Transportation Active Safety Institute
TASI: Our Focus on the Human Machine Interface

An Industry-Academic-Government Consortium to Advance the Use of Active Safety Systems to Reduce Vehicle Crashes and Save Lives

Dr. Sarah Koskie
Purdue School of Engineering & Technology, IUPUI
skoskie@iupui.edu

25 January 2007
Obstacles to introduction and acceptance

- One of the biggest obstacles to introduction and acceptance of Active Safety Systems is absence of a standard HMI protocol.

- Active Safety Systems provide two types of responses:
  - Warnings that require driver intervention
    » Beep, Flash, rumble of seat
  - Autonomous responses triggered by driving situation
    » Apply brakes strategically, adjust steering angle, etc.

- Autonomous actions provide the most consistent responses and simplify design of Active Safety Systems.

- However, some driving situations require a more complex response, obtainable only through human intervention.
Some HMI issues for active safety systems

- **How do people react?**
  - What is the average and range of abilities?
    - Hearing
    - Vision
    - Coordination
    - Attention span
    - Multi-tasking ability

- **Does a trigger yield an appropriate reaction?**

- **Should the driver have choices of how information is displayed?**

- **Should the driver have choices regarding alerts?**
Questions relating to HMI Design

- Is it possible to warn the driver?
  
  **YES:** What’s the best way?
  
  - What is range of human ability?
  
  - How many warnings is too many?
  
  - Which warning is best for each scenario?

  **NO:** What can we do to prevent the need for warnings?
  
  - How much information can the driver process?
  
  - Which information is most important in a given scenario?
  
  - How is the information best conveyed?

- What standards are needed?
Standards will eliminate a possible source of driver confusion

- Drivers need consistent alerts and displays.

**Audible Alerts**

**Visual Alerts**

**Haptic Alerts**

- Motorized Seatbelt
- Seat Vibration

- Acceptance / effectiveness also depend on
  - Reaction time
  - Data processing speed
  - Ability to distinguish among signals
  - Ability to respond without panicking
  - etc.
Summary

- Again, one of the biggest obstacles to introduction and acceptance of Active Safety Systems is absence of a standard HMI protocol.

- TASI universities will work with industry partners to design experiments to address these issues.

- Target start date is beginning of 2nd quarter.

- Questions?
Contacts

- Interested in specific activities? Please contact:

  Ralph V. Wilhelm, Ph.D.
  Technical Director
  Transportation Active Safety Institute (TASI)
  Purdue School of Eng. & Tech., IUPUI
  723 W. Michigan St. SL 160
  Indianapolis IN 46202
  Phone: (317) 508-6866
  rvwilhel@iupui.edu
  Fax: (317) 571-0429

  Sarah Koskie, Ph.D.
  Asst. Prof. of Elec. & Comp. Eng.
  Purdue School of Eng. & Tech., IUPUI
  723 W. Michigan St. SL 160
  Indianapolis IN 46202
  Phone: (317) 278-9043
  skoskie@iupui.edu
  Fax: (317) 274-4493
Slides describing TASI Activities follow

- Flow charts show larger scope of TASI’s activities.

- Activities in which Human Factors play a key role are highlighted in red.
**TASI Activities**

- **Mine available data;**
- **Run experiments to obtain missing data**
  - Accident data analysis
  - Benefit/effectiveness analysis
  - Cost sensitivity analysis
  - Human Factors/Biomechanics
- **Technology Research and Development**
  - New sensors
  - Algorithms

**Common Protocols & Processes**
- HMI protocol
- Product performance testing
- Test Methodology
TASI Activities

- **Common Protocols & Processes**
  - HMI protocol
  - Performance testing
  - Test Methodology

- **Test Methodology**
  - Laboratory/bench-test
  - Hardware-in-loop simulation
  - Closed-course test track
  - Instrumented roadway segment
  - On-road

- **Evaluation/Validation**
  - Protocols
  - HMI
  - Performance

- **Consumer Awareness/Education**