SurPRO 3000

‘Patented Precision’

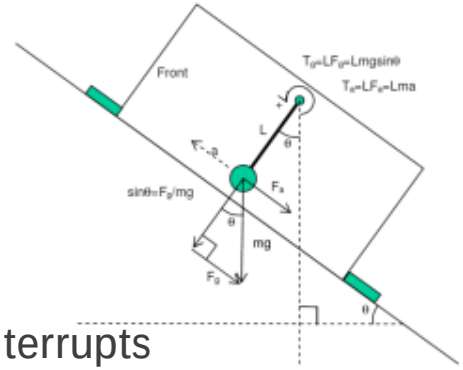
US Patent: 6,775,914
Can Patent: 2,405,133

SurPRO 3000

- Developed for compliance with FHWA contract specification **“Improving the Quality of Pavement Profile Measurement-Priority Number One: Reference Device”**
- Major revision including changes to footprint hardware and software
- Expected to exceed accuracy and repeatability cross correlation target of 98% in IRI waveband
- Available now – including upgrade packages for 2000 to 3000 model

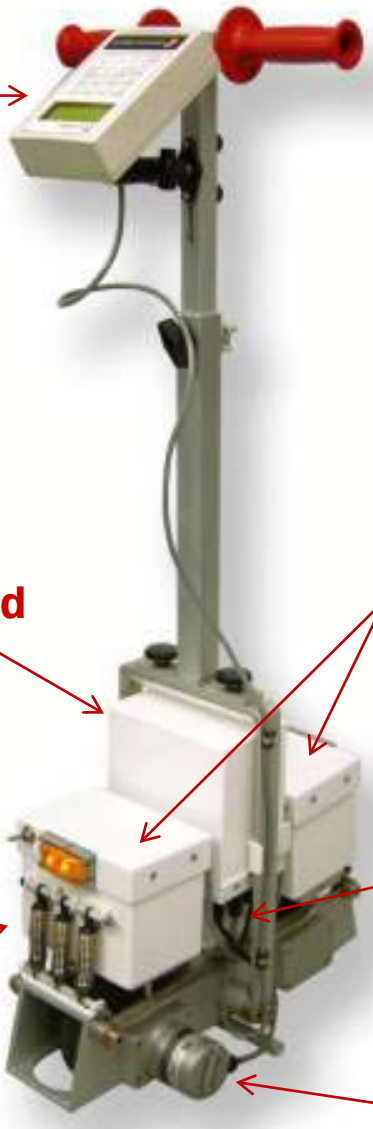
Basic Theory

- Instruments
  - 2 Inclinometers (force balanced) oppositely aligned
  - High Resolution optical DMI
  - Temperature Sensor
  - Industrial on-board computer with compact flash



- 1 kHz clock triggers data collection every millisecond using interrupts
- Uses DMI to calculate total distance travelled, digital velocity and acceleration
- Uses two inclinometers to measure the angle of the frame
- Corrects the angle of the frame using the acceleration value
- Calculates total true elevation change
- Stores data when total distance reaches the next sample position
- Uses inertial stabilizer loaded damped suspension to ensure stabilty and accuracy at higher operating speeds by ensuring profiler wheels are always in contact with road surface

Basic Theory



Display / Interface

Industrial On-board Computer with Compact Flash

Battery / Dampened Load to ensure wheel contact with surface

2 Inclinometers Forced Balanced and Oppositely Aligned

Damping Suspension

High Resolution Optical DMI

Features

- Adjustable wheel spacing of 250 mm, 12”, and 300 mm
- User selectable sample interval from 0.25” to 12”
- Very high accuracy and repeatability
- Unfiltered true elevation profiles
- Permanently stored calibration; does not require calibration for every use
- SurPRO can collect data for 20 hours before re-charging is needed.
- Durable and weather resistant (no laptop computer exposed to the elements)
- Can be checked on commercial aircraft as passenger luggage

Operation

- Transport to site by air or vehicle. SurPRO weighs 20.4 kg (42 lbs) and fits in a typical car trunk.
- Assemble in about 5 to 10 minutes
- Set up SurPRO using simple keypad, backlit 4 line LCD menu (enter site description, parameters)
- Check inclinometer level by performing closed loop profile
- Press RUN and collect data by pushing SurPRO.
- Press STOP and save file to compact flash.
- Print reports on-site or transfer files to external computer for further evaluation.

Maintenance

- Virtually maintenance free
- SurPRO is mechanically very simple, brief check for loose hardware and freely moving damping suspension
- Inspect tires for damage, wear, or debris.
- Delete old data files to free storage space.

Changes for FHWA Certification

- New large footprint tire – 70mm (2.76”) wide tires
- New ‘Tire Bridging Emulation Filter’ – 70mm (2.76”) long footprint filter.
- Alarms when profiling too fast on high texture pavements
- Optimization of data acquisition signal processing and digital filters
- Added .PPF (ProVAL) and .PRO (TxDOT) file formats.
- Added flexible file naming

Cost

- SurPRO 3000 Profiler
- Case, accessories, firmware and software
- Training (On-site available)
- Maintenance and support

October 2009 Experiment

CLIN3: Certified Portable Pavement Profiling Reference Device

- Generally a success with repeatability cross correlation **well above the required 98%**
- Firmware has been updated since field trials to improve chip seal surface repeatability to above 98%
- SurPRO can collect data on any road. For best repeatability however, must follow a continuous chalked or painted line by using the arrow on the center of the unit as a sight.

October 2009 Experiment

CLIN3: Certified Portable Pavement Profiling Reference Device

- Remarking chalk lines after rain caused deviations in profile
- Attempting to put a pointer or laser on kickstand made it harder to steer and follow reference line which resulted in wander
- Several test cells had cross slope or ruts that caused erroneous data if profiler wandered across the rut/cross slope.

October 2009 Experiment

CLIN3: Certified Portable Pavement Profiling Reference Device

- Temperatures during the week had about a 20° F ‘swing’ which caused slight but noticeable affects in DMI. Future tests will temperature compensate the DMI.

- Weather including wind, rain, cold temperatures, and night-time operation affected repeatability.

October 2009 Experiment

CLIN3: Certified Portable Pavement Profiling Reference Device

- This was an extremely educational week for environmental effects on profile data collection.
- **The accuracy and performance of the SurPRO 3000 instrument has proven that it can meet the requirements for the reference profiler.**
- **We feel the experiment was a great success and look forward to any additional testing.**