Session 1 - Welcome and Introductions

RPUG 2011 Speakers Bios and Abstracts

SESSION 1-0: GEORGE CHANG (TRANSTEC GROUP) - SESSION MODERATOR

SESSION 1-1:

WILLIAM HOFFMAN (NVDOT) - KEYNOTE SPEECH - 1

BIOS

Assistant Director, Engineering
Nevada Department of Transportation – Carson City, Nevada

Bill Hoffman is the Assistant Director of Engineering and in charge of NDOT's pre-construction engineering divisions including Project Management, Roadway Design, Structural Design, Environmental Services, Location, and Right-of-Way.

His focus is on project delivery and ensuring that NDOT's projects are of the highest quality and delivered on time and within budget. In this role, Bill supervises more than 300 engineering and right-of-way professionals responsible for developing all engineering work necessary in producing design plans and specifications used in the construction of NDOT projects. Mr. Hoffman is quickly becoming more involved with the implementation of NDOT's Pioneer Program, focusing on innovative project delivery methods including Public-Private Partnerships, Construction Manager At-Risk and Design-Build contracts.

SESSION 1-2:

PAUL SCHNEIDER (FHWA-NV) - KEYNOTE SPEECH - 2

BIOS

Paul is the Federal Highway Administration's Assistant Division Administrator for the Nevada Division Office. Paul works with the Nevada Department of Transportation, the four metropolitan planning organizations and other local public agencies in implementing transportation programs and projects throughout the state of Nevada.

Prior to his current position, Paul served in various positions within the FHWA with primary emphasis in roadway data collection and analysis, planning, environmental clearance, and engineering design.

Paul has over 26 years of experience with the FHWA and is a registered Professional Engineer in Tennessee.

Session 2 - Research and Standardization Initiatives

RPUG 2011 Speakers Bios and Abstracts

SESSION 2-0: LADONNA ROWDEN (ILLINOIS DOT) - SESSION MODERATOR

SESSION 2-1:

BOB ORTHERMEYER (FHWA-RC) - FHWA PAVEMENT SURFACE CHARACTERISTICS (PSC) PROGRAM

BIOS

Experience:
- Began working in field in 1978
- Nine years with North Dakota State Highway Department
- Consultant in the private sector for 14 years
- Joined FHWA in 2001

Education:
- B.S.C.E., North Dakota State University

Licenses and Registrations:
- P.E., North Dakota
- P.E., Minnesota

Areas of Expertise:
- Construction, Pavements, Pavement management, Asset management

Examples of recent projects done in support of the Division Offices
- Established and administering a $1.9 million pooled fund study, “Improving the Quality of Pavement Profile Measurement,” with support from 21 State agencies, the Office of Pavement Technology, Federal Lands and Division offices that will assist in building smooth roads; the study will provide a definition for a reference profile, build a reference profile device, supply a localized roughness module for ProVAL, and assist with strategies for verification sites.

ABSTRACT

(N/A)

RPUG 2011 Speakers Bios and Abstracts

SESSION 2-2:

ROBERT B. ROZYCKI (FHWA) - STATUS AND BRIEF TOUR OF THE NEW HPMS 8.0 SOFTWARE

BIOS

Robert is native and current resident of Virginia.

His academic background includes: in Civil Engineering and Planning from Villanova University and the University of Virginia, respectively.

He is currently serving over 21 years for the FHWA, mostly in the Highway System Performance Monitoring (HPMS) Division of the Office of Highway Policy Information as a Transportation Specialist with primary responsibilities relating to data quality review and data product development. Corollary duties include a specialized knowledge of HPMS-reported pavement data and coordination with internal and external customers and providers.

ABSTRACT

As a result of recent Highway Performance Monitoring System (HPMS) reassessment activities, additional and changed pavement data item reporting necessitated updated software along with geospatially enhanced capabilities for the reporting and QA/QC of submitted data. A brief overview, description, and tour of this new HPMS software will be given while focusing on pavement related aspects of the system. A preliminary status report and analysis of reported data will also be presented. It is anticipated that HPMS pavement data in a GIS environment will lead to enhanced and new analyses of the data, especially when the new data model is not limited to HPMS data alone and can allow other data sources to be incorporated. While the software and pavement data reporting requirements primarily serve federal business needs including likely future performance management analysis, the possible uses and applications via the software are not limited to them.

RPUG 2011 Speakers Bios and Abstracts

SESSION 2-3:

EDGAR DAVID DE LEÓN IZEPPI (VIRGINIA TECH) - OVERVIEW OF THE FHWA PAVEMENT FRICTION MANAGEMENT PROGRAM

BIOS

Dr. de León has worked in the areas of pavement management and transportation engineering for over 20 years. He is currently a Senior Research Associate at the Center for Sustainable Transportation Infrastructure at VTTI working for the Pavement Surfaces Consortium and other multidisciplinary research projects that address end-result and performance oriented specifications for hot-mix asphalt (HMA).

He completed doctoral research using non-contact methods to identify non-uniformities in HMA. He has performed extensive data collection for pavement structural and functional performance, as well as pavement life cycle cost analysis, pavement design and geometric design. He is a member of the Management of Quality Assurance (AFH20) TRB Committee since 2009.

ABSTRACT

The presentation will introduce a program that aims to reduce highway crashes and related fatalities where the lack of skidding resistance of the road surface is a contributing factor. The study will work with four selected state DOTs to perform friction and macrotexture measurements and develop Pavement Friction Management Programs (PFMP) using the existing and collected data. In each state, the PFMP will set specific investigatory and intervention threshold values that will be required for the different highway site categories, typically defined by highway class or traffic, geometrics (e.g., curves), and roadway environment/features (e.g., intersections).
The first phase of this study included a recommendation to the Federal Highway Administration (FHWA) of the most technically sound friction measuring equipment currently available to be used in developing the PFMPs. The research team identified an initial list of all equipment available to measure friction and macrotexture, established evaluation criteria by which the equipment can be compared in relation to their suitability for subsequent phases of this project, and

made a final recommendation for the device considered to be most suitable for this project.
The proposed presentation will describe this process and explains how in the second phase the study will provide a framework by which road engineers can monitor the condition of their networks and, based on objective evidence, make appropriate judgments regarding treating or resurfacing the road in those situations that require it. This will involve balancing the risk of a crash occurring with the costs and practicalities of providing adequate friction.

SESSION 2-4:

MAGDY MIKHAIL AND KEVIN MCGHEE (TXDOT AND VCTIR) - AASHTO PAVESUITE - PAVEMENT EVALUATION TOOLS

BIOS

Magdy Mikhail graduated with a Bachelor degree in Civil engineering from Ain Shams University, Cairo, Egypt in 1985, a Master's Degree in Materials Engineering from the American University in Cairo Egypt in 1990 and a Ph.D. in Civil Engineering from Arizona State University with a specialty in pavements and highway materials in 1996.

He has been working in the field of pavements and highway materials for the last 22 years. He worked with consulting firms in the United States and overseas. He also worked with the Superpave center with the University of Nevada Reno. He has been working with TXDOT for the last twelve years. He started his career with TXDOT as an Engineer with the bituminous section in May 1999. He was the pavement engineer for the Houston District from July 2000 to September 2003 and was the assistant director of the flexible pavement branch with the construction division from September 2003 to June 2007. He became the Technical Operations Manager for the Materials & Pavements section in July 2007. He is currently the director of the Pavement Systems Branch overseeing pavement design, pavement management, and equipment development.

Magdy Mikhail is a registered professional engineer in the state of Texas.

ABSTRACT (N/A)

Session 4 - Profile Measurement and Analysis

RPUG 2011 Speakers Bios and Abstracts

SESSION 4-0: DAVID J. KILPATRICK (CTDOT) - SESSION MODERATOR

SESSION 4-1

GARY HIGGINS (EARTH ENGINEERING) - CONSULTANTS PROFILER EXPERIENCE

BIOS

Mr. Higgins obtained a Bachelor of Science degree in Geology from Colorado State University in 1996. Mr. Higgins has worked for private geotechnical and material testing firms for the past 15 years as an engineering geologist.

Prior to 2007, his experience with roadway construction had been isolated below the riding surface and focused on support characteristics of the underlying subgrade soil. Since 2007 and in addition to his geologist duties, Mr. Higgins has been manager and operator of Earth Engineering Consultants, Inc. high speed profiling department. His quest for knowledge and understanding of the physical world paired with his interest in the inertial profiler system lends a scientific approach to the high speed inertial profiler operation.

ABSTRACT

The Consultant needs to collect accurate and repeatable High Speed Inertial Profiler (HSP) smoothness data which may be verified by the State Agency to ensure the HSP unit is collecting data properly and in accordance with the State specifications and tolerances. As a consultant, our goal is to provide a service utilizing properly calibrated/certified equipment with knowledgeable/certified operators. Our function is to provide accurate, repeatable data without regard to incentive/disincentive payment with focus to the task we were hired to perform and results which can be duplicated regardless of consultant/agency.
Our primary client is the paving contractor. We collect QC and/or QA HSP data on the paving contractors newly rehabilitated or newly constructed roadways and submit our collected data to the State entity. Our collected data may be used by the state to determine incentive or disincentive payment and to identify areas that require corrective action. In addition, it is common for the paving contractor to request the consultant's HSP to mark the roadway for corrective action (grinding) based on the States determination of localized roughness.

If done correctly, locating and grinding areas of localized roughness, as determined by the State, will result in improved ride quality numbers. If areas of localized roughness are not located correctly, the grinding process can significantly deteriorate ride quality of the newly constructed roadway. What is lacking from the certification courses, in Colorado and Wyoming, is a method to accurately and efficiently locate areas, identified by the state, for corrective action.
This presentation will highlight our success collecting accurate, repeatable data and our ability to accurately and efficiently locate areas of localized roughness, produce a ProVAL display of repeat runs which visually illustrates accuracy and repeatability of the HSP equipment to our client, the contractor and also, the ability to return to a project at a later date, after corrective action to verify the required corrective work has been completed and produce a ProVAL display for the contractor depicting the grinding results.

SESSION 4-2

RICHARD WIX (ARRB) - USING PROFILES TO MONITOR SUBSIDENCE CAUSED BY LONG WALL MINING

BIOS

Richard joined the ARRB Group (formerly known as the Australian Road Research Board) in 1990 and since then has been involved in automated pavement data measurement, both as an equipment developer and in the collection of pavement condition data.

During this time, Richard has contributed to the development of Australian standards for automated pavement data collection and has had a keen interest in the verification of automated systems used to collect pavement condition data in Australia and overseas. Additionally, he has overseen many large scale automated data collection projects for each of the Australian State Road Authorities and a variety of international projects too, most recently in Malaysia and Vietnam.

He is presently a member of the ARRB's technical advisory group which is responsible for future developments in pavement data collection.

Richard is a frequent visitor to the RPUG and once again looks forward to being part of this year's meeting.

RPUG 2011 Speakers Bios and Abstracts

ABSTRACT

ARRB did in conjunction with the road agency in NSW to monitor the subsidence of the major road corridor between Melbourne and Sydney.

SESSION 4-3

VADIM PERETROUKHINE AND MICHAEL NIEMINEN (FUGRO ROADWARE) - ON LOW SPEED PROBLEM IN ROAD SMOOTHNESS PROFILING

BIOS

Vadim Peretroukhine has been employed with Fugro Roadware since January 2011. He obtained his Master's degree with Honours in Math and Computer Science from the Moscow State University, with majors in discrete mathematics and AI. He worked as a researcher in the Moscow University and also participated in various projects for the Soviet Space Agency. In Canada he worked as a researcher and software developer mostly in the field of medical imaging, in such companies as Cedara Software and McKesson Imaging Group. Vadim Peretroukhine has publications and patents related to AI and medical imaging algorithms.

Michael Nieminen

Michael Nieminen is Director of Technology Development for Fugro Roadware and has been with the company since 2004. An established leader within the company, he endeavors to foster a collaborative and innovative culture within the engineering team. In the last two years the team has released a new ARAN platform, the Vision processing software, and the iVision viewing software.

ABSTRACTS

The longitudinal pavement profile is one of the most important road functional characteristics that greatly affects the user’s ride quality and vehicle dynamic load. High-speed inertial profilers collect pavement profile data at highway speeds and measure the profile of a roadway. The principal components of inertial profilers

are height sensors, accelerometers, and a distance measuring system. The height sensors record the height to the pavement surface from the vehicle. The accelerometers, located on top of the height sensors, record the vertical acceleration of the vehicle that can be integrated twice to obtain the vehicle vertical displacement. The difference between the measurements of the height sensors and accelerometers is the longitudinal road profile that is the input for calculation of roughness indicators such as the International Roughness Index (IRI).
Usually, the testing speed of inertial profiler is between 80 and 100 km/h. Practically, from time to time during a collection session profilers have to reduce the speed due to the high traffic volume, traffic lights etc. The major problem is that when the speed gets lower, the longitudinal profile is more sensitive to the measurement from the accelerometer. The measurement of the elevation is proportional to the amplitude of the acceleration squared; for example, the longitudinal profile is roughly 16 times more sensitive to the accelerometer signal at 20 km/h versus 80 km/h. As a result, the calculated longitudinal profile and the IRI fail to meet the accuracy and repeatability criteria at lower speeds.
Fugro Roadware developed a special technique that mitigates the influence of low-speed zones that are present within a collection session. The basic idea of the technique is that the usual pipeline of low-pass and high-pass filters is extended with special speed-sensitive filters that smoothen the accelerometer influence at low-speed zone and remove parasitic frequencies specific for certain low speed intervals. As a result, the resulting longitudinal profile is much closer to the true road profile.
Our speed-dependent filters are non-casual, so the longitudinal profile and the IRI indexes are calculated as a post-processing activity based on the collected raw data. Our data analysis shows a good correlation with the profiles collected at cruising speed throughout. We will present our theory, our progress so far, and the results of our analysis. We continue to work on improving the repeatability of the profiles calculated with a new technique for the collection sessions that have low-speed zones.

SESSION 4-4

RAY MANDLI (MANDLI) - MULTI-STATE COMPREHENSIVE PAVEMENT ANALYSIS - AUTOMATED PAVEMENT CONDITION SURVEY

BIOS

Ray Mandli founded Mandli Communications, Inc. in 1983, and over the last 28 years his company has grown to be one of the most innovative technology integrators in the transportation industry. During this time Mandli has developed such technologies as high-resolution right-of-way imaging, transverse and longitudinal pavement profiling, pavement distress analysis, and 360º intersection imaging.

Always at the forefront of the industry, Mandli has worked with over 30 states across the nation, and has brought technology solutions to several nations outside of the United States. Ray Mandli's latest innovations include a mobile LiDAR data collection system, and RetroView, which collects sign retroreflectivity data from a moving vehicle.

ABSTRACT

Mandli Communications was recently subcontracted for a project with the Federal Highway Administration - Office of Asset Management to collect approximately 864 miles of IRI, rutting, GPS, and pavement imaging data across the I-90 corridor running through South Dakota, Minnesota, and Wisconsin. The primary goals the FHWA outlined for this project were to define a consistent and reliable method of assessing infrastructure health with a focus on pavements and bridges on the Interstate Highway System, and to develop tools to provide the FHWA and State DOTs ready access to key information that will allow for a better and more complete view of infrastructure condition and health nationally.

This is the first multi-state project where Mandli utilized the new Laser Crack Measurement System (LCMS) from Pavemetrics. The LCMS is able to collect a wide variety of pavement characteristics, including distress, rutting, macro-texture measurements, pot holes, sealed cracks, joints in concrete, tinning, and more. Preliminary tests has shown great repeatability results, especially when identifying distress on the same length of pavement over multiple runs. Recent advances have also been made in customizing the data output for the system to meet standard distress protocols. For this project Mandli integrated the system into our standard data collection vehicle, synchronizing the data stream with out right-of-way imaging, positional, LiDAR, and road surface profiler systems.

The presentation will highlight the capabilities of the LCMS and the collection vehicle as a whole, and will go over the unique challenges and logistical hurdles of utilizing the system for a multi-state collection project. It will also detail the results

of the data collection, compare those results to what can be obtained by other technologies, and comment on where we believe the LCMS will fit into the future of pavement data collection.

SESSION 4-5

CAMERON RAINEY AND STEPHEN CHAPPELL (VIRGINIA TECH) - TIMING IS EVERYTHING: A SOFTWARE APPROACH FOR A GENERALIZED PROFILOMETER

BIOS

Cameron Rainey has been a member of the VTPL since June 2010. He is currently pursuing his Masters degree by researching terrain mapping and road surface obstacle detection. While at the VTPL he has worked on software integration of LIDAR and INS systems. He completed his undergraduate studies at Francis Marion University where he received his Bachelor's Degree in Computational Physics in 2009.

Stephen Chappell has been a member of the VTPL since June 2010. He is currently pursuing his Master's Degree by researching terrain mapping, instrumentation, and sensor fusion. While at VTPL, he has designed and incorporated instrumentation in the construction of a laser profilometer on a military vehicle. Stephen completed his undergraduate studies at Virginia Tech where he received his Bachelor's Degree in Mechanical Engineering in 2009.

ABSTRACT

Systems that combine multiple independent sensors to produce a unified result rely heavily on synchronization. The Vehicle Terrain Performance Laboratory has been engaged in the development of a terrain profiler for the U. S. Army Aberdeen Test Center. In this system, two scanning lasers are used to collect terrain surface data, while a GPS coupled with an IMU collects vehicle position and orientation information. Acquisition times for each of these systems are recorded separately, and use two different clocks. Work has been done to develop a data processing scheme that is expandable to any number of sensors. This allows data collected from any vehicle mounted sensor to be placed at a specific GPS location, taking into account vehicle roll, pitch, and yaw.

Having the ability to expand the system to an unlimited number of sensors allows for a great deal of flexibility for system upgrades. Synchronization between systems is key for generation of reliable data. While these systems are linked at the hardware level, they still maintain independent system clocks. A method of synchronizing all clocks to a universal time is a necessity. This, however, is not practical at the hardware level, and therefore must be carried out in software. Each sensor, in addition to having its own onboard clock, also has its own coordinate system. By representing each sensor generically, virtually any sensor can be added. However, data collected by these sensors is initially collected in sensor-space and must be rotated and translated to place it in a vehicle-space. From there it can be placed in global-space when taking into account vehicle position and orientation.

This generalized processing approach allows for a properly instrumented profilometer to become a host platform for a number of sensors that require spatial data processing. A system that was originally equipped with a scanning laser could be upgraded to include point lasers or a road-following wheel. Such a system can be scaled quickly at the software level, depending on specific task.

Session 5 - Pavement Evaluation Equipment

RPUG 2011 Speakers Bios and Abstracts

SESSION 5-0: KYLE EVERT (NDDOT) - SESSION MODERATOR

SESSION 5-1

JEAN-FRANCOIS HEBERT AND JOHN LAURANT (PAVEMETRICS SYSTEMS, CANADA) - 3D SENSORS FOR HIGH SPEED NETWORK LEVEL DETECTION OF RAVELING CONDITIONS AND TEXTURE EVALUATION USING SIMULATED DIGITAL SAND PATCH MEASUREMENTS

BIOS

Jean-François Hébert has a Ph.D. from Laval University (Canada) in computer engineering, applied to machine vision. He worked 10 years at INO (National Optic Institute) in Quebec City, as a researcher and a system engineer. He has contributed greatly to the development of the various road inspection systems developed by INO over the last decade. In November 2009, he co-founded Pavemetrics Systems with two colleagues.

ABSTRACT

The LCMS (Laser Crack Measurement System) is based on two high performance transverse 3D laser profilers that are placed at the rear of the inspection vehicle looking down in such a way as to scan the entire 4m width of the road surface with 1mm resolution at 100 km/h. In collaboration with INO (National Optics Institute of Canada) and the MTQ (Quebec Ministry of Transportation) several years of road and lab tests were conducted to perfect and evaluate this system for its capacity to detect diverse road caracteristics ranging from cracks and rutting to macro-texture and raveling. This presentation will describe our progress in implementing the automated detection and evaluation of road conditions with high texture values and raveling. Currently we have realized that high texture values and raveling can not be well descriminated using standard MPD (Mean Profile Depth) measurements. To address this problem we have developped algorithms that simulate Digital Sand Patch (MTD) measurements. We propose algorithms that calculate,‘road porosity indexes (RPI)’ and ‘raveling indexes (RI)’ in order to simulate ‘sand patch (MTD)’ measurements.

During this presentation we plan to show our current results for caracterisation of road texture with dense 3D data and show results on the detection of raveling and aggregate loss on different pavement surfaces. We will propose a method of reporting raveling conditions as a function of number of missing agregates per unit of surface.

SESSION 5-2

KELVIN WANG (OSU AND WAYLINK SYSTEM) - POTENTIAL FOR COMPREHENSIVE EVALUATION OF PAVEMENT SURFACE WITH 3D LASER IMAGING

KELVIN WANG

BIOS

(N/A)

ABSTRACT

3D laser imaging technology has migrated from manufacturing floor to pavement survey covering entire pavement lane in the last couple of years. Recently the research team led by the author has developed and delivered 3D laser imaging sensors for the pavement industry, the PaveVision3D. The presentation first focuses on the sensor development and software solution in both visualization and automated processing. In addition to traditional cracking survey, pavement surface data generated with 3D laser imaging technique can be used to produce other surface characteristics of pavements, such as macro-texture, potholes, rutting, faulting, even longitudinal profiling, and others.
The current generation of 3D laser imaging has limitation on longitudinal frame rate, which translates to 10 to 15 MPH data collection speed if 1mm resolution is required in the longitudinal direction. In order to obtain true 1mm resolution in the longitudinal direction at 60 MPH data collection speed, a re-design of the sensor is required. The presentation discusses the potential for such a design.
The long-term goal of PaveVision3D is to produce virtual pavement surface at 1mm resolution or better in all three directions (x, y, and z) at 60 MPH data collection speed. The virtual pavement surface would have true spatial and micro-level accuracies. Each 3D pixel would have one-ft spatial positioning accuracy,

and all pixels are of 1mm definition. A combination of high-precision Inertial Measurement Unit (IMU), Differential GPS receiver, and Distance Measurement Instrument (DMI) are used to assure spatial accuracy, and acquire positioning data such as pavement super-elevation, grade, curve radius, et al.
When such virtual pavement surface is established, the vast majority of pavement survey, including surface distresses, profiling, and surface characteristics can be measured with the virtual surface.

SESSION 5-3

ABBY CHIN AND MICHAEL OLSEN (OREGON STATE UNIVERSITY) - COMPARISON OF INERTIAL PROFILER MEASUREMENTS WITH LEVELING AND 3D LASER SCANNING RESULTS FOR PAVEMENT PROFILES

BIOS

Abby graduated with a Bachelor of Science in Civil Engineering from Syracuse University in 2010. She is currently pursuing a Master of Science in Civil Engineering focusing on Geomatics and Geotechnical Engineering from Oregon State University. Abby is currently Vice President of the Geo-Institute Graduate Student Organization at Oregon State. In her spare time she enjoys playing soccer and watching football.

ABSRTACTS

The Oregon Department of Transportation (ODOT) will be implementing an International Roughness Index (IRI) based smoothness incentive/disincentive program with an inertial profiler certification and a Quality Assurance program. The overarching objective of this research is to provide ODOT with a test site and methodology necessary to certify contractors performing smoothness measurements using inertial and inclinometer based profilers.

To this end, we are in the process of establishing a baseline profile at a site for certification of inertial and inclinometer based profilers used by contractors in the state of Oregon. This site will be surveyed using traditional survey leveling techniques and 3D laser scanning to establish the “true profile”. The profiles of

each of the three systems will be compared to assess their accuracy and repeatability.

This presentation will present initial results of this research including comparisons of each of the measurement devices, focusing on their advantages and disadvantages. Particularly, 3D laser scanning shows promise as a valuable tool for this type of analysis since it can be done safely from the side of the road, obtains dense measurements across the entire road so a variety of profiles can be analyzed, evaluates overall surface roughness, and the data can be used for a variety of other purposes including drainage assessment, as-built surveys, etc.

Session 6 - Texture, Friction, Noise, and Sustainability

RPUG 2011 Speakers Bios and Abstracts

SESSION 6-0: AFFAN HABIB (VDOT) - SESSION MODERATOR

SESSION 6-1

BO SODERLING (LMI 3D) - WORKING TOWARDS A REVISED MPD STANDARD (ISO 13473-1): A SNEAK-PEEK ON THE CURRENT MIND SET

BIOS

Bo has been with LMI and formerly Selcom AB since 1984 and has a background in electronics engineering.
Deeply involved in Selcom and LMI development of laser sensors for road measurements, Bo has moved on via application development & support and is currently holding a Business Development Manager position with focus on road scanning applications.

ABSTRACT

MPD (Mean Profile Depth) is one of the most commonly used and accepted measures for characterizing road surface textures. Methods for calculating MPD were first developed within ISO (ISO 13473-1) based on which a similar ASTM standard was developed (latest version ASTM E1845-09).
Since the introduction of ISO 13473-1 in 1997, requirements on equipments have increased significantly. Demands for higher measurement speeds, reduced laser spots, larger measuring ranges etc. have increased the possible variability in profile data used for MPD computation. Discrepancies in results between equipments have been identified and in several cases been found to be caused by e.g. the re-sampling process to convert profile data from time to space domain, profile filtering and drop-out handling. The work to correct the identified problems and strengthen and improve the standard is done within ISO/TC 43/SC 1/WG 39. LMI Technologies has been invited to participate and contribute to this work as a major sensor specialist. The US has 4 formal members in this WG and several of its meetings have been held at the NHI in Arlington, VA, in connection with the TRB Annual Meetings.
The presentation will present and discuss the current status of progress towards a revision of 13473-1 and highlight a number of expected additions to the standard

and their background and motivation in measurement practices and equipment/data comparability.

- Drop-out (Invalid data) detection
- Re-sampling of data to (optionally) 0,5 mm spacing interval in 100 mm profile segments
- Averaging of available time domain data (sensor raw data) between re-sampled 0,5 mm (or 1 mm) profile spacing intervals.
- Profile normalization via defined low-pass filtering of 100 mm profile segments

The impact of varying the control parameters to the above mentioned items will be exemplified by post processing of raw sensor data from varying road surfaces and sensors.
Sensor properties, ongoing sensor developments and the expected impact from these will be brought into the scope of a revised standard along the lines proposed. The conclusions towards definition of control parameters will be reviewed and motivated.

SESSION 6-2

RICHARD SOHANEY (TRANSTEC GROUP) - EXPERIENCES WITH CDOT'S QUIET PAVEMENT RESEARCH PROGRAM

BIOS

Rich Sohaney is a Project Manager at The Transtec Group where he is active with pavement surface characteristics projects, including tire-pavement noise, pavement surface texture, smoothness, and dynamic data acquisition.

Rich has been with Transtec for about 1-1/2 years. Prior to Transtec, he has worked in the field of noise and vibration engineering in the information technology and automotive industries. He has a Masters of Science degree in Mechanical Engineering from Purdue University, and a Bachelors degree from Lehigh University in Pennsylvania.

ABSTRACT

The Colorado Department of Transportation initiated a quiet pavement research program (QPR) in 2006 which now, in 2011, is nearing completion. Over the six-

year period there have been four rounds of tire-pavement and traffic noise testing at over 30 test sites across the state. The test sites have pavements representative of roadways throughout the state including dense-graded hot-mix asphalt (HMA), SMA, Nova Chip, and concrete with a variety of surface textures. This presentation will give an overview of the research program, discuss experiences with tire-pavement and traffic noise testing spanning multiple years, and show some key findings.

SESSION 6-3

THOMAS LUNDBERG, MIKA GUSTAFSSON AND LEIF SJÖGREN (VTI, SWEDEN) - THE USE OF TEXTURE IN THE SWEDISH ROAD MANAGEMENT

BIOS

Leif Sjögren

- **Researcher at The Swedish Road &Transport Research Institute (VTI), Sweden**
- Leif has been employed at VTI since 1980. He started to work at VTI in 1980 as an engineer. Since 1990 *Senior Researcher* and in the year 2000-2001 *acting Research Director* of the unit Measurement and Technology.

His fields of research cover road surface characteristics and related research such as the use of road surface condition, measuring techniques, quality assurance, acceptance testing of road surface measuring devices and other research concerning road surface characteristics.
Membership:

- PIARC, sub committee D2A Road surface characteristics.
- The European standardisation work, CEN TC227 WG 5, Surface characteristics of road and airfield pavements.
- TRB committee AFD 90 Road Vehicle Interaction.

Thomas Lundberg

- **Researchengineer at The Swedish Road &Transport Research Institute (VTI), Sweden**

Thomas has been employed at VTI since 1986.
His field of work is Road Surface Measurement techniques and Road Surface Characteristics.
Currently he is project leader for several development projects concerning Road Surface Characteristics, quality assurance, acceptance testing of measurement devices and the use of data in PM systems.

ABSTRACT

The pavement surface condition and especially it´s macrotexture is an important characteristic to assess in the management of the roads. The texture has a big influence on many functional characteristics such as friction, homogeneity, internal and external noise, rolling resistance, tire wear, drainage, visibility, and reflectivity. Modern measurement methods make it possible to measure the texture in high speed. The Swedish Road Administration has committed VTI in several projects to evaluate and manage the use of macrotexture in the Swedish pavement management system. This paper will describe the results and status from some of those projects.

Texture can be divided into three main classes covering different wavelengths (varying roughness), microtexture, macrotexture and megatexture, each having an influence on different user effects. Macrotexture (Mean Profile Depth, MPD) and megatexture (root mean square, RMS) are included among the indicators measured in Sweden. In order not to do to frequent measurements it is a big advantage to be able to do prognosis both between actual measurements as well as future prognoses. Since the measurement strategy of the national roads in Sweden doesn't include measurement of all roads every year and there are a need to know the yearly status of the entire road network, a model to do prognosis of macrotexture is under construction. In this sense macrotexture is difficult since it do not follow a linear trend. The development of this model will be described. The final model approach will also be used for other parameters such as megatexture, IRI (International Roughness Index) and rut depth.

Furthermore, the results from a case study (short term macrotexture variability)will be presented. The purpose of this study is to follow the short term development of macrotexture on a newly built road. The measurement object has been measured frequently during more than a year, from before the opening, 24 June 2010, up to now. The study will give more knowledge to,

- Initial development of macrotexture
- The influence of studded tires on the macrotexture
- Develop a method for approving the performance of new paved sections concerning macrotexture homogeneity (with focus to traffic safety, sustainability and homogeneity and bonus and penalty)

RPUG 2011 Speakers Bios and Abstracts

SESSION 6-4

JOHN HARVEY (UC DAVIS) - SUSTAINABILITY OF PAVEMENT SURFACE CHARACTERISTICS

BIOS

John Harvey is a Professor of Civil and Environmental Engineering at the University of California, Davis and Director of the UC Pavement Research Center (UCPRC). He attended university at Oregon State University and UC Berkeley. He is a professional civil engineer in California. He is Principal Investigator for the California Department of Transportation sponsored Partnered Pavement Research Center seeking solutions to a wide range of pavement problems.

ABSTRACT

The net effect on green house gas emissions and energy use of pavement surface characteristics of asphalt and concrete pavements is being investigated by the University of California Pavement Research Center using the Life Cycle Assessment (LCA) approach for Caltrans and the Miriam project. IRI and Mean Profile Depth or Mean Texture Depth are the typical pavement surface characteristics used in models for fuel consumption. The LCA models for GHG and energy use in the Use Phase are described, and results of initial case studies for concrete and asphalt rehabilitation are presented. Plans for extrapolation to the state highway network for use in pavement management are described. Questions are raised regarding applicability of parameters for some concrete textures.

Session 7 - Profile Quality Assurance and Incentive/Disincentives

RPUG 2011 Speakers Bios and Abstracts

SESSION 7-0: CHAD SHIVE (NDDOT) - SESSION MODERATOR

SESSION 7-1

LI NINGYUAN (MTO, CANADA) - QUALITY ASSURANCE OF PAVEMENT PROFILE MEASUREMENTS IN MANAGING ONTARIO PROVINCIAL HIGHWAY NETWORK

BIOS

Dr. Li Ningyuan is Senior Pavement Management Engineer at the Ministry of Transportation of Ontario, and Adjunct Professor in the Department of Civil Engineering at University of Waterloo, from which he received his Ph.D. degree in civil engineering in May 1996.

Dr. Li has 29 years of experience in pavement performance evaluation and infrastructure asset management. He is currently a board member of Road Profiler User Group (RPUG), a member of many professional groups including TRB and American Society of Civil Engineers (ASCE). Currently, he is working on strategic long-term investment plans for preservation of the Ontario provincial highway networks by using the ministry's pavement management system tools.

ABSTRACT

This presentation shares audience with Ontario experience in managing pavement profile measurements at network level in terms of quality assurance program implemented over the past 15 years. The presentation covers three parts: 1) description of the current practice in field survey and evaluation of pavement surface conditions, including field measurement and collection of pavement longitudinal and transverse profiles, 2) introduction of the quality assurance of data collection program and procedure applied to pavement management system of Ontario provincial highway network, dealing with the outsourced contracts for measuring pavement profiles of pre-defined individual road sections and converting them into performance measures, 3) discussion of the issues related to pavement profile measurements, data quality assurance and performance evaluation methods, and technical needs identified for improvement in the future.

RPUG 2011 Speakers Bios and Abstracts

SESSION 7-2

TERRY TREUTEL (FORMERLY WISDOT) - VERIFYING CONTRACTOR PROFILE RESULTS

BIOS

Terry recently retired from the Wisconsin Department of Transportation after 26 years. During that time Terry worked in design, construction, survey and materials in three different regional offices before transferring to the Madison Central Office, Materials Quality Management Section in 1993. While in Madison he has been involved in the development of the WisDOT Quality Management Program specifications for Portland cement concrete, and ride quality and has been a primary instructor for the Highway Technician Certification Program. Since 2005 Terry been the Ride Spec Coordinator for WisDOT and has been responsible for a smooth transition from using the California Profilograph and PI to the inertial profilers and IRI. Joe Wilson is taking over the Ride Spec Coordinator responsibilities and Terry will continue working for WisDOT on a limited term basis to help Joe get up to speed and help out in the field as needed.

ABSTRACT

The process of validating contractor profile results through comparison testing must address a number of issues to assure that hat consistent and repeatable result are reported for acceptance purposes. Defining tolerances for comparison results is difficult and may vary from project to project. Listed below are a few of the things I feel need to be considered when comparing results from different profilers with different operators.

1) The paths of the profiles being compared must be very close to the same location and if possible performed at the same time.
2) Verification should include cross correlation results as well as ride quality results.
3) Performing multiple runs to determine cross correlation results from the same operator and equipment will help to realize what o expect when comparing results from different operators and equipment. It would be unrealistic to expect any better correlation between different operators and equipment that the same operator using the same equipment is able to achieve.

4) Consistent start and stop locations between runs is essential to achieve the best cross correlation. Auto start and stop features on the profilers will help to assure that that all profiles cover the same length.
5) DMI differences between the devices being compared must be addressed to achieve the best cross correlation. Profile length difference caused by DMI calibration difference can be corrected by adjusting the sampling interval. Differences in length due to traveled path differenced can't be corrected. It is essential that profiles being compared follow relatively the same path. Some type of guidance device to assure that the paths being followed are consistent may be necessary.
6) Surface texture can cause some major differences when comparing profiles tested with a single point laser compared to a wider sensor such as a Roline laser. Single point sensors will not get the repeatability or accuracy required to properly measure profiles on surfaces with texture such as longitudinally tined concrete.
7) Roadway design and the horizontal and vertical curves on the road tested will make cross correlation more difficult. Forces acting on the accelerometers when turning corners or going up and down hills may introduce variability and inconsistenc in results.

SESSION 7-3

STEVE KARAMIHAS (U OF MICHIGAN) - SMOOTHNESS INCENTIVE LIMITS – IN LIGHT OF TIRE IMBALANCE, SUSPENSION FRICTION, AND THE LIMITS OF HUMAN PERCEPTION

BIOS

(N/A)

ABSTRACT

(N/A)

RPUG 2011 Speakers Bios and Abstracts

SESSION 7-4

STEVE KARAMIHAS (U OF MICHIGAN) - JCP SLAB CURL STUDY ON THE ARIZONA SPS-2 SITES

BIOS

(N/A)

ABSTRACT

(N/A)

Session 8 - Profiler Certification and Smoothness Specs

RPUG 2011 Speakers Bios and Abstracts

SESSION 8-0: ERIC PRIEVE (CDOT) - SESSION MODERATOR

SESSION 8-1

ROHAN PERERA (SME) - PROFILER CERTIFICATION USING THE AASHTO R56 PROCEDURE

BIOS

Dr. Perera is a Senior Project Engineer with Soil and Materials Engineers in Michigan. He has been working in the pavements field for 27 years. His experiences include: pavement roughness and profile data analysis, pavement design, pavement evaluation, pavement management, and non-destructive testing of pavements. He has worked on numerous research projects dealing with pavement smoothness.

He has also provided technical assistance to the LTPP program on profile related activities, including acceptance testing of new profilers and organizing and analyzing data from profiler comparison studies. He has also provided technical assistance to several state highway agencies who are implementing AASHTO standards on profiling.

ABSTRACT

The American Association of State Highway and Transportation Officials (AASHTO) released AASHTO Standard R56 titled Certification of Inertial Profiling Systems in 2010. This standard indicates that cross-correlation of IRI-filtered profile data should be used to judge the repeatability of a profiler. According to this standard, the accuracy of a profiler is judged by cross-correlating IRI-filtered data collected by the profiler with the IRI-filtered data collected by a reference device. Minimum cross-correlation values for repeatability and accuracy are indicated in this standard. There have been some problems with meeting the requirements of this standard, particularly the accuracy cross-correlation value. In fact some agencies are using an accuracy cross-correlation value less than that indicated in the AASHTO standard for certification because of the inability of the profiler to achieve the value specified in the AASHTO standard. Repeatability and accuracy cross-correlation values obtained from several equipment comparison and

certification efforts are presented. The cause why some profilers were not being able to meet the AASHTO specified repeatability and accuracy cross-correlation values are described.

SESSION 8-2

EMMANUEL FERNANDO (TTI) - PROFILER CERTIFICATION PROGRAM AND NEW TEST TRACKS AT TXDOT

BIOS

(N/A)

ABSTRACT

(N/A)

SESSION 8-3

GARY LYNCH (ATWOOD SYSTEM) - IMPLEMENTING A PAVEMENT DATA MANAGEMENT SYSTEM

BIOS

(N/A)

ABSTRACT

The necessity to provide taxpayer value and driver satisfaction on today's roads has required the engineering function of IRI data collection to aid in the evaluation of new and refurbished roadways.
Currently, ride quality data collection is being accomplished using High Speed Inertial Profilers (HSP) equipment and Proval software for ride analysis within defined State specifications for ride quality.
Atwood Systems software organizes HSP ride data to enhance its value over time and across the business enterprise. Specifically our software captures the results of ride analysis, enhances it and presents it as an enterprise management reporting system. In doing so, all parties (State agencies, Contractors and Researchers) are

provided a data repository for immediate and historical data analysis. We provide the means to manage large volumes of data over time with a central point of data entry in a standardized pay spec format for comparative results analysis. We capture run supporting documentation for audit capability.
Our presentation will provide insight on how to move the engineering function of HSP IRI data collection to the next level in becoming a complete enterprise reporting system for transportation management officials and engineering firms. We will highlight our success in providing software to extend the value of the IRI lane data for QC / QA reporting purposes to State and Federal reporting entities. First, we will demo the software for importing data from Proval, entering lane run data in a standardized manner and transmission of data to a central data repository. Second, we will demo our System Information Browser that allows the review of lane data by project, analysis of the data for incentive / disincentive and archiving for historical trend analysis.

SESSION 8-4

BRIAN SCHLEPPI (OHIO DOT) - DEVELOPMENT OF A BRIDGE RIDEABILITY SPECIFICATION

BIOS

(N/A)

ABSTRACT

(N/A)

Session 9 - Open Panel Session

RPUG 2011 Speakers Bios and Abstracts

SESSION 9-0: JOHN ANDREWS (MD SHA) - SESSION MODERATOR

SESSION 9-1

TOM NORDSTROM (MNDOT) - PANEL MEMBER DISCUSSION #1

BIOS

Tom possesses a Bachelor's degree from the University of Minnesota and a Master's degree from the University of Michigan. He works for the Minnesota Department of Transportation as a Senior Research Analysis Specialist. Tom has been involved with MnDOT's Profiler Certification Program since its inception in 2002, and has overseen the development of the agency's new Pavement Surface Smoothness Specification, which was implemented this past spring.

SESSION 9-2

PETER VACURA (CALTRANS) - PANEL MEMBER DISCUSSION #2

BIOS

(N/A)

SESSION 9-3

JAMES WATKINS (MSDOT) - PANEL MEMBER DISCUSSION #3

BIOS

James C. Watkins is longtime resident of Jackson and an employee of the Mississippi Department of Transportation (MDOT). He is currently serving as the State Research Engineer for MDOT.

He is the RAC (Research Advisory Committee and Transportation Research (TRB) Board representative for the Department. Mr. Watkins graduated from the

University of Mississippi with a Bachelor of Science in Civil Engineering in 1989. He has been a registered Professional Engineer in Mississippi since 1997 and has been a member of the Chi Epsilon National Engineering Society since 1989.

He completed MDOT's Leadership Enhancement Assessment Development (LEAD), a succession-planning program, in 2004, as well as Basic Supervisory and Certificate in Supervisory Management (CSM) training through the Mississippi State Personnel Board. In 2005, he was chosen to serve on the TRB Committee on Vehicle Interaction and Surface Properties (AFD90).

Currently, his job includes oversight of the department's research program, library, pavement management and warranty, overlay recommendation, smoothness assurance program, and non-destructive testing equipment, which includes skid tester, Falling Weight Deflectometer (FWD), profilers, Dynamic Cone Penetrometer (DCP), and profilograph.

During his career, he developed and implemented the Pavement Management System for MDOT, which processes the construction history and condition information for 13,000 center-lane highway miles. As a contract analyst, he designed and developed an Environmental System in FoxPro for ARCO Chemical Company that calculates, tracks, reports, and graphs emissions in tanks, boilers, and flares. Recently he designed and developed a software program to calculate the faulting on jointed concrete pavements using laser data collected at highway speeds. His interests are in pavement management, preservation, and technology.

SESSION 9-5

NILESH SURTI (NCDOT) - PANEL MEMBER DISCUSSION #5

BIOS

Nilesh is the State Pavement Construction Engineer for the NCDOT in the Construction Unit. He has been in this position for just over one year. Within this past year, he has finished developing NCDOT's IRI special provision for pavements.

His career began at the NCDOT in the Structure Design Unit as a summer intern. He received a permanent position in the Soils & Foundations section since his background was in the field of geotechnical engineering. After 13 years in the

Geotechnical Engineering Unit, he moved on to become a Project Manager in the Design-Build section at NCDOT. He helped develop the contract and managed the largest project awarded at NCDOT which is North Carolina's first modern toll road with the winning bid at $447 million.

Nilesh is a graduate of NC State University in Raleigh, NC. He enjoys watching college and pro football. GO WOLFPACK!!!

SESSION 9-6

JOE WILSON (WISDOT) - PANEL MEMBER DISCUSSION #6

BIOS

Joe Wilson is a lifelong River Rat, having grown up on the Wisconsin River near Lodi, Wisconsin. He is currently working for the Wisconsin DOT running the Department's Profiler Certification and Verification Program after having taken over the job duties of recently-retired Terry Treutel whom Joe would like to acknowledge deserves credit for getting the program up and running and graciously helping with Joe's transition to the position. In addition to the profiler work, Joe continues to provide the Department with non-destructive testing services such as the MIT Scan-2 device while also assisting in various pavement forensic investigations of early distress.

Joe earned a Bachelor's of Science Degree in Cartography from the University of Wisconsin in 1989. Among his previous work with the Department, Joe developed a statewide GIS Highway Crash Analysis System, worked for a time as WisDOT's Aerial Photographer for the Surveying and Mapping Unit, operated the Department's Photolog van that was originally equipped with a 35mm motion picture camera and helped oversee that program's transition to digital data collection including gps. Joe then worked as a Research Analyst conducting various pavement related studies. Thus he has worked in a number of diverse positions within the Department over the past 21 years. Joe is determined to carry on and augment the foundation Mr. Treutel has laid with WisDOT's Profiler Program and is looking forward to making new acquaintances in the field of pavement profiling. His interests, among other things, include supporting his Wisconsin Badgers and World Champion Green Bay Packers.