



NDS Tool Development

FHWA Support of SHRP 2 Safety Implementation

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FHWA Support of Implementation

- 1. Expand and support user community –**
 - Safety Training and Analysis Center (STAC)
 - Provide training
 - Assist states and other researchers
- 2. Research funding – Implementation Assistance Program**
- 3. Tools – Exploratory Advanced Research**
 - Better access to data.
 - Simplify privacy protections



FHWA Exploratory Advanced Research Program

- Bridge between basic and applied research.
- Funds longer term, higher risk breakthrough research
- Projects with potential for transformational improvements to transportation systems.



EAR Projects – Challenges

Technical Challenges:

- Large, complex data sets (NDS -- 2 petabytes)
- Difficult video conditions, e.g. constantly varying shadows
- NDS video comparatively grainy, low-res, compression artifacts



Automated Data Extraction from Images

- Human beings can easily identify the sign in all three situations.
- Machines can't.



Exploratory Advanced Research (EAR) Projects

Three project objectives --

- Automated video coding/data extraction
- Automated identity masking
- Calibration and evaluation of automated algorithms



EAR: Automated video decoding/data extraction

Initial BAA

- Award: Carnegie Mellon University – National Robotics Engineering Center -- 9/26/2012
 - Expected completion – 9/2014
 - Funding: \$998,000 PI: -- Brett Browning
 - Title: *“Machine Learning for Automated Analysis of Large Volumes of Highway Video”*
 - Focus – outside the vehicle
 - Objective -- Robust, flexible algorithm; tolerant of shadows, variance in object orientation, etc.



EAR: Calibration & evaluation

Inter-Agency Agreement

- Award: Oak Ridge National Laboratory, 6/28/2013
 - Expected completion: 5/2016
 - Funding: \$1,166,000 PI: Tom Karnowski
 - Title: *Computer Vision Measurements and Analysis to Support Naturalistic Driving Study*
- Key tasks
 - After-the-fact camera calibration
 - Develop metrics, procedures and standard data sets to measure effectiveness of automated algorithms



EAR: New BAA

New EAR Broad Agency Announcement -- BAA DTFH61-13-R-00011 following on earlier work

Topic 2A: Automated Feature Extraction (3 awards)

Focus entirely within the vehicle – head pose, gesture, mouth and eye motion, phone use, etc.

Topic 2B: Automated Identity Masking (2 awards)

Automatically mask identity while still allowing researchers to determine head pose, expression, etc.



EAR: Topic 2A Awards

- Award: SRI International – 3/13/2014
 - Completion: 3/12/2016
 - Funding: \$598,000 PI: Amir Tamrakar
 - Title: *DCode: A Comprehensive Automatic Coding System for Driver Behavior Analysis*
- Award: Carnegie Mellon University – 3/13/2014
 - Completion: 3/12/2016
 - Funding: \$600,000 PI: Marios Savvides
 - Title: *DB-SAM: CMU Driver Behavioral Situational Awareness System*



EAR: Topic 2A Awards

- Award: Univ. of Wisconsin – Madison – 4/10/2014
 - Completion: 4/10/2015
 - Funding: \$600,000 PI: John Lee
 - Title: *Quantifying Driver Distraction and Engagement*



EAR: Topic 2B Awards

- **Award: Carnegie Mellon University – 4/17/2014**
 - **Completion:** 4/30/2015
 - **Funding:** \$314,000 **PI:** Fernando De la Torre
 - **Title:** *Video De-identification in the Automobile Environment*
- **Award: SRI International – 2/12/2014**
 - **Completion:** 2/15/2015
 - **Funding:** \$399,000 **PI:** Gregory Ho
 - **Title:** *Dmask: A Reliable Identity Masking System for Driver Safety Video Data*



Wrap-Up

- FHWA committed to the development of tools to make it easier for a wide range of researchers to access and utilize the SHRP 2 Safety data sets.
- Exploratory Advanced Research – We will continue to look for research gaps which may be addressed by new or follow-on research projects.



Thank You

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