MTI Research Snaps presents:

Advanced Driver Assistance Systems & Automated Features: Are They Driving Us to Safety?

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November 16, 2021

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INTRODUCTION

- 36,000+ deaths, 2.7+ million injuries, and 6.7+ million traffic crashes annually
- Driver errors - cause 90-95% of crashes (NSC, 2020; Bellis & Page, 2008)
  - Recognition errors – 41%
  - Decision errors – 34%
  - Performance errors – 10%
  - Non-performance errors – 7%
- Vehicles with advanced features

Source: https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/81117
ADVANCED FEATURES & SENSORS

- Adaptive Cruise Control
- Emergency Braking
- Pedestrian Detection
- Collision Avoidance
- Over Speed Warning
- Lane Keep Assist
- Traffic Sign Recognition
- Lane Departure Warning
- Cross Traffic Alert
- Park Assist
- Surround View
- Blind Spot Warning
- Rear Collision Warning
- Park Assistance Surround View

Legend:
- Camera
- Short-Medium Range Radar
- Ultrasound
- LIDAR
- Long-Range Radar
NEED FOR RESEARCH

Understanding the functionality and limitations of advanced features

Low-level acceptance and confusion among drivers

Previous researchers tested ADAS and other advanced features in specific conditions

Driver behavior may vary based on road condition, weather condition, area type, demographic, driving history, and socio-economic characteristics

Mandates the need to perform an in-depth analysis of advanced features and compare for various driving conditions
To explore and assess the effects of advanced features on driver behavior

- Different classes of roads (rural highways, freeways, and urban arterials)
- Different weather and lighting conditions
- Age and gender
- Driving history and familiarity
**Scenario Fabrication**

Three scenario types
- Urban
- Rural
- Freeway

Weather conditions
- Rain
- Clear weather

Lighting conditions
- Daylight
- Nighttime

**Warning Features**

- Lane departure warning (LDW)
- Blind spot warning (BSW)
- Over speed warning (OSW)

**Automated Features**

- Adaptive cruise control (ACC)
- Lane keep assist (LKA)
DATA COLLECTION

- 51 participants
- 62% males and 38% females
- 46% young (16-25 years) drivers & 54% adult (>25 years) drivers
- A vehicle without ADAS, with ADAS, and with automated features was randomly assigned
- Lighting and weather condition were randomly assigned
- Each participant was tested in all three scenarios
RESULTS SUMMARY: WARNING FEATURES

- Driving behavior varied with type of driving scenario and warning features in the vehicle
- Longer headways but more lane departures observed at nighttime
- Longer headway and less aggressive lane-changing, braking and turning maneuvers observed during rain
- Driver above 25 years and male drivers showed aggressive driving behaviors (braking and speeding)
- Warning features effected braking, lane-changing, and turning behaviors in addition to serving their intended purpose
RESULTS SUMMARY: AUTOMATED FEATURES

- Improved braking, lane-following, and vehicle handling in all three driving scenarios
- Lane keep assist improves braking and lane-following behavior compared to land departure warning
- Adaptive cruise control improves braking behavior compared to both blind spot warning and over speed warning
- More aggressive car-following behavior observed with automated features
- Variation in driver behaviors reduced by over 50% compared to both warning features and no ADAS
- Automated features > Warning features > No ADAS
Thank you for joining us for:
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