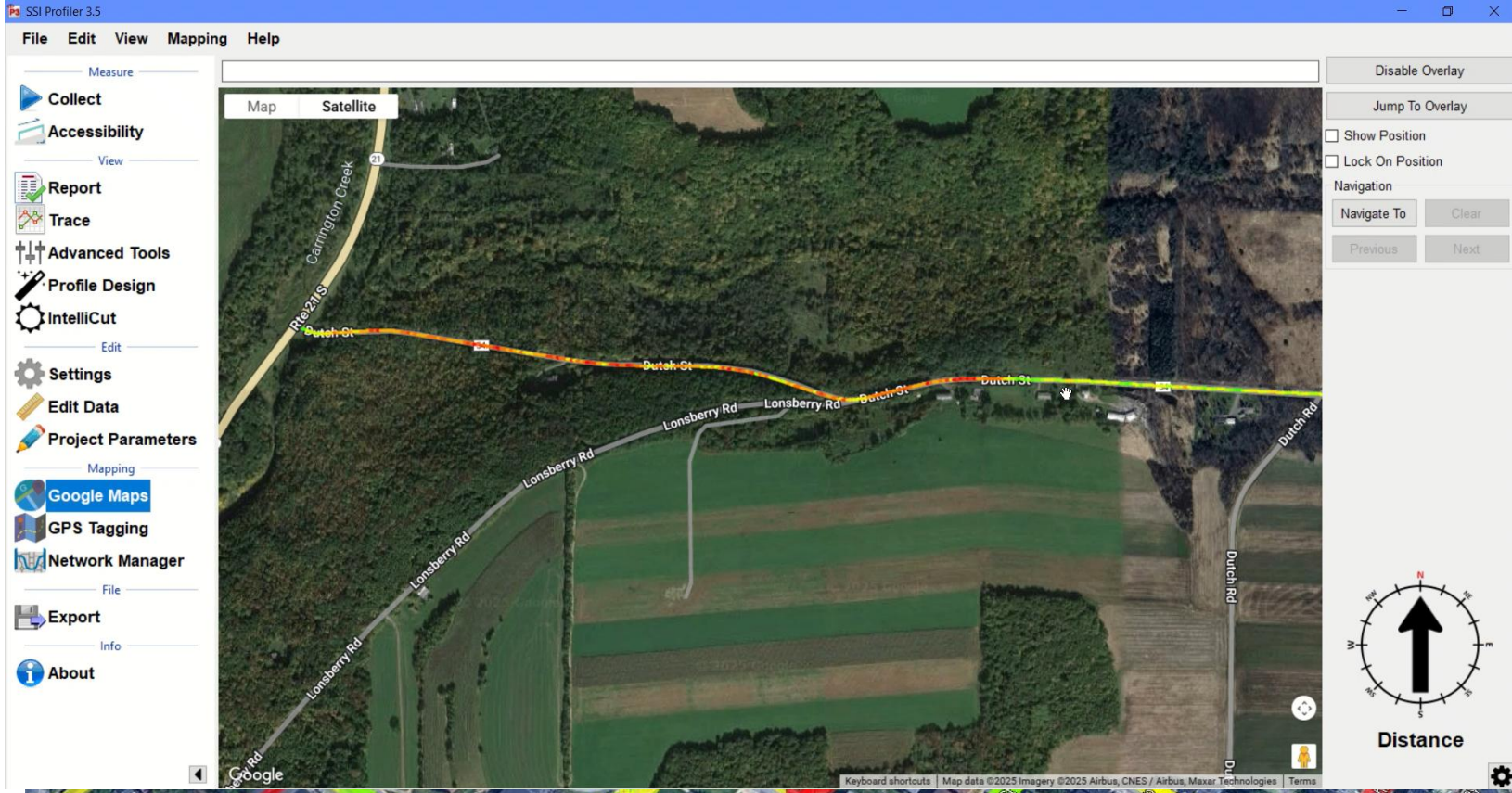
Instant IRI and Slope Reports

Upload a milling model to a machine in under 2 hours

Simple Reporting

ASTM E950
AASHTO r56/r57

- SSI Imagery Reports
- Google Earth KML/KMZ
- ProVAL PPF
- Percent Improvement
- Wavelength Reports
- GPS Triggering
- Distress Detection
- Same software for scanning systems



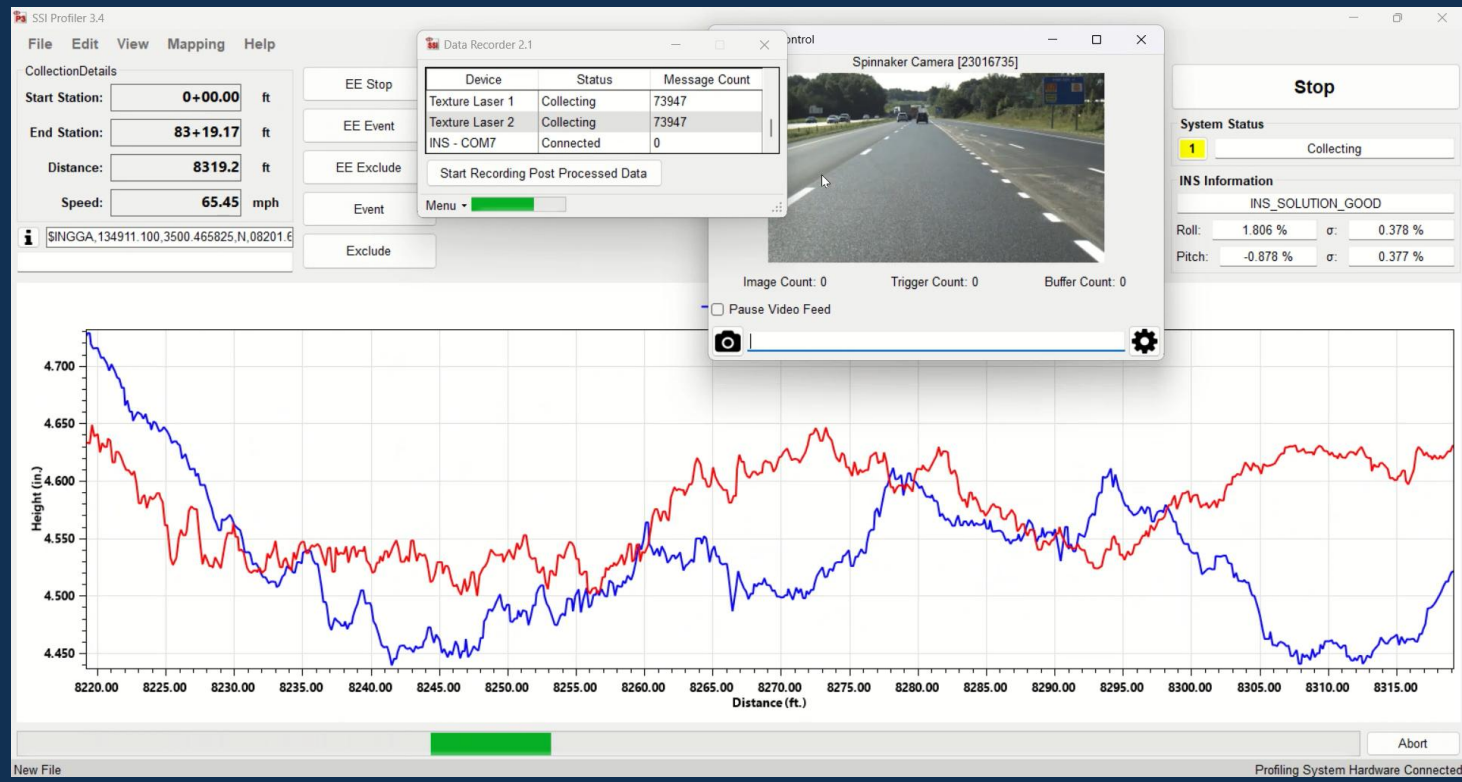


Contractors as QC

- If the State collects all compliance data where does that leave Contractors to use profiling systems?
    1. Existing Data Preparation
    2. Compliance Verification
    3. Machine Control

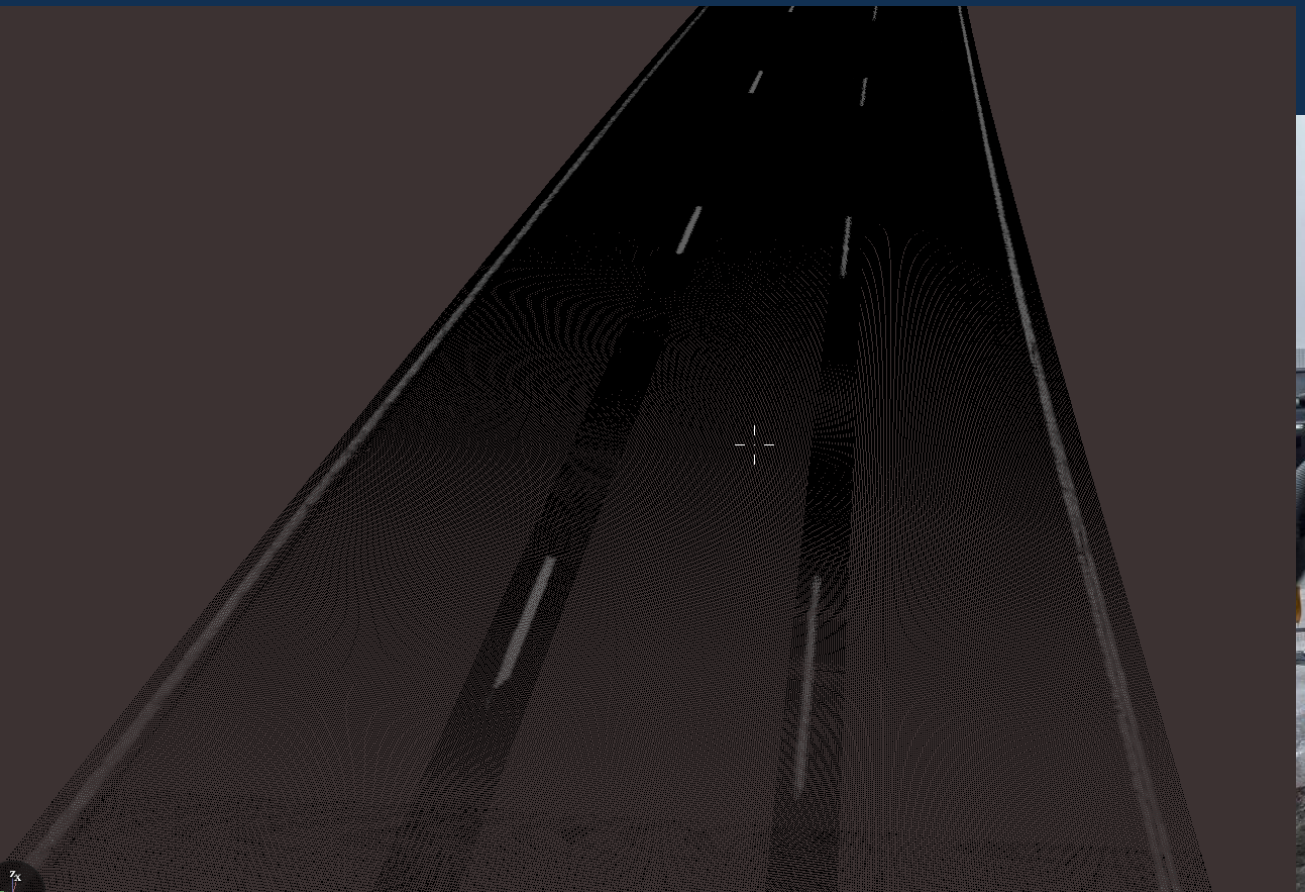
For any system ask:

1. Is it simple?
2. Is it accurate?
3. Is processing quick?



Contractors as QC

Directly use pavement surface data on a mill or a paver
Scan and model using profilers to set your cut depth and slope







Machine Integration is Here

- Profile and survey data loaded onto mills or pavers
- Development has made it possible to add machine control to more machine types
- SSI aims to simplify process for all











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