Autonomous Vehicles and Human Behaviors: Pedestrian Communication with Autonomous Vehicles

Michael Clamann, PhD, CHFP
March 27, 2017
Pedestrian Fatalities Over Time

Leverage technology to:
- Improve detection
- Improve communication

Source: NHTSA (2016)
Pedestrian Detection
Pedestrian Communication
Are you going? Or should I go?
What if I point a lot and flail my arms around?
Wait, maybe you should go.

You go first.
This is confusing.
Let's just sit here and reflect.
Manufacturers and other entities should have a documented process for the assessment, testing, and validation of the vehicle human-machine interface (HMI).

Considerations should be made for the human driver, operator, occupant(s), and external actors with whom the HAV may have interactions (other vehicles, pedestrians, etc.).

HMI design should also consider the need to communicate information to pedestrians, conventional vehicles, and automated vehicles regarding the HAV’s state of operation relevant to the circumstance (e.g., whether the HAV system identified a pedestrian at an intersection and is yielding).

(Federal Automated Vehicles Policy – Human Machine Interface)
of the selected plan of action on an electronic sign mounted on the vehicle. In another example, the notification is provided by displaying text indicative of the selected plan of action on an electronic sign mounted on the vehicle. In another example, the notification includes playing an audible instruction message indicative of the selected plan through a speaker of the vehicle.
Drive.ai Solves Autonomous Cars' Communication Problem

By Evan Ackerman
Posted 30 Aug 2016 | 16:00 GMT

Photo-illustration: Drive.ai
Guidelines for Display Design

- At 100 feet:
  - Letters 6-inches tall
  - 47 inches for “Safe to Cross”
  - MUTCD requires 9-inches
  - Larger for moving displays
Our Display Prototypes

1. Advice
   - Explicit suggestion (walk / don’t walk)

2. Information
   - Vehicle intent
Subjective Assessment

“Did you use [the display] to make your crossing decision?”

12% reported using
76% reported seeing 56% seeing

“What was the primary piece of information you used to make your decision to cross?”

4% display
56% vehicle distance
46% vehicle speed
24% traffic density

46% of participants state using a display makes the crossing decision easier.
PEDESTRIAN SAFETY

Whether your kids are walking to school, the park or a friend’s house, here are a few simple tips to make sure they get there safely.

The Hard Facts

Unintentional pedestrian injuries are the fifth leading cause of injury-related death in the United States for children ages 5 to 19. Teenagers are now at greatest risk. Teens have a death rate twice that of younger children and account for half of all child pedestrian deaths.

Top Tips

1. Teach kids at an early age to look left, right and left again before crossing the street. Then remind them to continue looking until safely across.

2. Teach kids to put phones, headphones and devices down when crossing the street. It is particularly important to reinforce this message with teenagers.
Recommendations

• Displays should be
  – Simple, salient, familiar
  – Consistent
  – Flexible & scalable

• Testing is vital
Questions?
michael.clamann@duke.edu