RESEARCH PROJECT OVER-VIEW:

An Evaluation of the Effects of Motorcycle LED Brake Lamp Flash Frequency Sequences on Conspicuity When Texting in a Static Vehicle

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Research Study's Objective

- Corroborate and advance the findings of Wierwille, Llaneras, and Neurauter (2009)
  - Use Mobile Eye Tracking Technology
    - Examining the effect of an LED motorcycle brake lamp treatments on Conspicuity
      - 83.3 millisecond flash frequency sequence,
      - 117.5 millisecond flash frequency sequence
      - Continuous state.

Study's Design Basis

- Secondary Task: Texting
  - Major causal factor for rear-end collisions (Carney, McGehee, Harland, Weiss & Raby, 2015; Fitch et al., 2013).
- View Angle: 20 degrees
  - Captured visual attention from 20 to 40 degrees off-axis from the forward view (Klauer, S. G., Dingus, T. A., Neale, V. L., Sudweeks, J. D., & Ramsey, D. J. ,2006.

Significance of the Problem

- Texting is the leading type of distraction in fatal accidents (NHTSA, 2014)
- Primary cause of automobile - motorcycle collisions is the low conspicuity of the motorcycle
  - Over 200 motorcyclist Fatalities per year from being rear-impacted (NHTSA-FARS, 2014)

Theoretical Framework

- Conspicuity
  - Engel, F. L. (1976)
- Saliency mapping
  - Multi-layer feature maps
    - Hierarchy of Conspicuity
    - Control mechanism for fixations
- Visual information processing
  - Sensory vs Cognitive elements
    - Oculomotor Capture

Saliency Map

- Visual fixation guidance is provided by the Saliency Map
  - If no cognitive influence

Images from: Niebur, E. and Koch, C. Control of Selective Visual Attention: Modeling the `Where' Pathway. Neural Information Processing Systems 8:802-808 (1996)

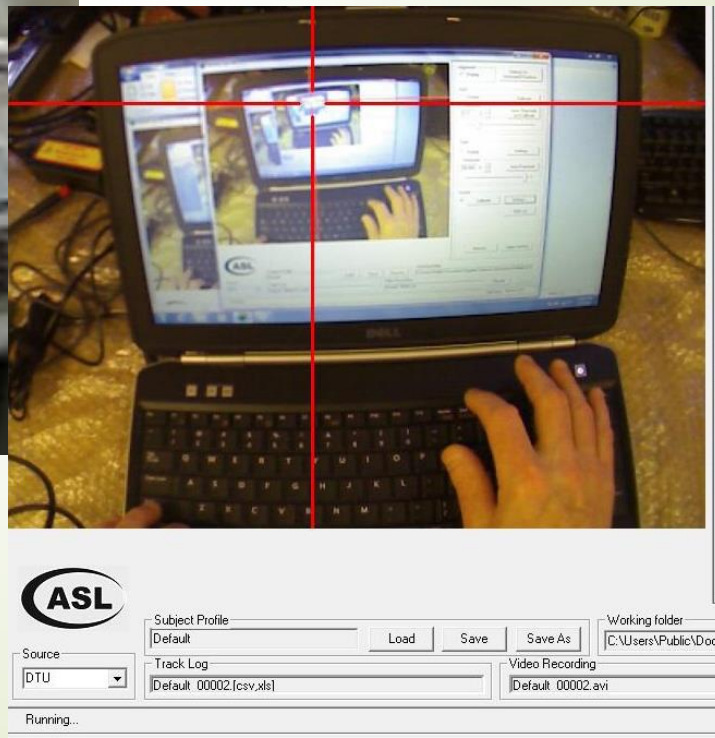
Equipment

- LED Brake Lamp
  - Harley Davidson "Layback"
  - Hi-resolution applique
- Mobile Eye Tracker
  - Advanced Laboratory Science Mobile Eye-5
- Brake Lamp Control Module
  - Digital Signal Corporation Prototype multichannel, microprocessor-based

Study Set-Up at IUP

Data Collection

Wireless Data Observation & Collection



Data Interpretation

- Will the flash sequences significantly increase the attributes of conspicuity?
  - Qualitatively determined
    - Advance of the motorcycle's queue position in the scan path
  - Quantitatively determined
    - Decrease in the detection performance time
    - Decrease in Total Visual Fixation Duration Time

THE END

Q&A

Studies Primary cause of automobile - motorcycle collisions is the low conspicuity of the motorcycle

- Association des Constructeurs Europeens de Motorcycles, 2009
- Craen, Doumen, Bos, & van Norden, 2011
- Gershon & Shinar, 2013
- Gkritza, Zhang & Hans, 2010
- Huang & Preston, 2004
- Hurt, Ouellet, & Thom, 1981
- International Motorcycle Manufacturer's Association, 2010
- Mahshid, Law, Hussain, Alfian & Ng, 2013
- Motorcycle Safety Foundation, 2014
- Shaheed, Gkritza, & Marshall, 2012
- Shaheed, Zhang, Gkritza & Hans, 2011
- Shinar, 2007
- Suraji & Tjahjono, 2012
- Wells et al, 2004).