



History of RPUG to Promote Innovation

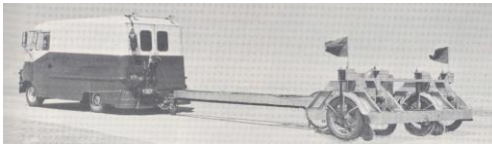
By

Dr. George K. Chang, PE

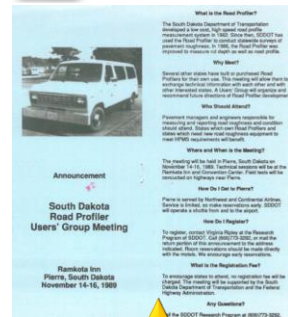


THE
TRANSTEC GROUP
The World's Pavement Engineering Specialists

A Brief History of Profiling and RPUG



AASHO
Road Test



AASHTO
Spec



TPF
Studies



1950

1960

1970

1980

1990

2000

2010

2020



The Little Book of Profiling

Basic Information about Measuring and Interpreting
Road Profiles

September 1998

Michael V. Savari
Steven M. Karimian

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RPUG



SINCE 1989



Influence of RPUG

- A platform for Idea Exchanges to Encourage innovation
- 1. Profile Measurement Methods
- 2. Technology Improvement
- 3. Smoothness Analysis
- 4. Smoothness Training and Support

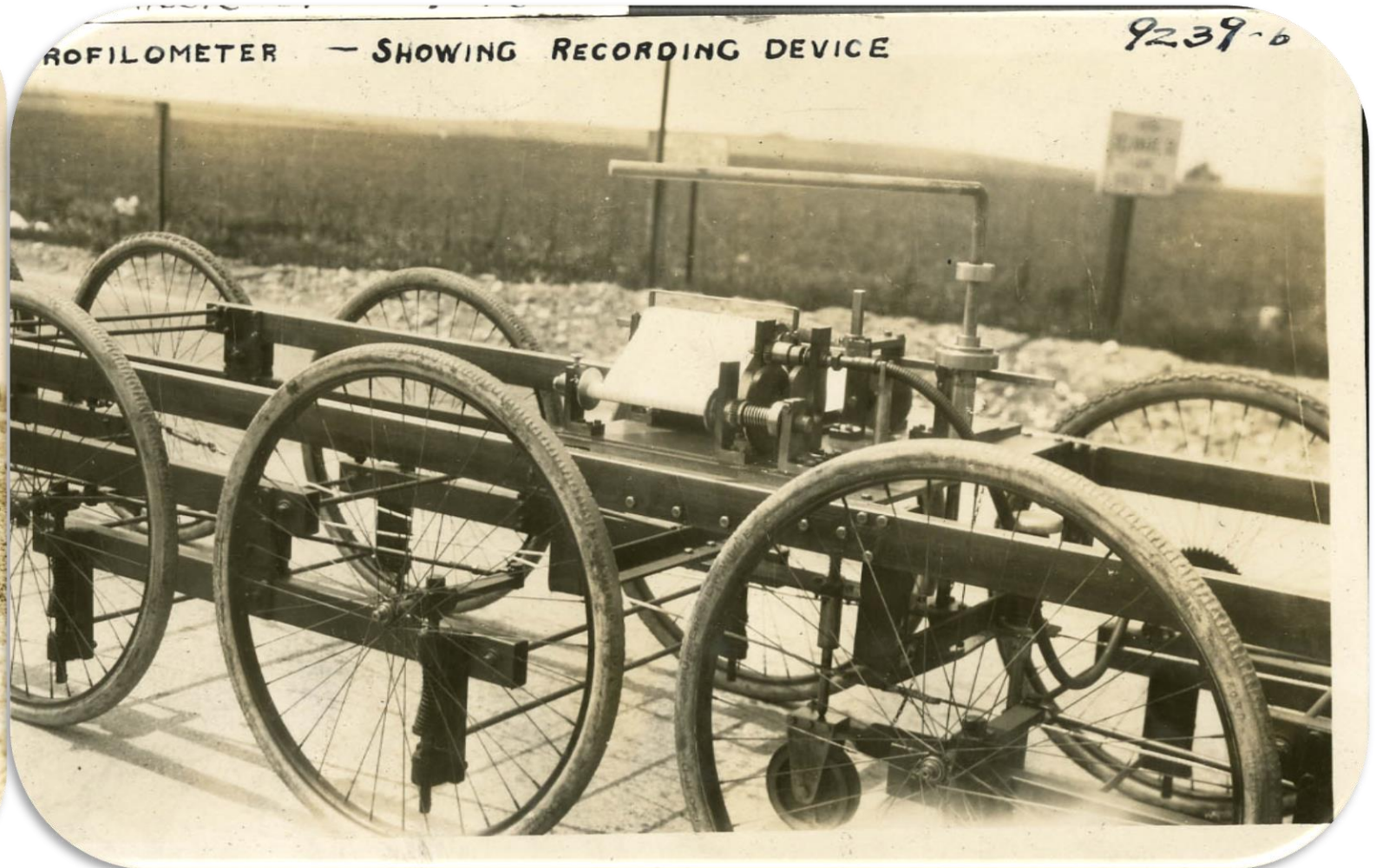
Profile Measurement Methods

Rolling Straightedge



Source: Steve Karamihas, UMTRI

Ohio Road Profilometer



Circa. 1928, Source: Brian Schleppi, Ohio DOT

Profilograph



BPR Roughometer



Circa., 1940, Source: Dave Huft, SDDOT



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Ohio Profilometer



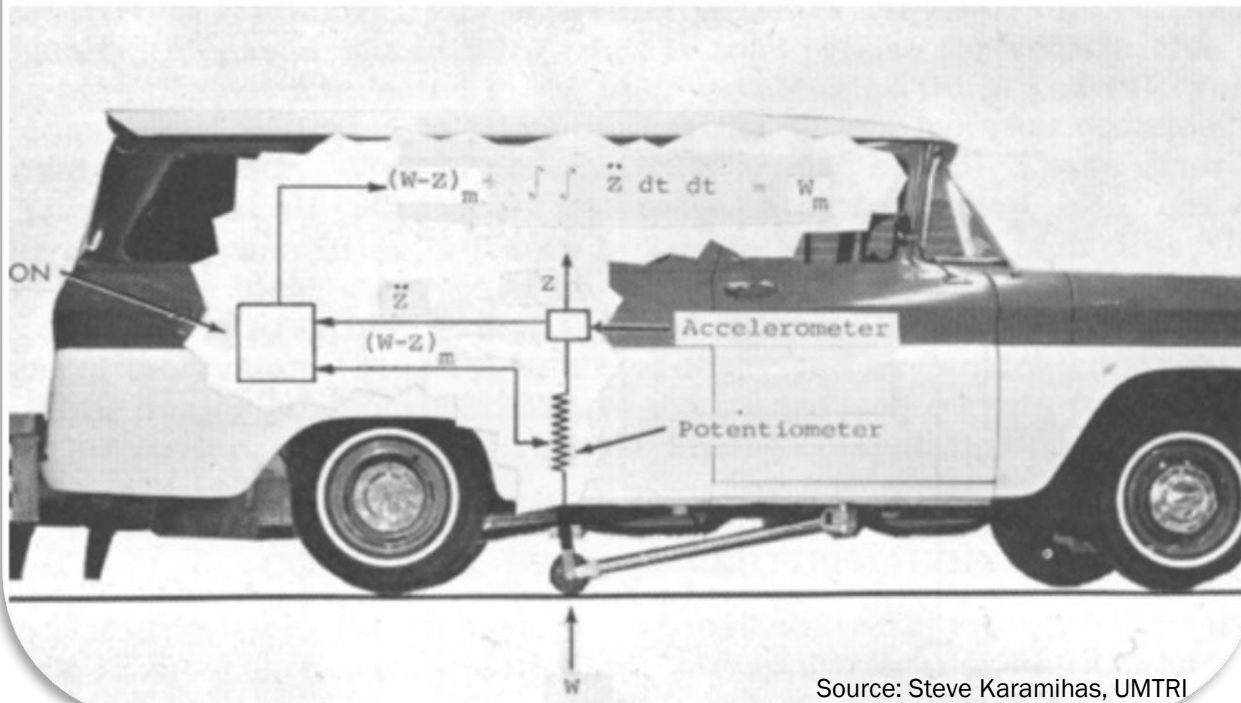
Source: Brian Schleppi, OH



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GM Profilometer

1964 - General Motors Research



South Dakota Profiler



Circa. 1984, Source: Steve Karamihas, UMTRI

High Speed Inertial Profiler



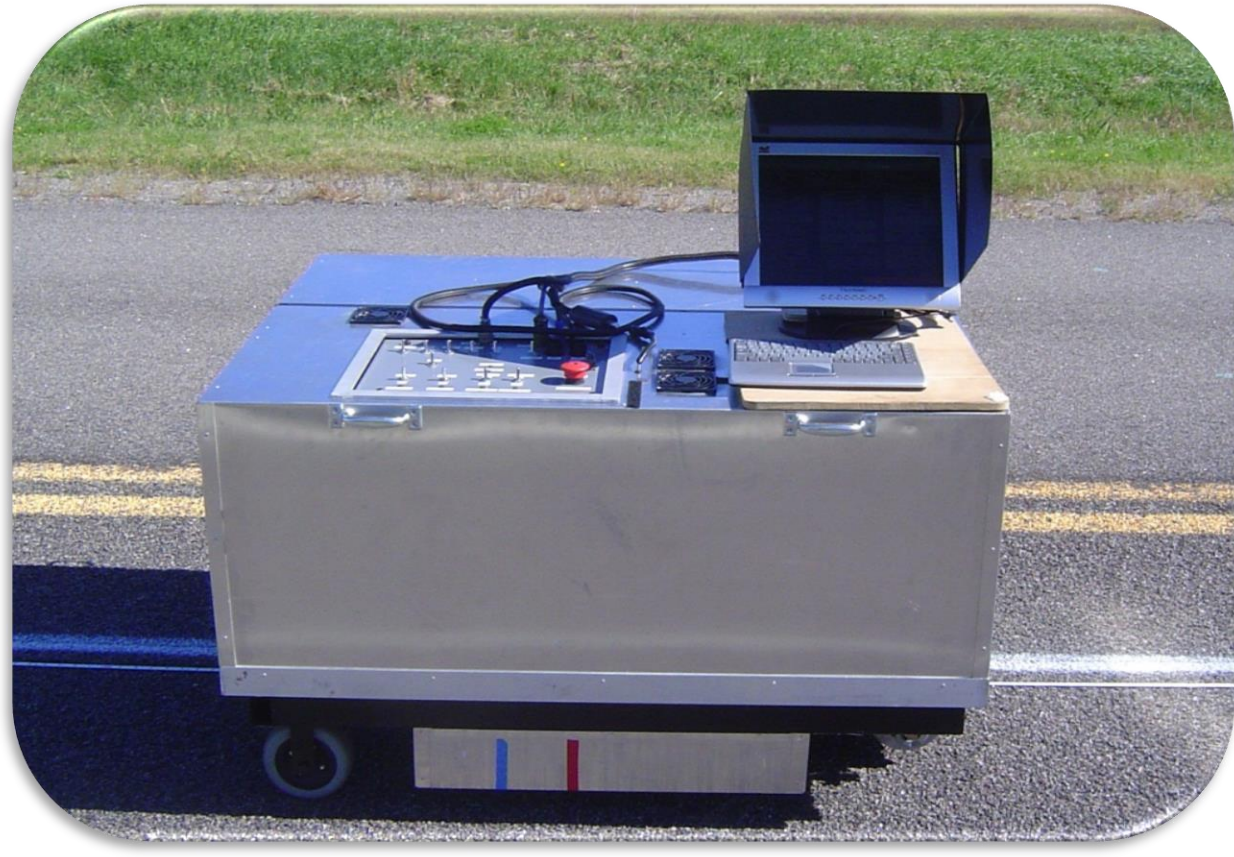
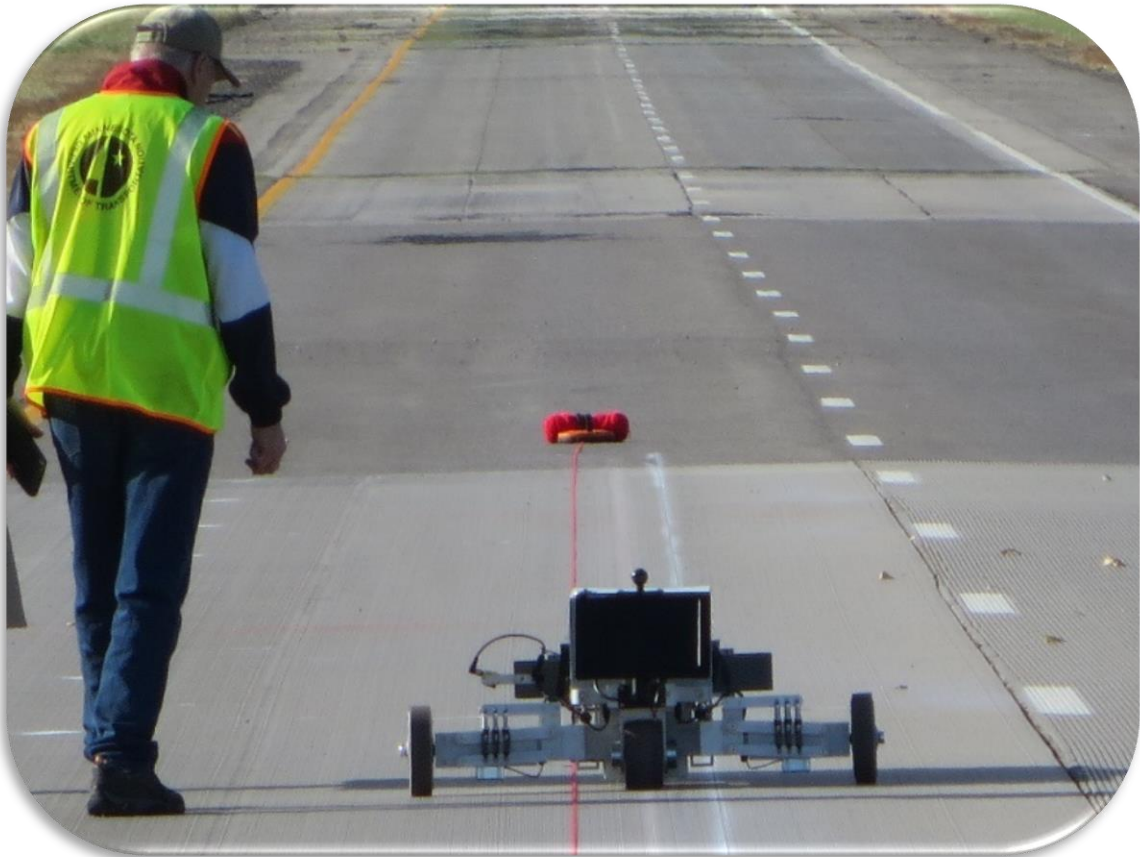
Lightweight Inertial Profiler



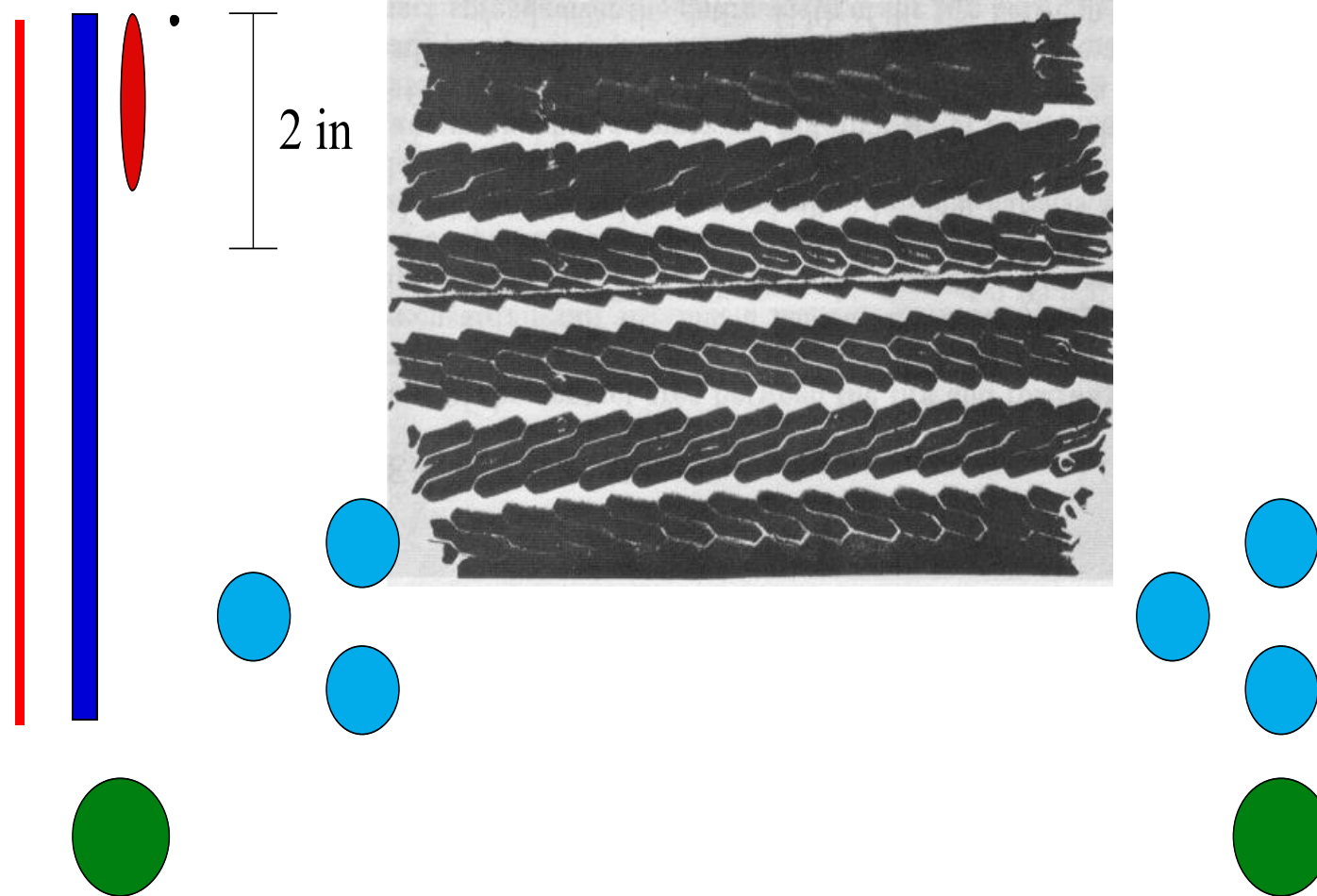
Walking Profilers



Autonomous Profilers

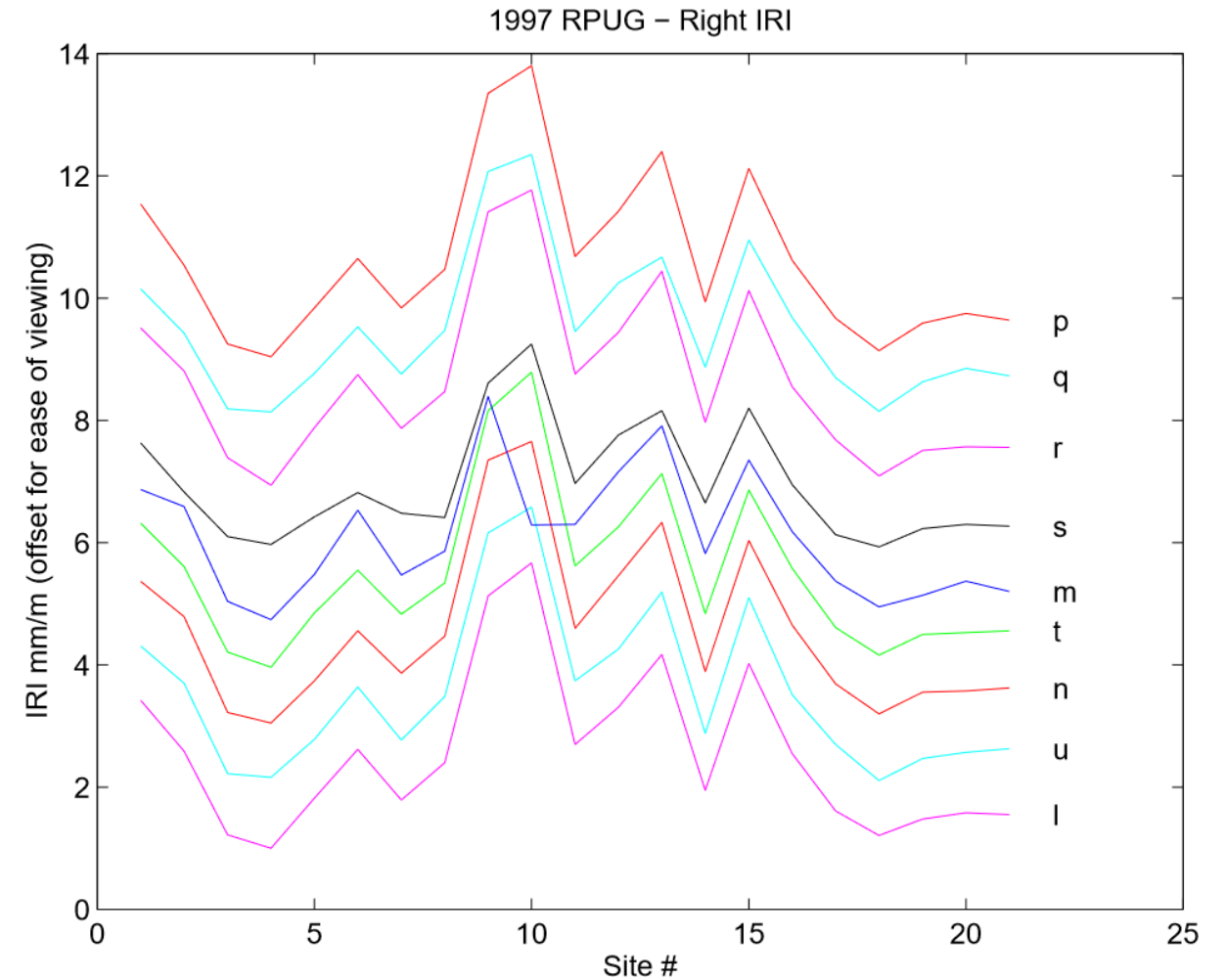
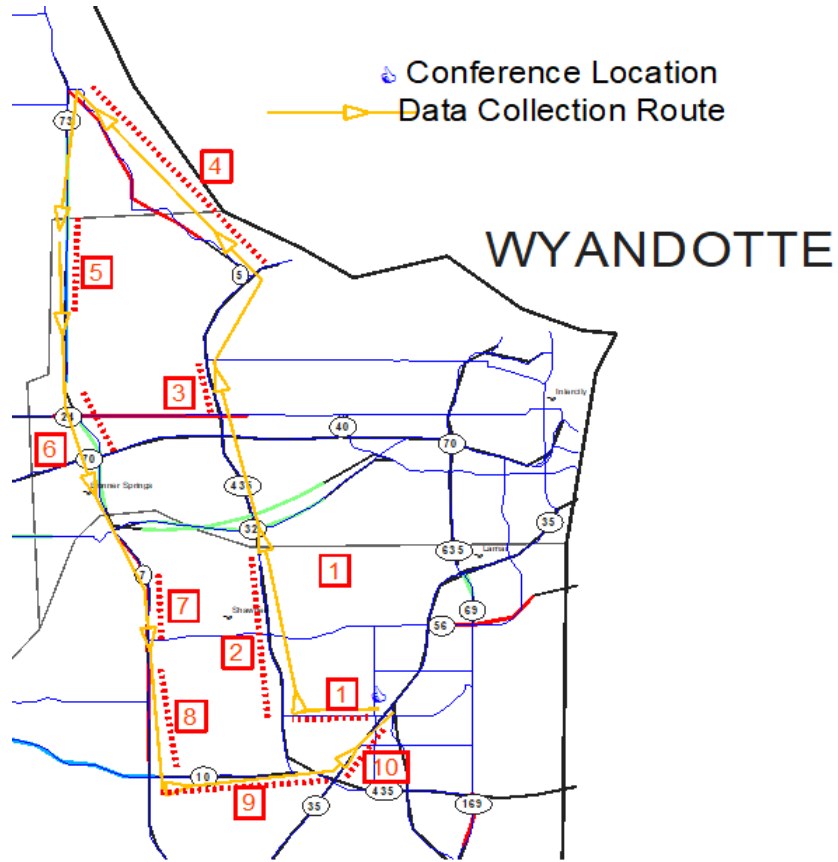


Foot Prints of Various Sensors

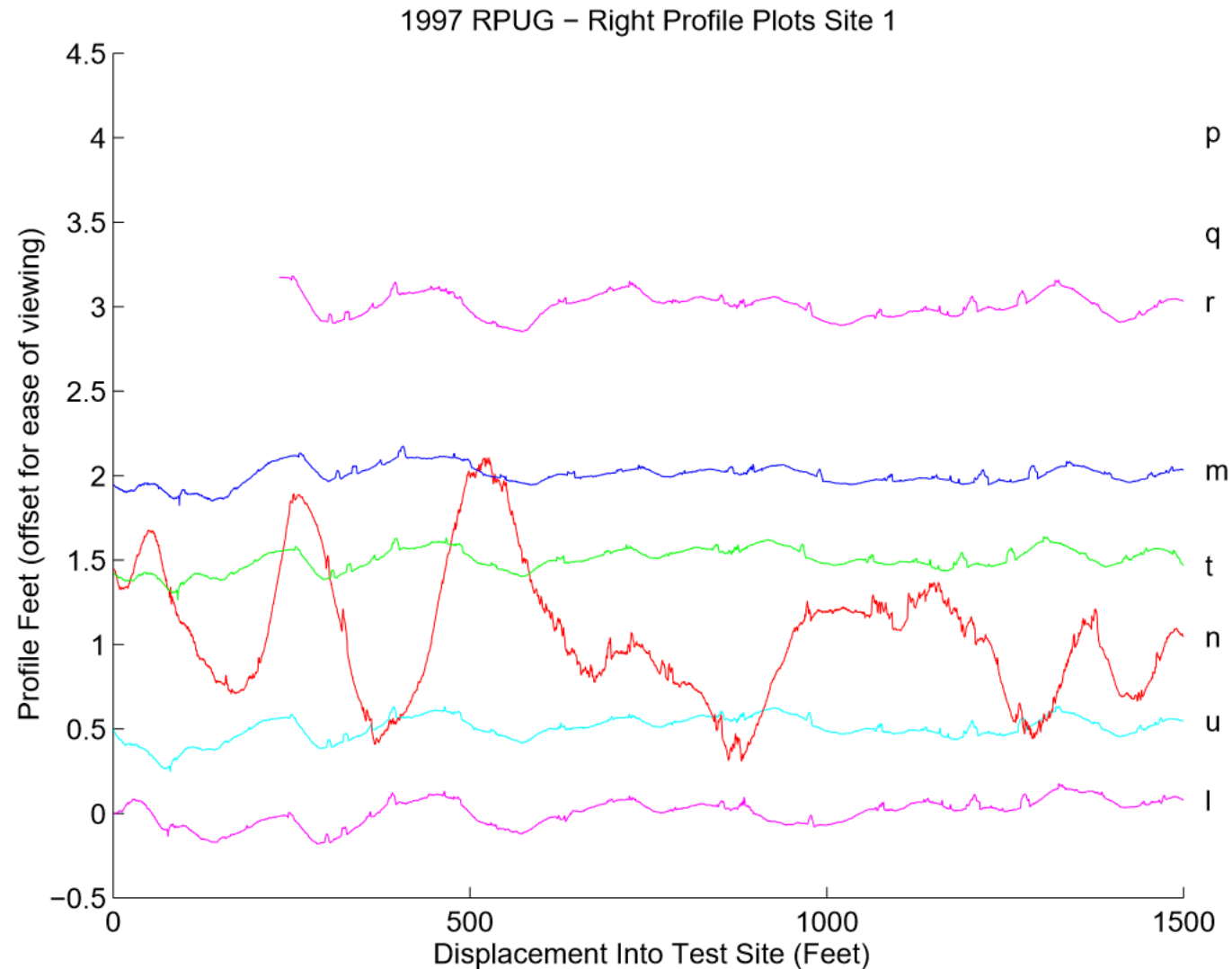


Technology Improvement

1997 RPUG Profiler Rodeo

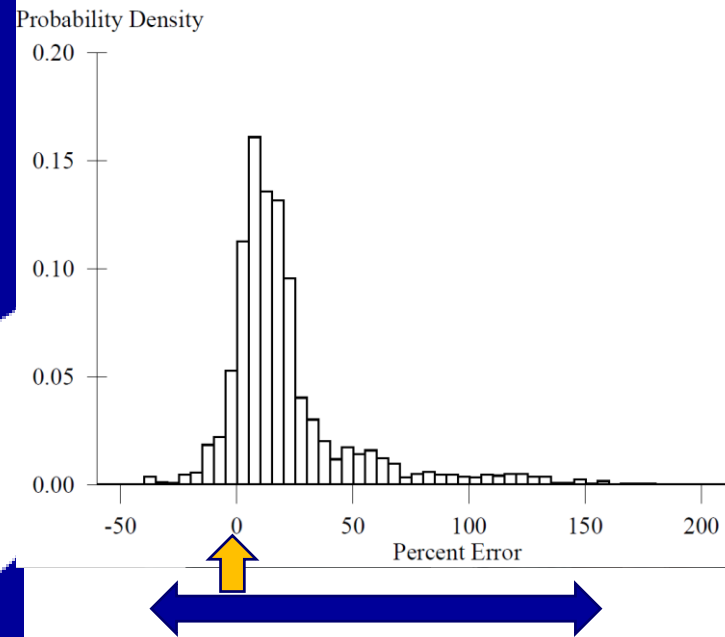


1997 RPUG Profile Comparison

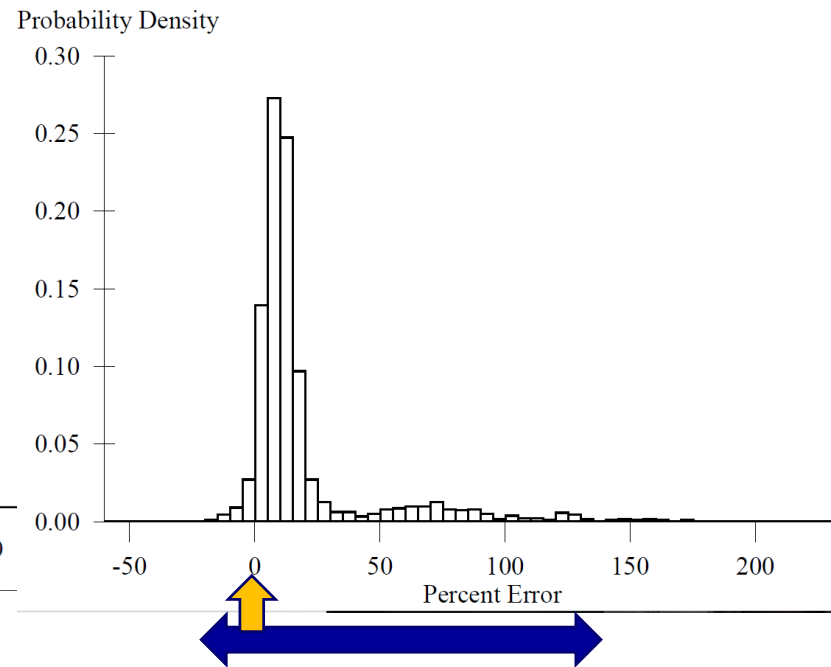


Profile Measurement Improvements

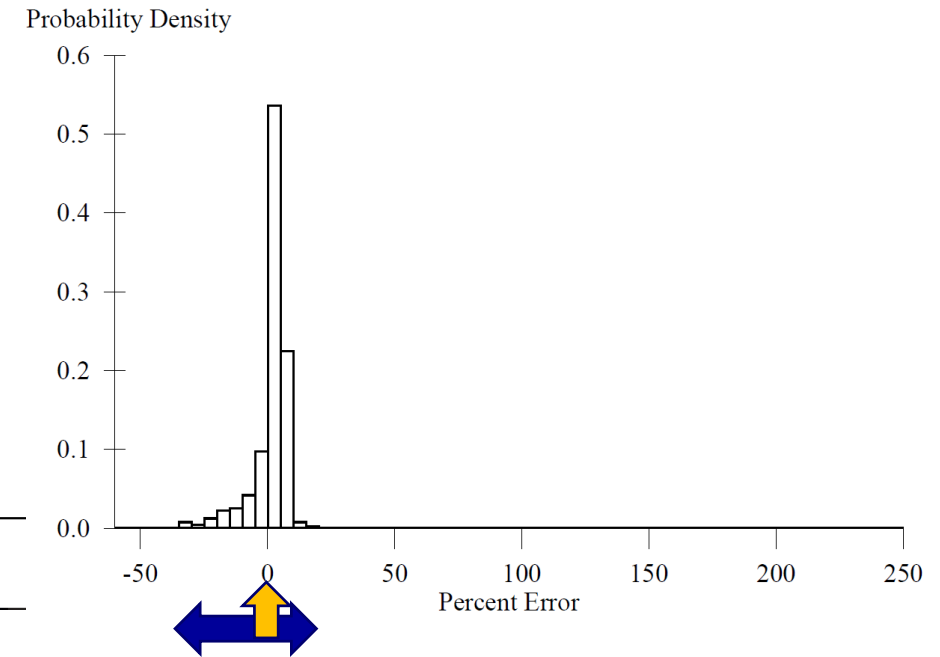
1993



2004

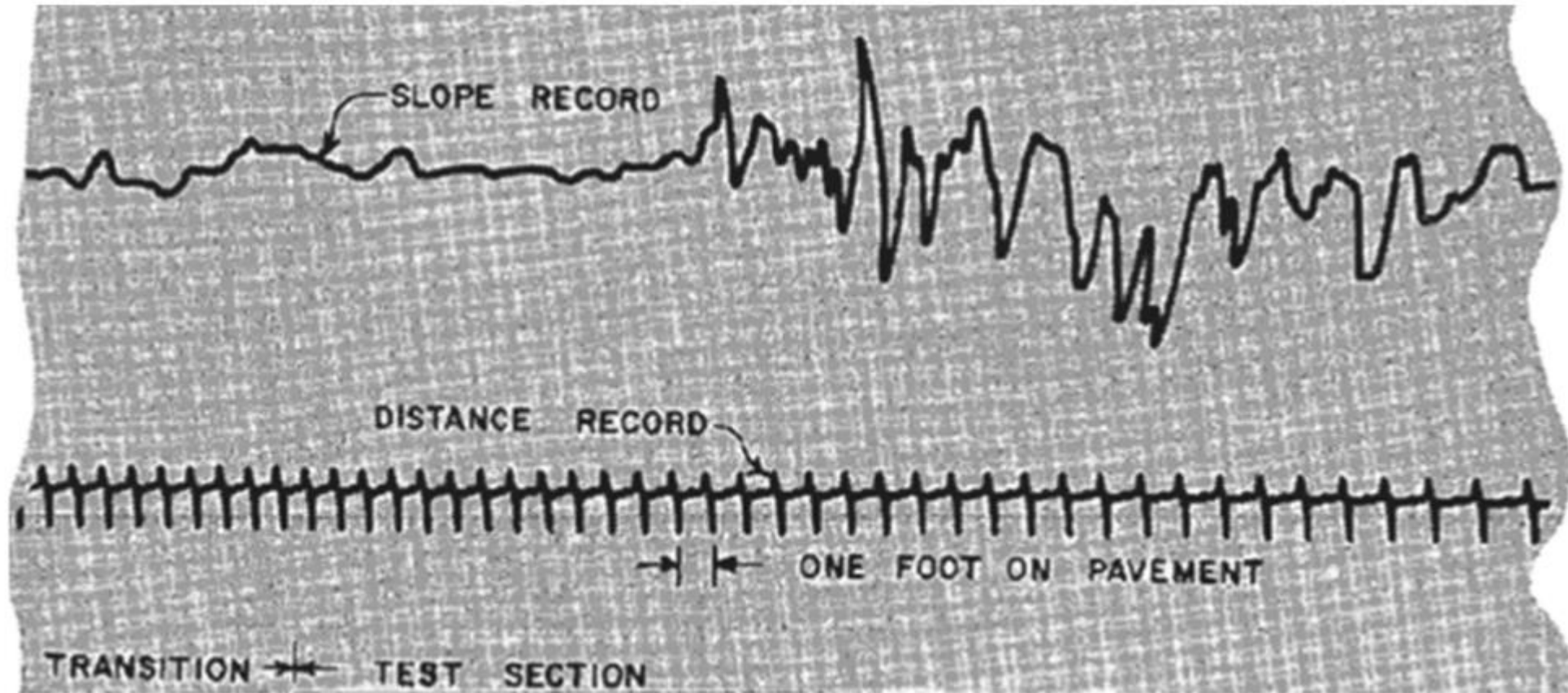


2015



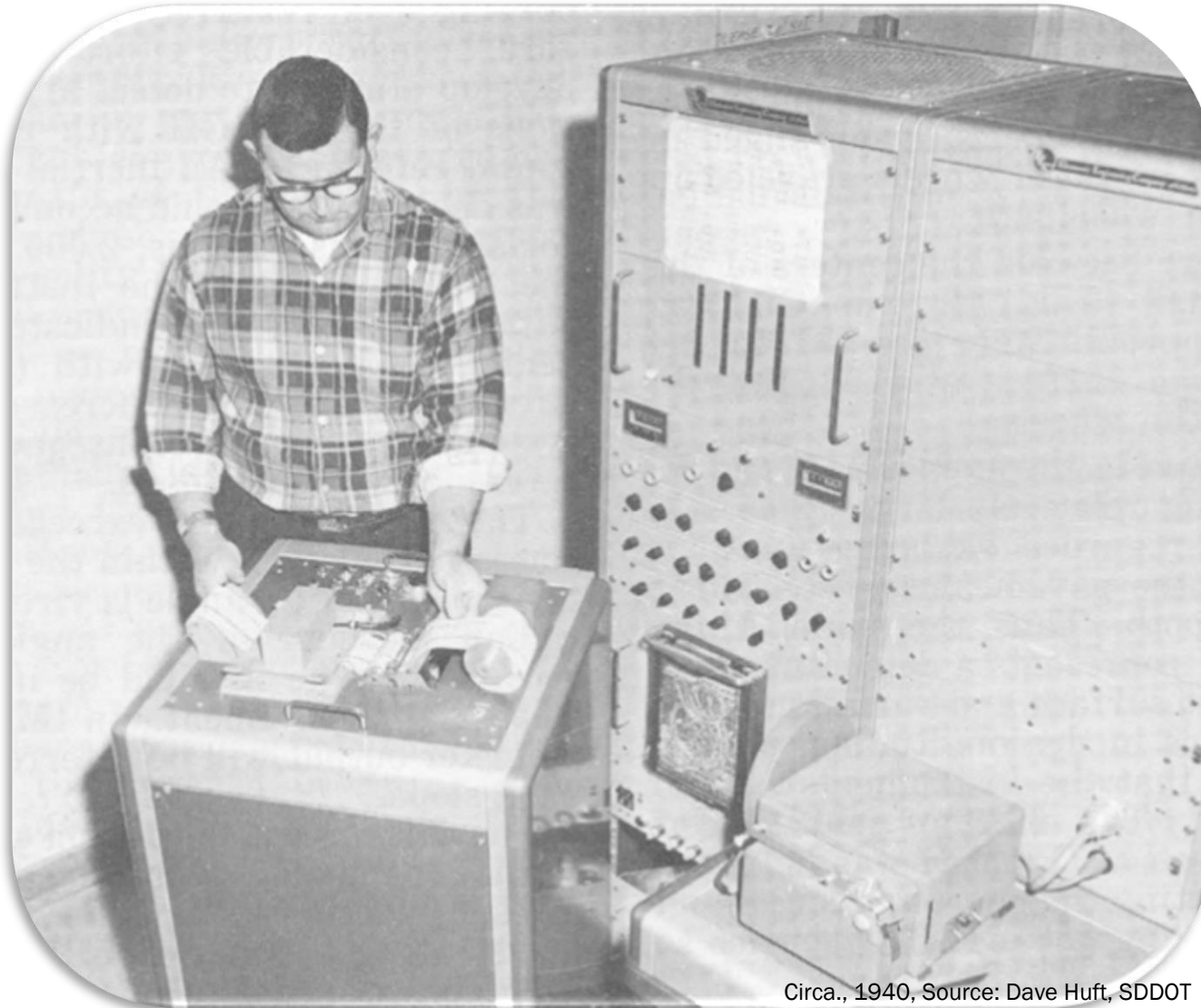
Smoothness Analysis

AASHO Road Test Profile Charts



Circa., 1940, Source: Dave Huft, SDDOT

AASHO Profile Digitization and Interpretation



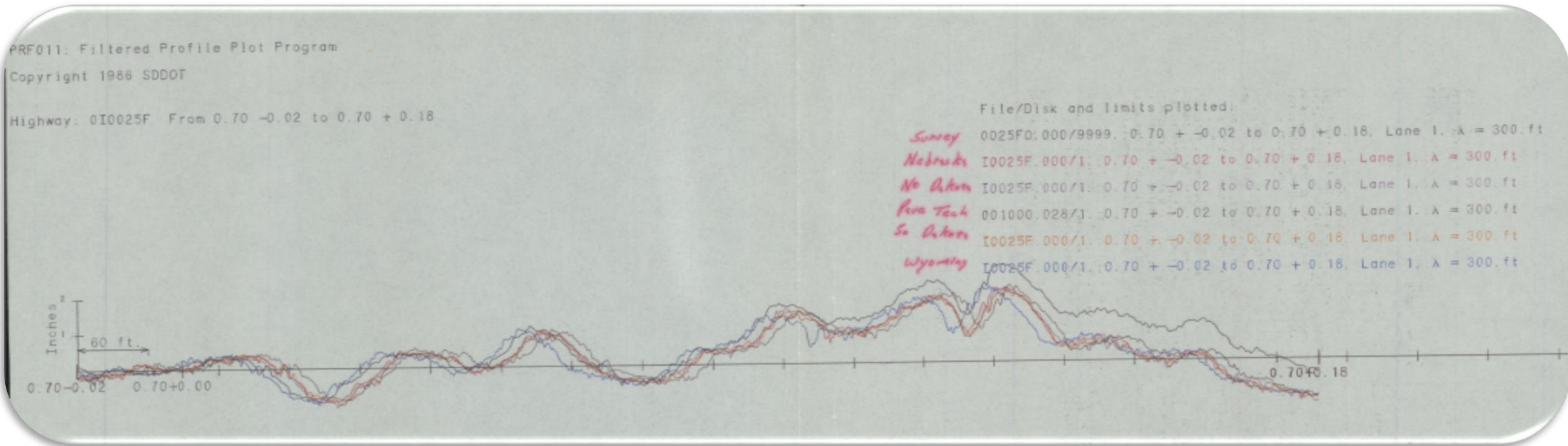
Circa., 1940, Source: Dave Huft, SDDOT

Mini-Computer For Profile Analysis



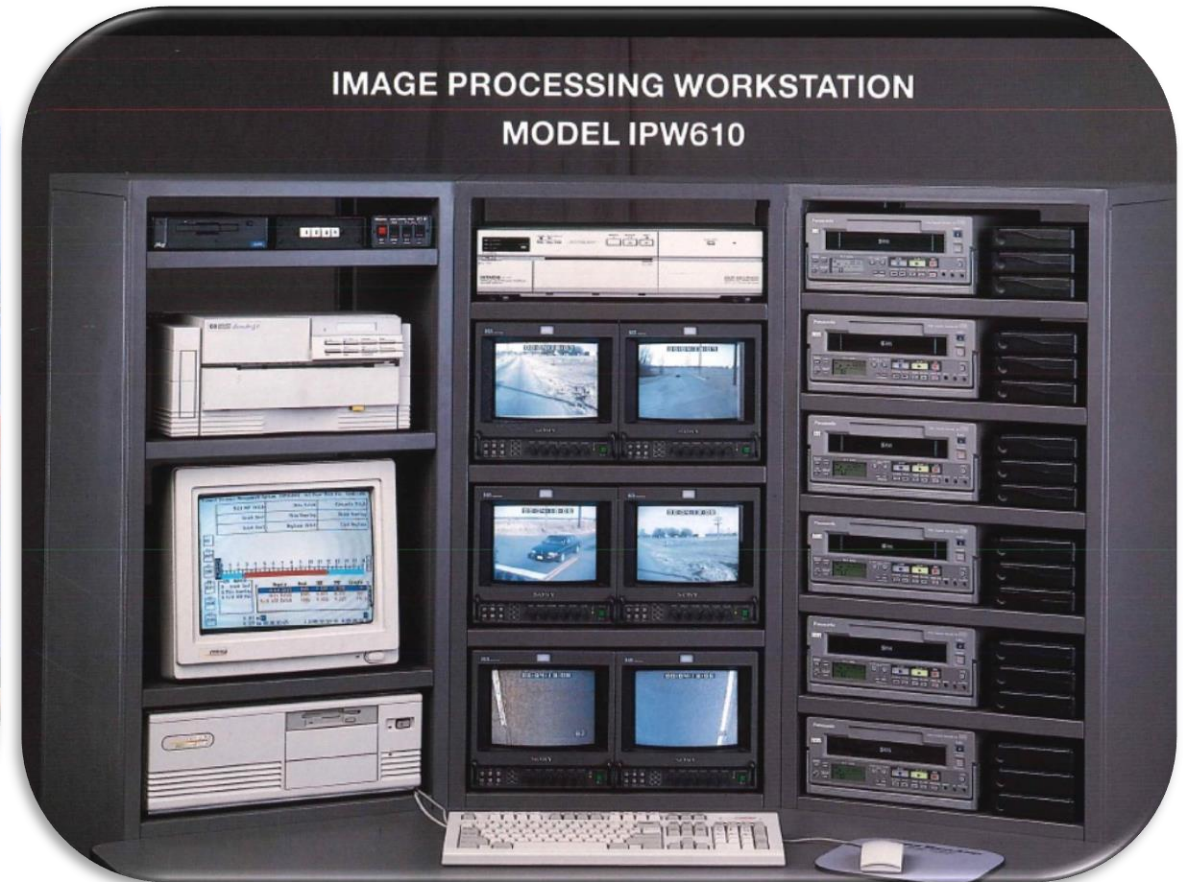
Circa., 1970, Source: Dave Huft, SDDOT

Filtered Profile Plots

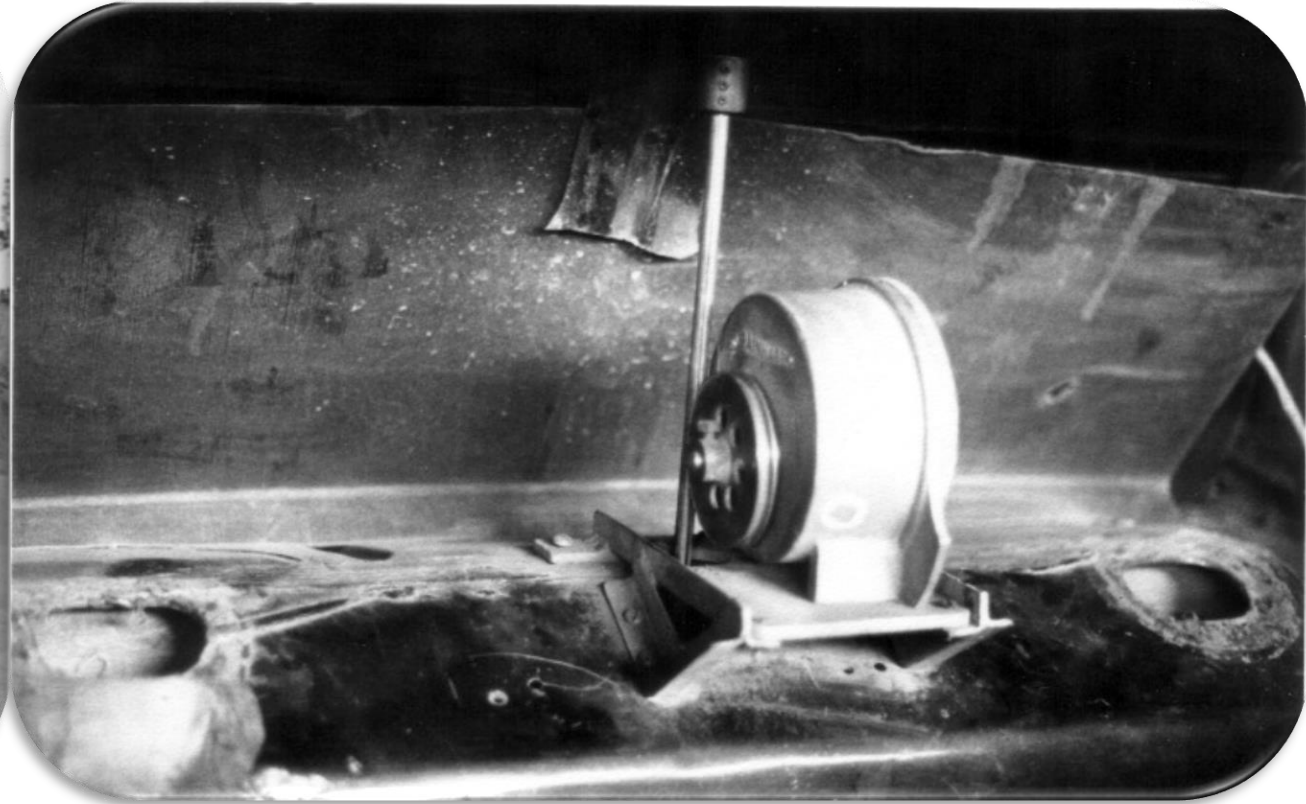


Circa., 1986, Source: Dave Huft, SDDOT

Profile Data Process Workstation

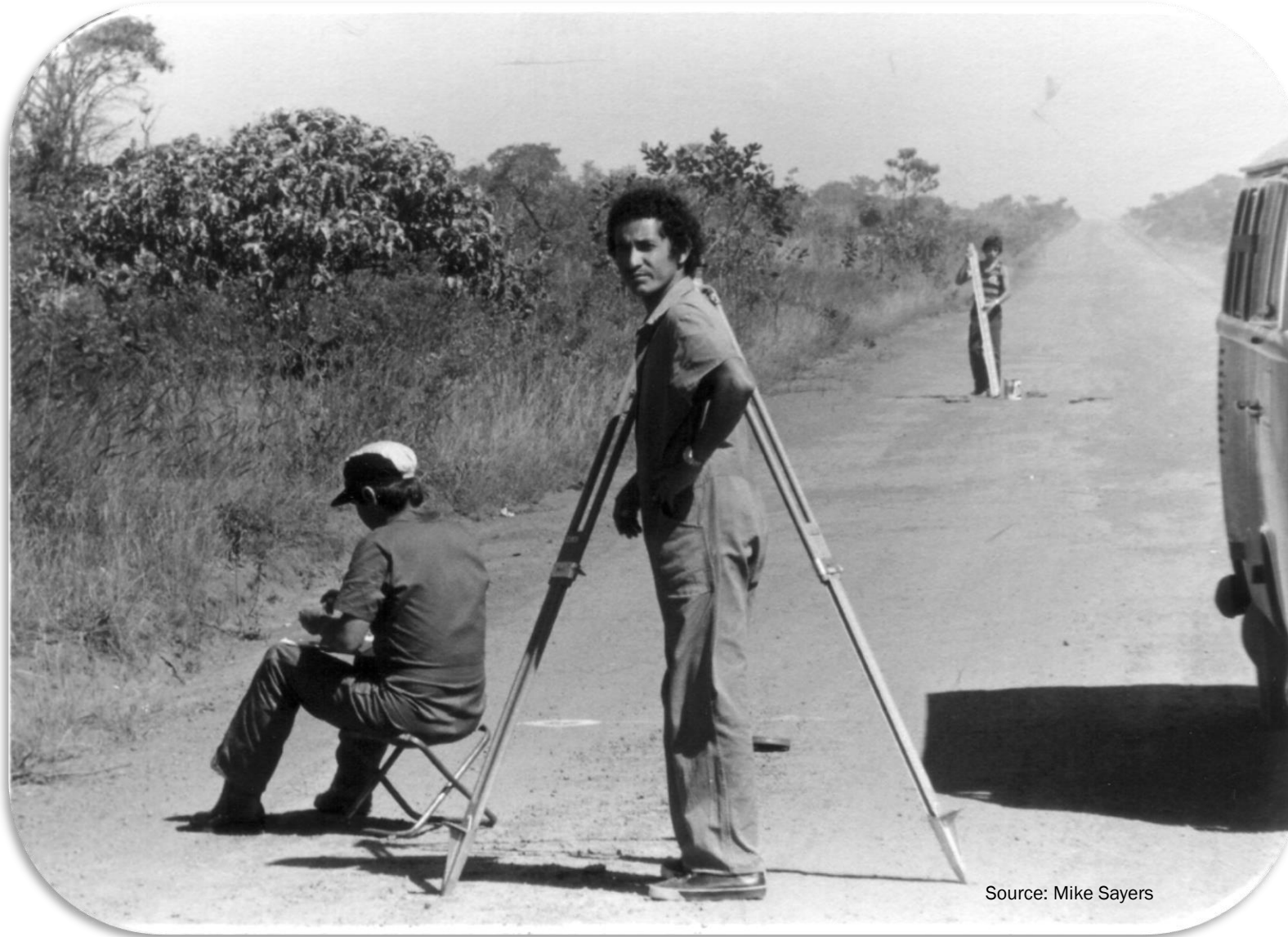


World Bank IRI Experiment



Source: Mike Sayers

World Bank IRI Experiment

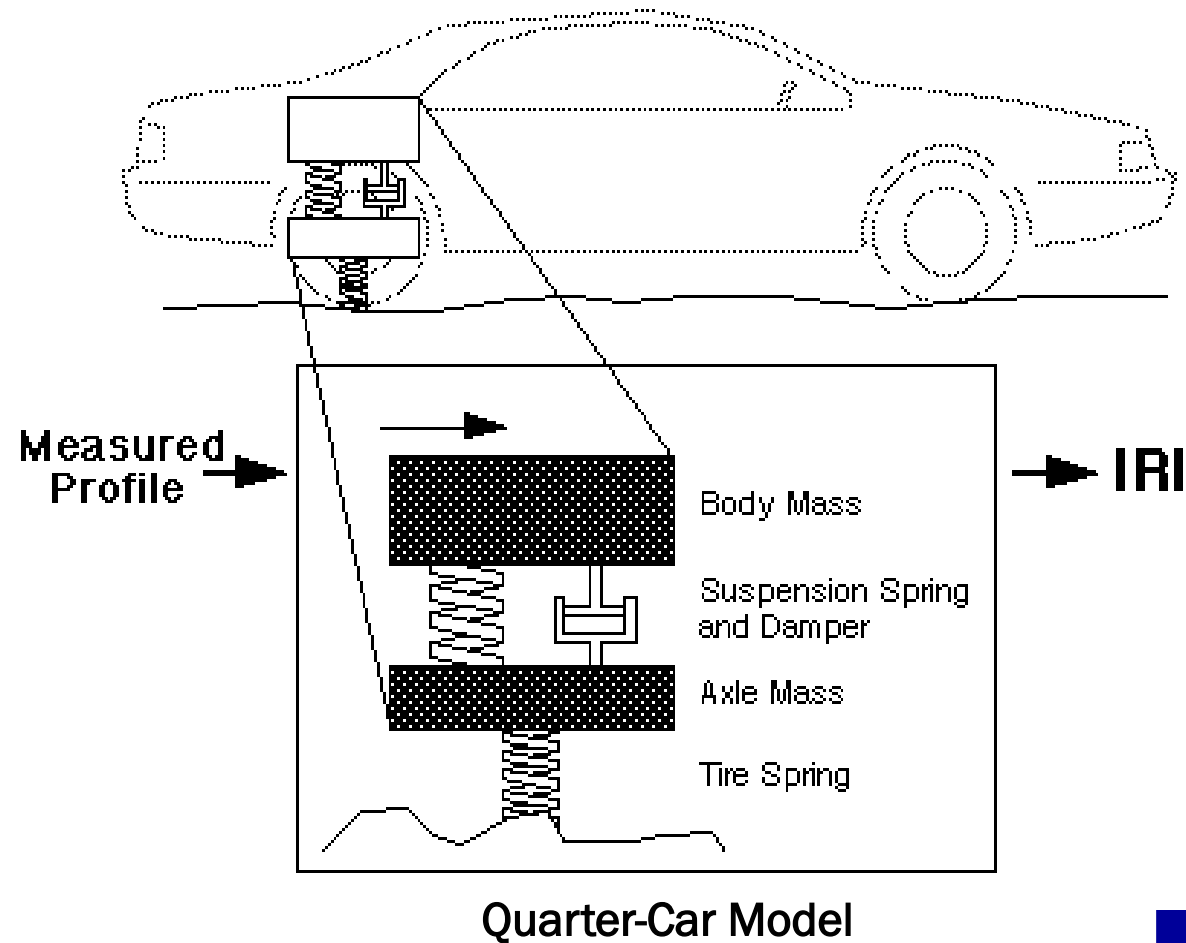


Source: Mike Sayers

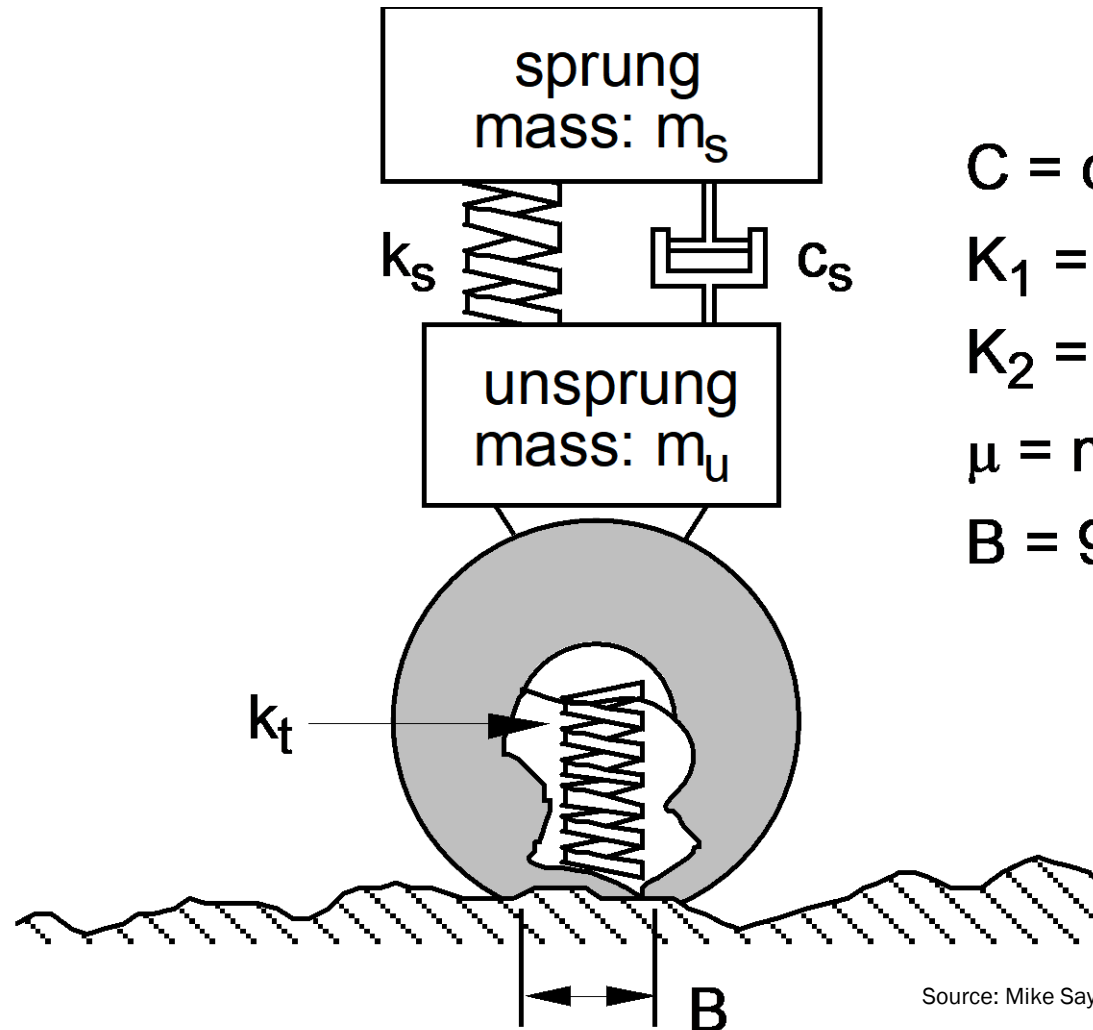


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Courtesy of Mike Sayers, 198X

International Roughness Index (IRI)



Golden Car Model



$$C = c_s/m_s = 6.0 \text{ sec}^{-1}$$

$$K_1 = k_t/m_s = 653 \text{ sec}^{-2}$$

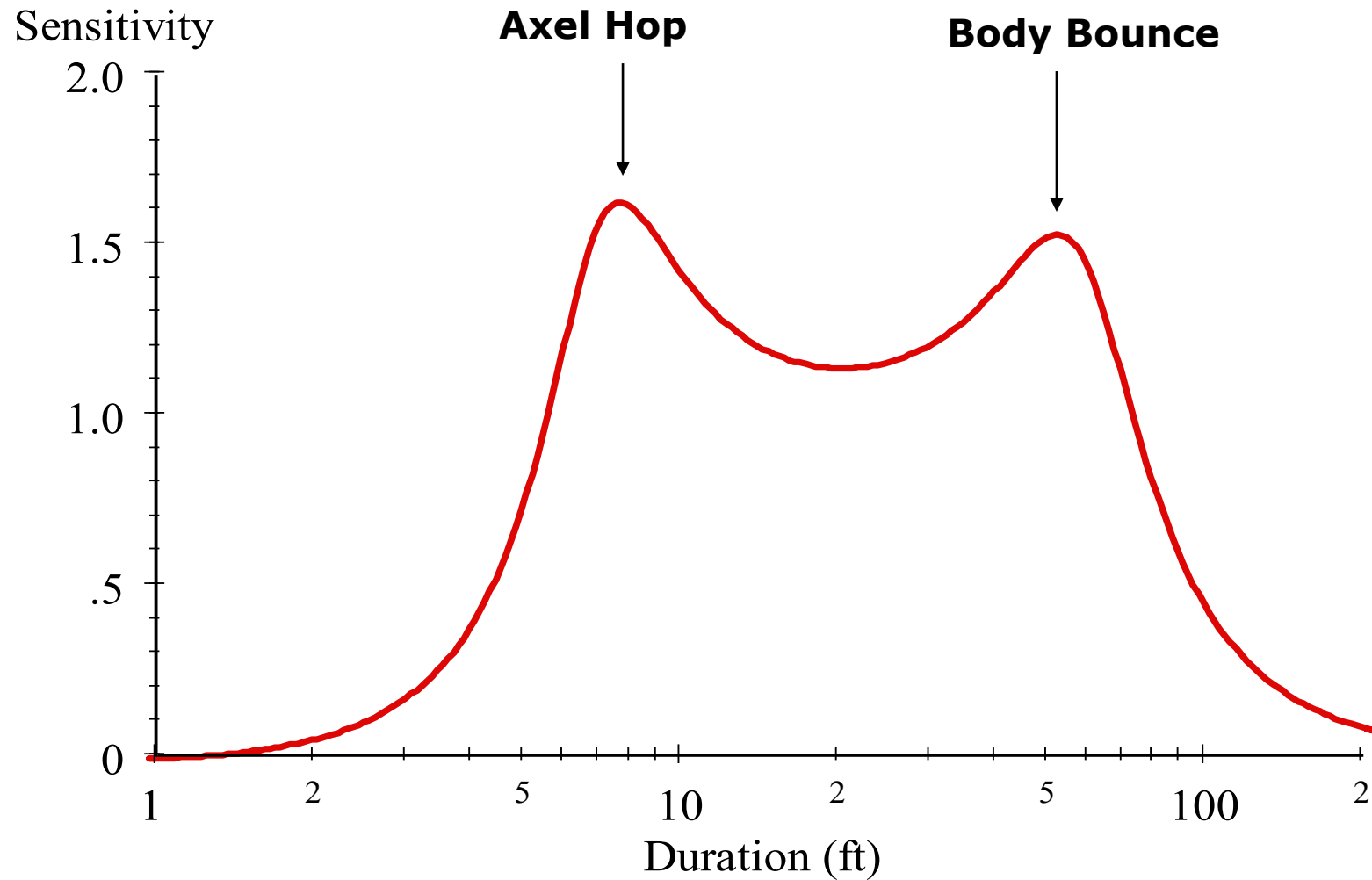
$$K_2 = k_s/m_s = 63.3 \text{ sec}^{-2}$$

$$\mu = m_u/m_s = 0.15$$

$$B = 9.84 \text{ in}$$

Source: Mike Sayers, 1995

IRI Sensitivity

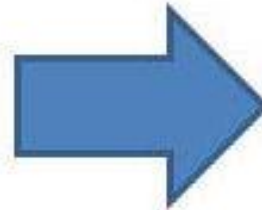


Evolution of Uses of IRI

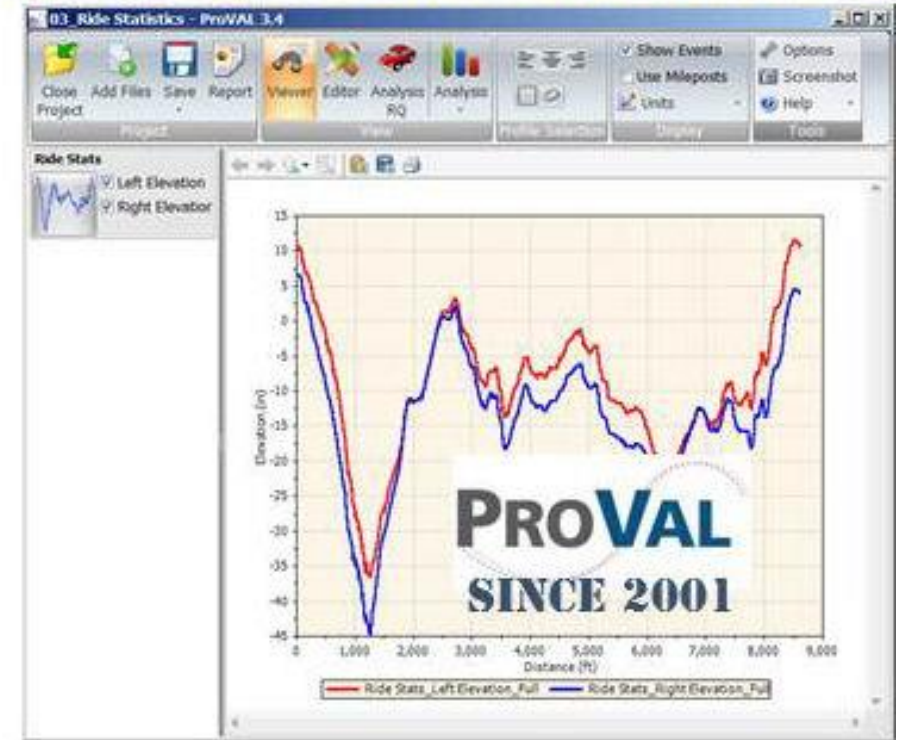
- Network Monitoring and Reporting
- Construction Acceptance of Pavements
- Forensic Investigations
- Use in Maintenance Operations

Profile Viewing and Analysis - ProVAL

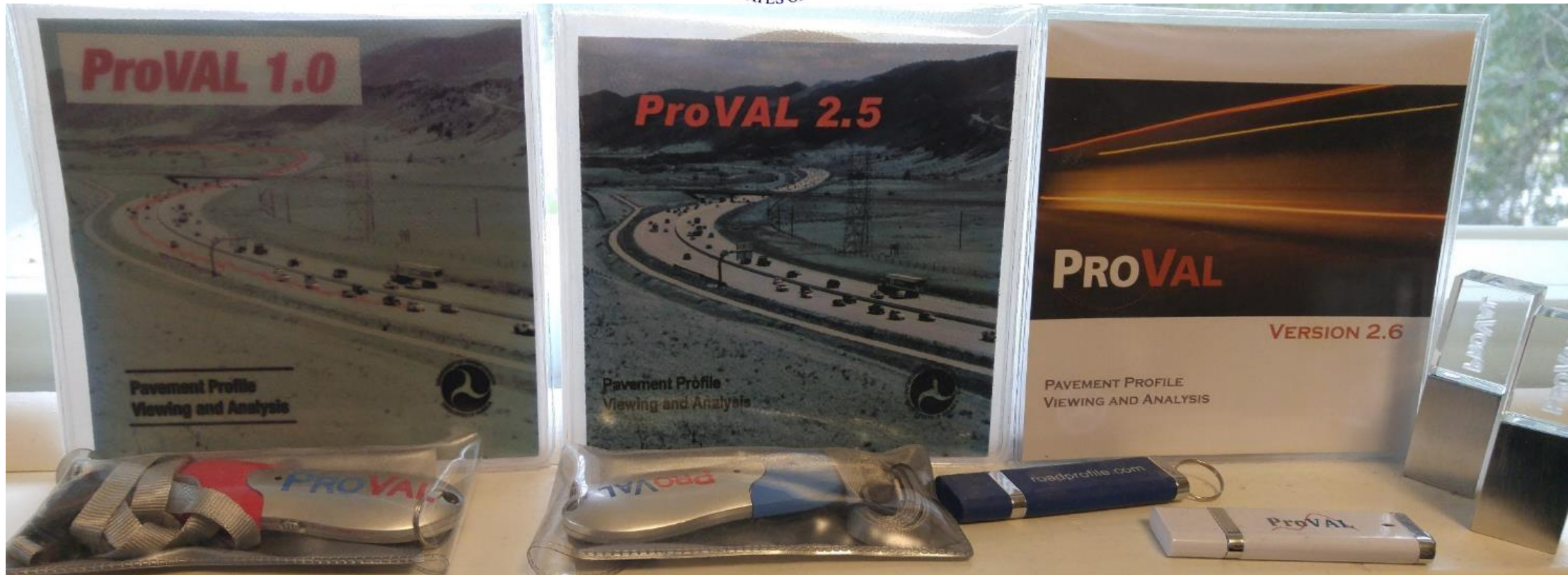
Many Different Profilers...



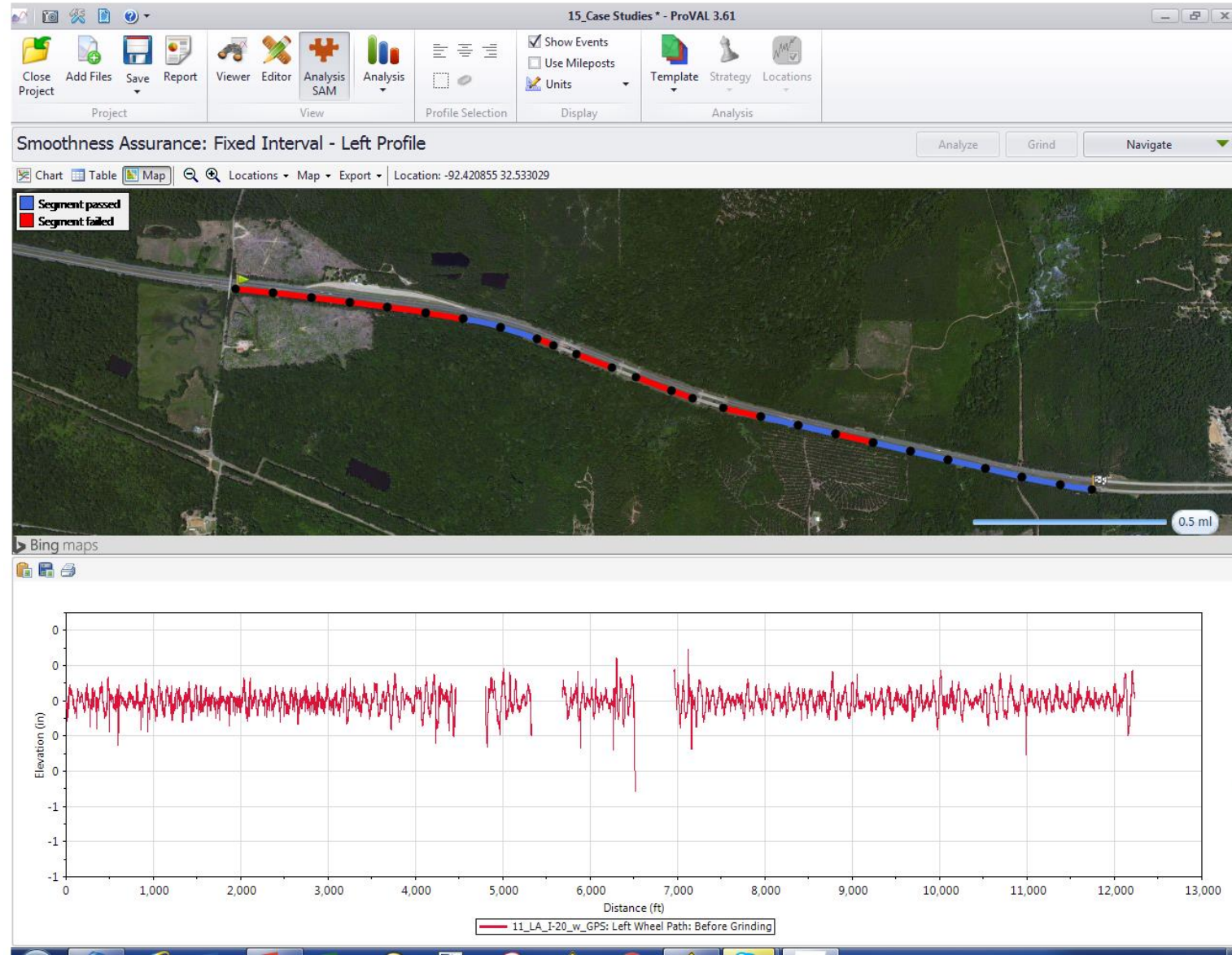
One Standard Software



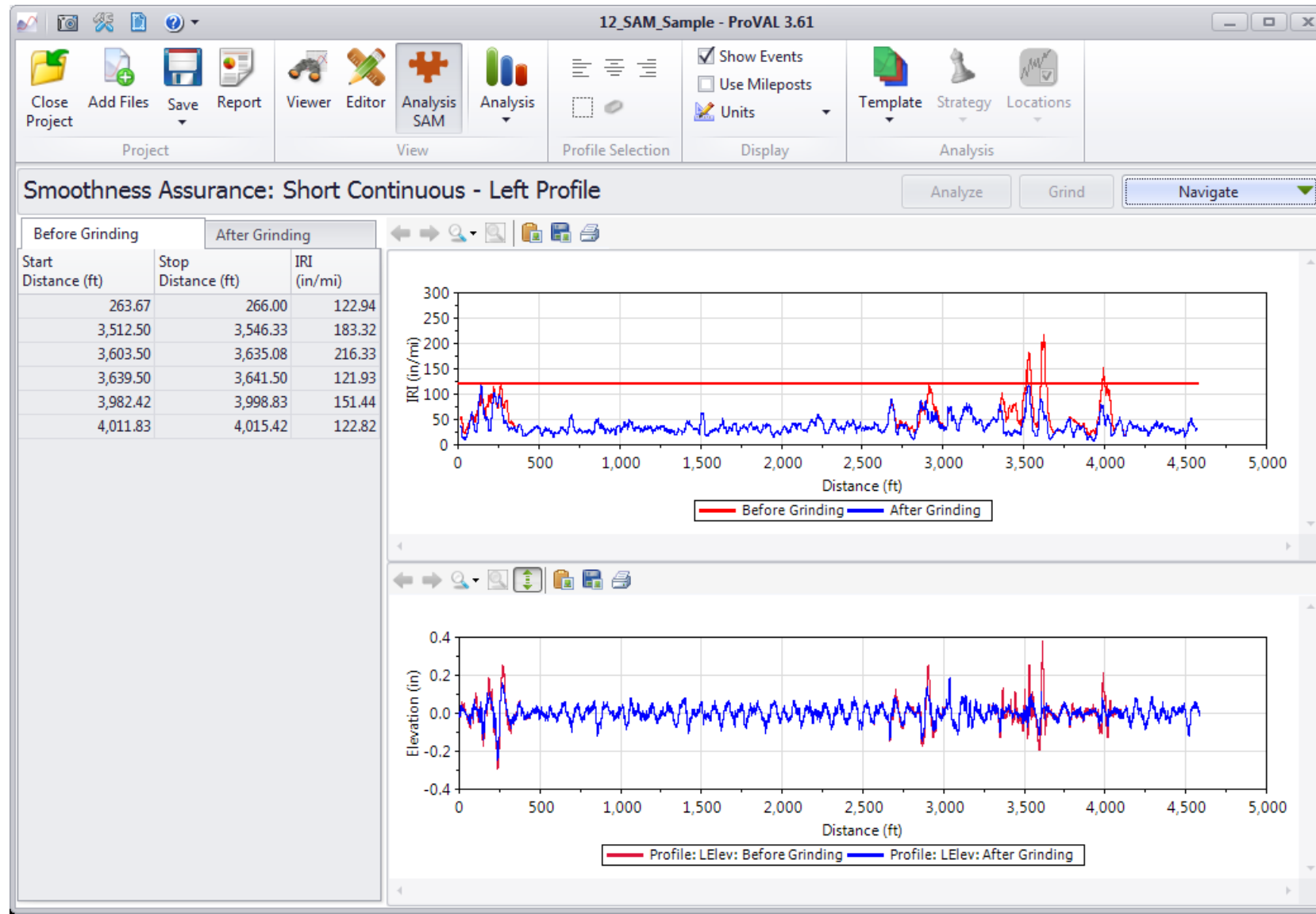
ProVAL – Since 2001



ProVAL 3.6



Smoothness Assurance Module (SAM)



SAM – Smoothness Assurance Module



Circa. 2006

ProVAL Website – RoadProfile.com



View and analyze pavement profiles

SOFTWARE

WORKSHOPS

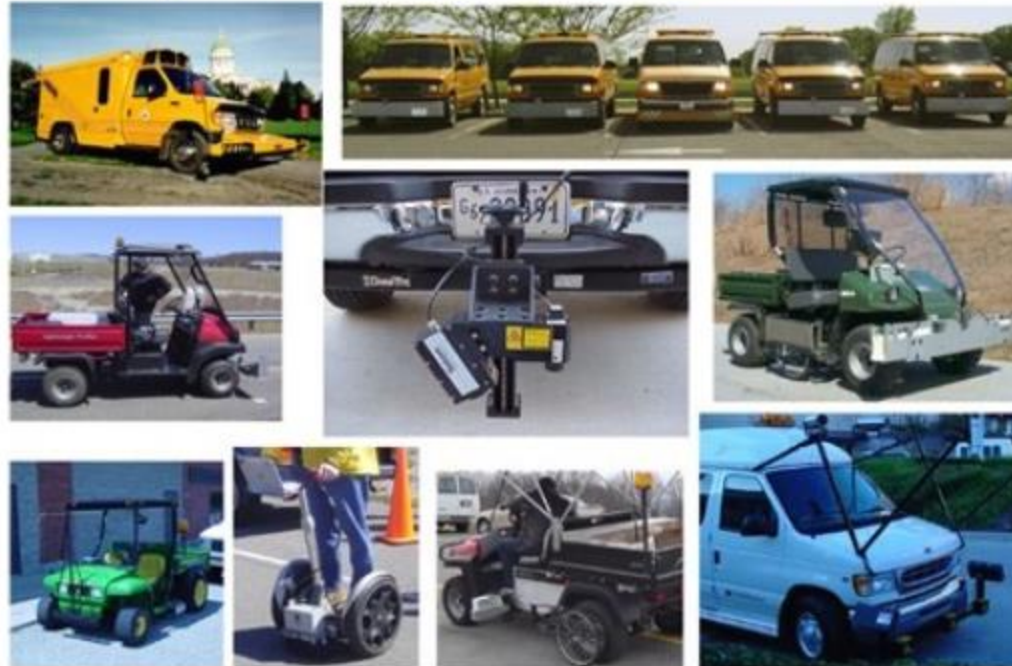
LIBRARY

FAQ

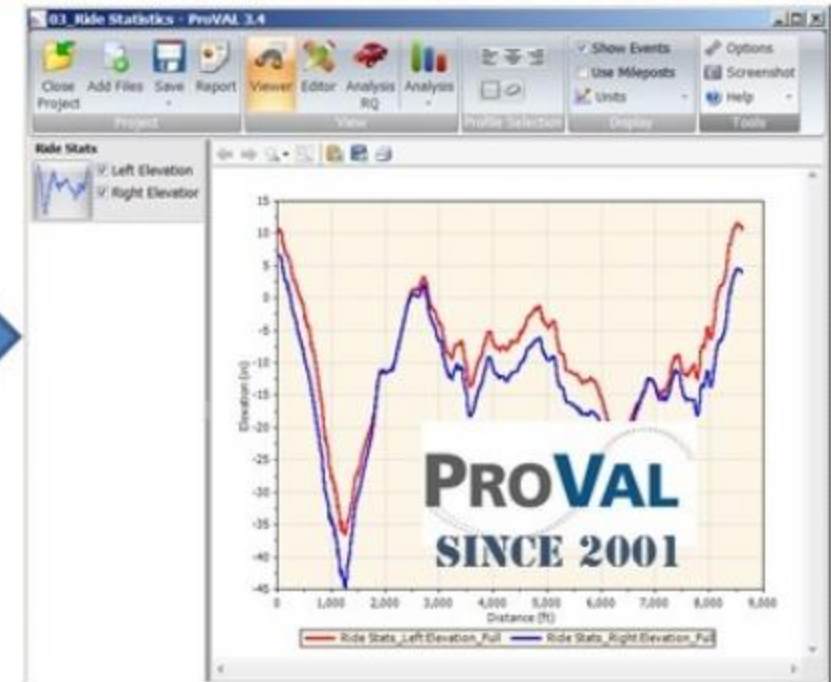
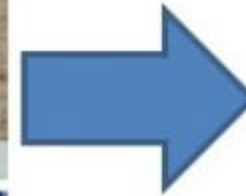
NEWS

SUPPORT

Many Different Profilers...

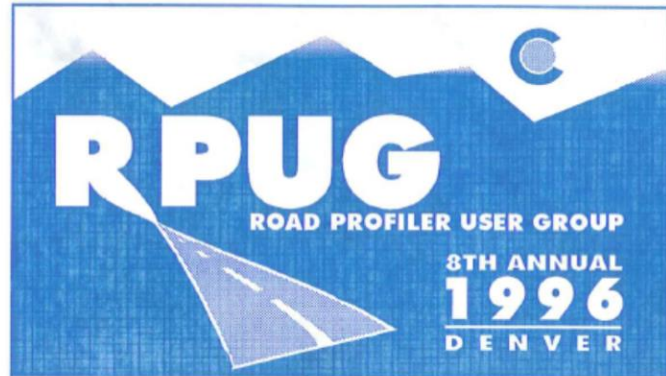


One Standard Software



Smoothness Training & Support

Training at RPUG



September 22 - 25, 1996
Marriott City Center - Denver, Colorado

Meeting Notes

Sponsored by:

Colorado Department of Transportation
Federal Highway Administration
Colorado State University Transportation Information Program

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Little Book of Profiling

The Little Book of Profiling

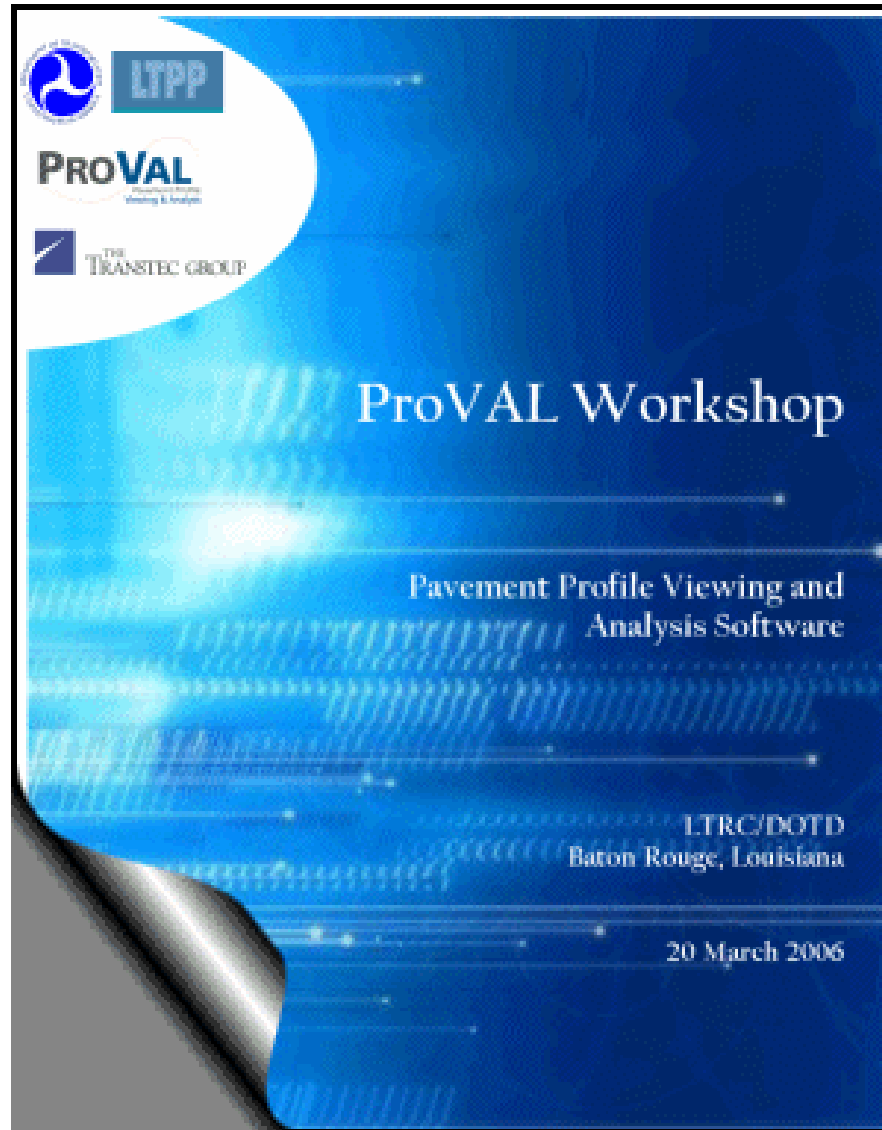
Basic Information about Measuring and Interpreting
Road Profiles

September 1998

Michael W. Sayers
Steven M. Karamihas

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ProVAL Workshop



PAVEMENT PROFILE VIEWER AND ANALYZER (ProVAL version 2.5) SOFTWARE WORKSHOP

Tentative Agenda

OBJECTIVES

- ✦ To familiarize attendees with the current version of the *Profile Viewer and Analyzer* software (ProVAL www.roadprofile.com).
- ✦ To refresh some of the key fundamentals of pavement profiling and analysis methods.
- ✦ To inform attendees of the advantages, limitations, and pitfalls related to analyzing and interpreting pavement profiles.
- ✦ To provide an interactive and hands-on approach throughout the workshop.

AGENDA

- 12:30pm Welcome and Self-Introductions
- 12:45pm Overview and Outline of Workshop
- 12:55pm Preview of Pavement Profile Viewer and Analyzer Software
- 01:10pm Refresher on the Fundamentals of Pavement Profiling
- 01:45pm Profile Analysis – Part I
- 03:00pm Break
- 03:30pm Profile Analysis – Part II
- 04:30pm Adjourn for the day

Next Session

- 08:00am Bumpfinder and Grinder Simulation – Part I
- 09:30am Break
- 09:45am Bumpfinder and Grinder Simulation – Part II
- 11:30am General Discussion including the Future of Pavement Profiling
- 11:45am Conclusion and Workshop Evaluations
- 12:00noon Adjourn

WORKSHOP MATERIALS

- ✦ CD-ROM containing latest version of the FHWA ProVAL Software
- ✦ Printed packet including Workshop Slides

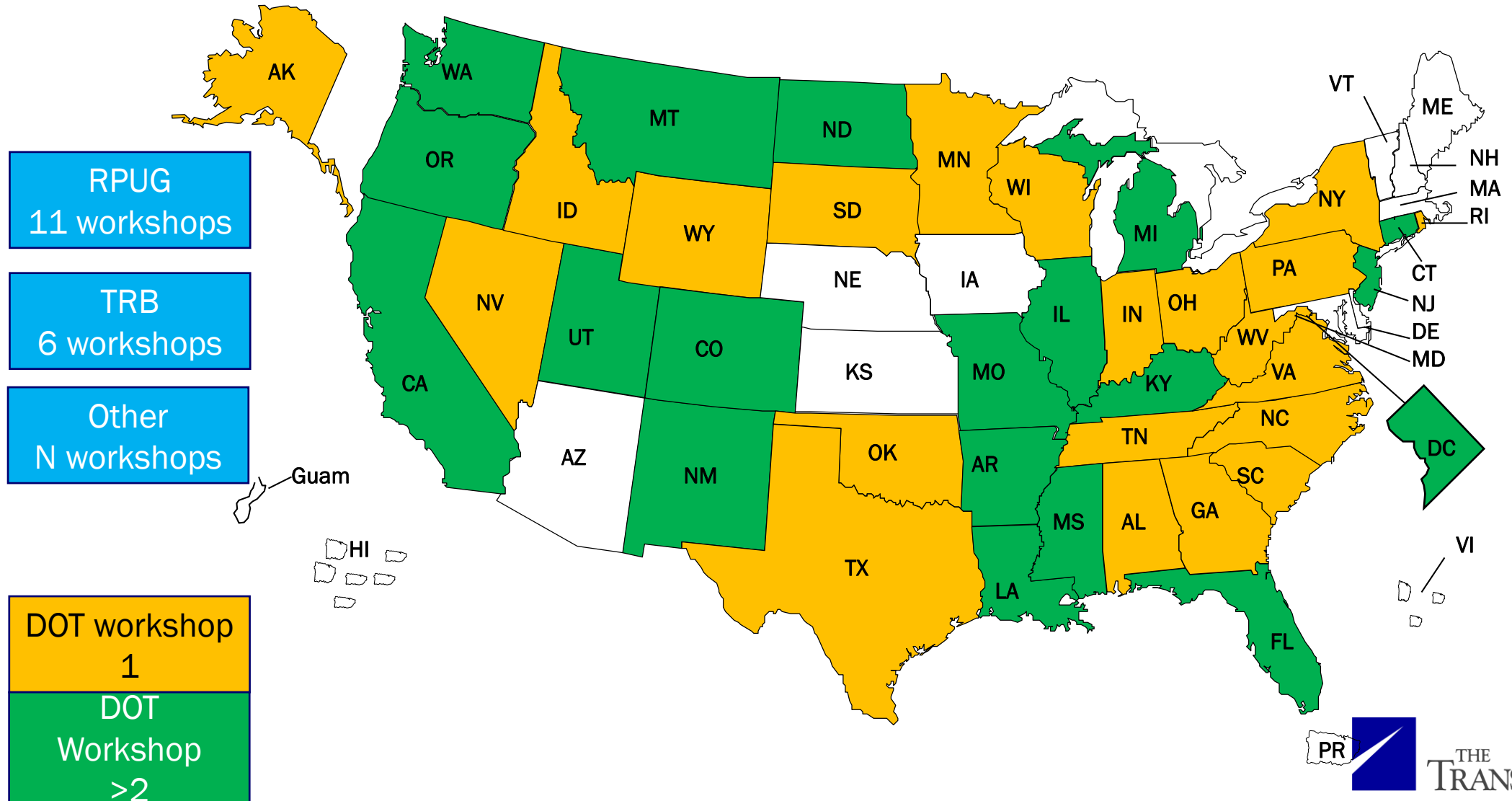
SPECIAL NOTES

- ✦ Attendees will need to bring their laptop computers for the hands-on sessions.

INSTRUCTORS

Steven M. Karamihas Senior Research Associate UMTRI 2901 Baxter Road Ann Arbor, MI 48109-2150 (734) 936-1057	George K. Chang, P.E., Ph.D. The Transtec Group, Inc. 1012 East 38 1/2 Street, Austin TX 78751 (512) 451-6233	Michael J. Swan, P.E. Project Manager Dick Corporation 10320 Brecksville Road Brecksville, Ohio 44141
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100+ ProVAL Workshops



ProVAL workshop 2007 Washington State



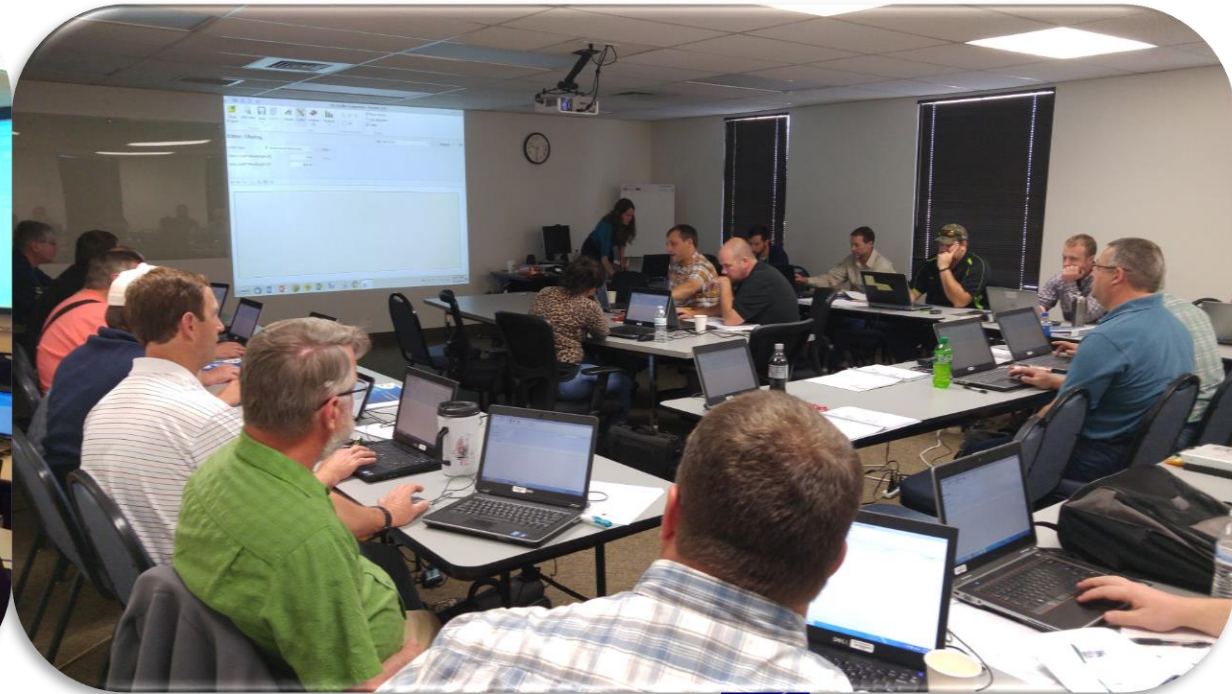
ProVAL workshop 2009 LTRC



ProVAL workshop 2014 NM DOT



ProVAL workshop 2016 ID DOT



ProVAL Workshop in Japan



ProVAL Workshop ワークショップ

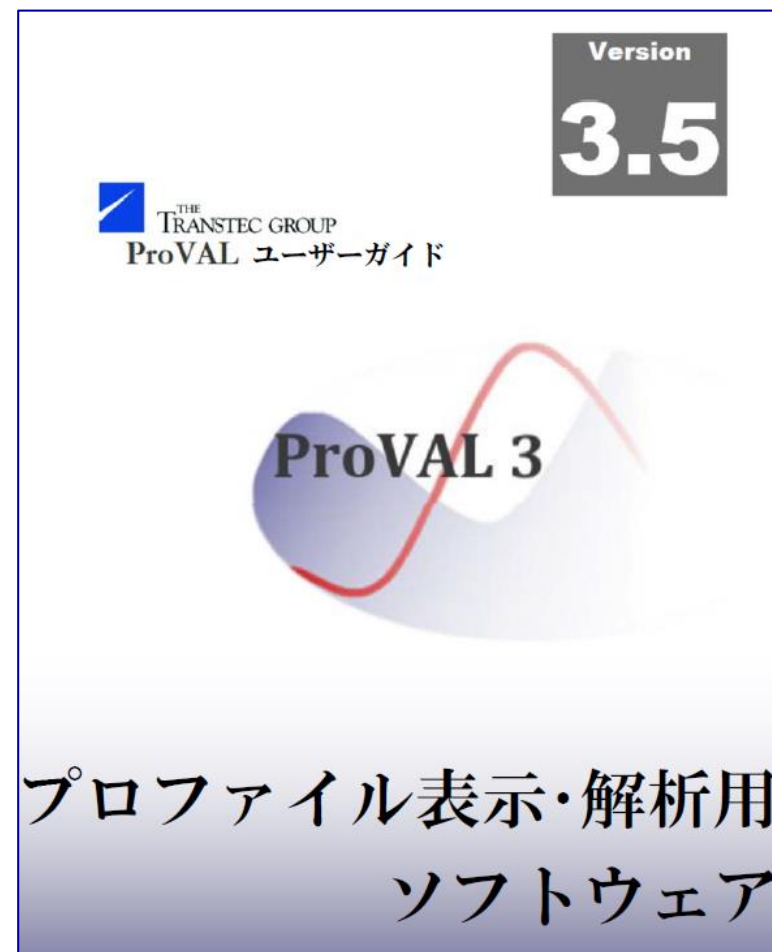
Profile Viewing and Analysis Software

プロフィール表示・解析用ソフトウェア

Friday, April 19, 2019

Hokkaido University of Science Satellite Campus

1-1, Higashi 1, Kita 3-Jo, Chuo-ku, Sapporo, Hokkaido 060-0003, Japan



How to get Technical Support?

- Online Helpdesk www.roadprofile.com/proval-support
- Email
 - Support@roadprofile.com



www.RoadProfile.com

Vendors' Participation

Vendors' Participation in RPUG



RPUG 2018 CONFERENCE – SOUTH DAKOTA

30 Years On The Road To Progressively Better Data

Rapid City September 18–21

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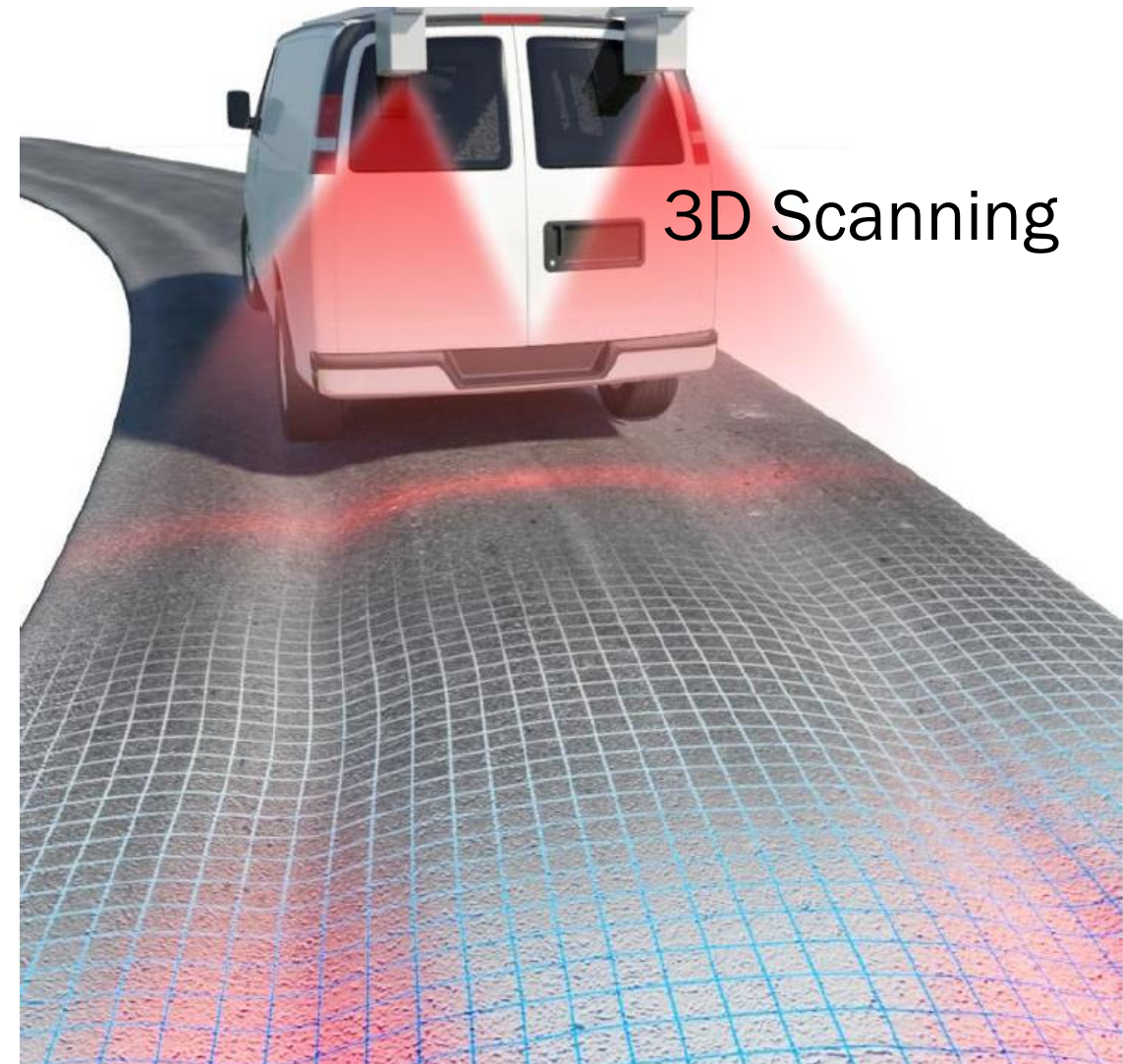


RPUG Driving Force - Steering Committee



Developing....

Stop&Go Urban Profiler



Welcome to RPUG

The purpose of the Road Profile Users' Group (RPUG) is to serve as a forum for the exchange of information between end users, data collectors, vendors, construction and design engineers and researchers who have an interest in road profiles, road roughness/smoothness, pavement surface textures/friction, tire-pavement noise, and safety-related topics.



Thank You!

