SIMULATOR USERS GROUP MEETING - 6/28/2005

BREAKOUT GROUP DISCUSSIONS OF STANDARD DRIVING SIMULATOR SCENARIOS ("CARSS"):

1. Intersection Incursion Scenario: University of Iowa

- ***Summary for Wade Allen Breakout group***
  - Consider kinematics: Can subjects safely steer or safely brake (depends on speed and distance or time-to-collision)
  - Look at repeated exposures with different kinematics (speeds and time-to-collision)
  - Trigger cross traffic based on time-to-collision (speed divided by distance to cross traffic)
  - Decision making: brake versus steering
  - Measure steer/throttle response times
  - Embed in larger scenario with and without other hazards.
- ***Summary for Sue Chrysler and Linda Boyle Breakout group***
  - Need better definition of accelerator release.
  - Approach velocity is not consistent, hard to compare across subjects of different speeds.
  - Operational definition of reaction time.
  - Emergency events – can only do these a limited number of times.
  - Include parked car pullout, oncoming center lane crossing, pedestrian and bicycle coming in the center lane.
    - Example in the former NADS alcohol study, one thing that should have been considered is the dilemma zone: i.e., present the yellow as a true dilemma zone; Older drivers have a lot of problems in intersection; their making the unsafe maneuver themselves. Thus, can we capture eye glances.
- ***Summary for Karlene Ball Breakout Group***
  - Good to discriminate subjects with impairments in cognition, visual fields?
  - Emotional impact of the collision on the subject?
  - If we have crashes or near misses in these scenarios and if they have to continue, how does that work?
- ***Summary for Jerry Wachtel Breakout Group***
  - Use consistently the car on the left or on the right for the incursion.
  - A time trigger is sued: Speed of the subject can affect the perception of the incurring vehicle (angle, size).
- ***Additional Comments***
  - Intersection scenario: we should pick one or the other: lots of interesting discussion regarding the time to collision measure. Those who are going slower will have different perception than those going faster; angle of inflection – needs to be looked at.
  - Compensating algorithms: compensate for the noise in the TTC scenarios.

- Intersection encounter scenario: lots of variables. Movement of cross vehicle; movement of lead vehicle and speed of whole scenario. Kinematics of all this: slow speed, you can steer in time, high speed, you can steer, but not stop in time. Issues are alerted or at risk (perception) and you are probably more careful in those situations.

2. Novice Drivers Scenario: University of Massachusetts at Amherst

- ***Summary for Wade Allen Breakout group***
  - Repeated exposures would be of interest
  - Motivated looking: e.g. Include an encroaching pedestrian, then see if subject looks on subsequent trials; Include hazards in scenario so that subject is alerted for subsequent hazards.
  - Look for steering and throttle responses.
  - Eye and head movement details: saccade, glance duration, head versus eye movement.
  - Embed in larger scenarios.
  - Why are only 60% of experienced drivers showing evidence of looking? Is this low percentage due to sparse scenery?
- ***Summary for Sue Chrysler and Linda Boyle Breakout group***
  - Requires wrap-around, wider field of view
  - Requires camera, but could bode by observing live. Data reduction may be difficult.
  - For consistency across labs, need a performance measure that is less subjective.
  - May need eye tracker. Otherwise measure of "looking" is subjective.
  - Maybe use accelerator release.
  - Rename this one to "parked vehicle" or "limited sight distance: scenario.
  - May want to add occasional pedestrian.
  - Signal detection, obstructive view.
- ***Summary for Karlene Ball Breakout Group***
  - Need pedestrians for crosswalk?
- ***Summary for Jerry Wachtel Breakout Group***
  - Green vehicle is a confound.
  - Need oncoming traffic?
  - Use a smaller vehicle than the truck to block the view.
- ***Additional Comments***
  - A bit of a confound – some people do not have trucks that large.
  - There does not appear to be a pedestrian in the scenario – what other exposure do you have in terms of looking. The looking of exp is awfully low and should be considered.
  - Wrap around simulator; or side screen to see turns and will therefore limit its use; need a coding; or a researcher recording information – consistency is a big factor; would need an eye tracker, but if none available, need more than the head turn.

- Do you want a pedestrian in there? If you are using the drive to make a clinical decision – need to provide more useful feedback. Need to have someone in there.

3. Car Following Scenario: University of California at Riverside

- ***Summary for Wade Allen Breakout group***
  - Look for following differences when lead vehicle accelerating vs. decelerating.
  - Time varying behavior: analyze Fourier integrals or use techniques (e.g. wavelets) that implicitly identify average response plus time variations.
  - Nonstationary behavior: empirical subjects are nonstationary.
  - Protocol to motivate car following: when lead vehicle slows subject will decelerate to avoid collision, need something to motivate acceleration when lead vehicle accelerates (maybe a following car that honks).
  - Imbed with other scenario elements such as curve following, changing grade
  - Need continuous measures for behavior.
- ***Summary for Paul Green Breakout group***
  - Cross platform issues
    - SCANNER – Nick Ward currently using this.
    - FAAC – world is set, cannot utilize.
    - DriveSafety – just write TCLs script and assemble tiles.
    - GE Patrol Sim – can have a function to drive leading vehicle.
    - STISim – simple to do.
  - Robustness/replicability: Erwin has data, keep in mind there is task demand and demand of driving simluator.
    - Key implementation points – vehicle dynamics are a big deal for this, texture and roadway size matter (if low pixel rate or is blurry, it is difficult to see the screen change), role of FOV is tbd.
    - What level of variability represents no change in driving?
  - What questions/problems is this scenario intended to answer?
    - Drugs, individual differences, simulator comparison, support systems for car following, distraction, visual information processing.
  - Background for control theory – Flach and Jagacinski book (Control Theory for Humans).
  - Traffic conditions to model
    - Begin with initial separation of 10s
    - Unclear if instructions should be to maintain speed or fixed distance.
    - Generally no following vehicles (this affects following behavior, without vehicles following the subject, large gaps can occur.
    - Is this realistic for everyday driving – might resemble driving to LA.
    - Suggested conditions – 2-lane road, 12 ft lanes, no cross winds, no head winds, straight roadway.
  - Use: Vision, visual attention, evaluation of support systems, evaluation of distance perception.
- ***Summary for Sue Chrysler and Linda Boyle Breakout group***

    - Joanne has used similar measures, gets measure of time lag.
    - What are criterion variables? What is "good" driving? Especially important for clinical settings and training.
    - Not sure that DriveSafety can accept that complicated a formula for lead car speed.
    - Scenario outcomes: maintaining highways; 3 things to gain - 1. Phase shift, 2. Gain, 3. How well they are following.
    - Need a tighter reaction time description.
    - Useful for the effects of drugs – different simulator had different perceptions of distances.
    - Control theory?
    - Want ability to link lead vehicle to subject without changing.
- ***Summary for Karlene Ball Breakout Group***
    - Cross platform issues?
- ***Summary for Jerry Wachtel Breakout Group***
    - Can all simulators implement "triple sinusoidal" pattern?
    - Is there ability to link the lead vehicle to the subject vehicle so that the subject doesn't lab too far in the back?
- ***Additional Comments***
    - What is this particular scenario good for: for visual attention; simulator comparison; speed and headway maintenance; driver distraction.

4. Standard Test of Driving Ability of Older Drivers: University of Groningen, The Netherlands

- ***Summary for Wade Allen Breakout group***
    - Measure performance as a function of distance so that it can be related to the roadway curvature.
    - Measure both steer angle and throttle position.
    - Steer angle should be proportional to curvature.
    - Compute vehicle curvature error as a measure (Road curvature minus vehicle lateral acceleration divided by the square of speed).
    - Place in larger scenarios.
- ***Summary for Sue Chrysler and Linda Boyle Breakout group***
    - Will depend on what else they're doing. Steering is sensitive to distraction, some finding less RMS when distracted.
    - Sense of speed is so distorted.
    - Forcing them to drive a certain speed is good. But some subjects may not want to drive that fast.
    - Density of roadside objects must be standardized.
    - Would need to look at lane position.
    - Need to decide on operational definition of lane crossing.
- ***Summary for Karlene Ball Breakout Group***
    - Is following curves a good thing, can it make subjects sick?
    - Pre-post training issues.
- ***Summary for Jerry Wachtel Breakout Group***

- Standardization across simulators is difficult.

- ***Additional Comments***
  - Different types of steering scenarios; lane excursions, or sd steering vehicle – steering behavior is quite similar.
  - Variation on the same type of simulator; there is often different steering.
  - Older driver (curve scenario). Drives typically try to straighten that curve – do not follow the midline of your lane.
  - Steering: heavy work load in scenarios and need to define other variables that are related to steering.
  - Sense of speed tends to be distorted for each person and may have people driving differently from what they normally anticipate.
  - What constitutes a lane excursion. Lane tracking. Lane control.
  - Wondering if having them follow curves – if this would make older drivers sick. Are there any data on that…

GENERAL COMMENTS/IDEAS FOR FURTHER SCENARIOS

- The simpler, the better.
- How to integrate these scenarios into a larger drive.
- Joanne Harbluk suggests a driver distraction task:
  - Lane change task (from Adam project): Series of signs that pop-up and the driver's role is to change lanes whenever a new sign pops up.
  - Measures:
    - Perception reaction time
    - Variability of performance in lane change
    - Recovery
  - She's found that it discriminates well between in-vehicle tasks of different difficulties
  - Training to proficiency – people provide their own baseline.
- (Sue's scenario): Blind approach with crest curves; same maneuver with oncoming crash scenario. Good situation awareness task. Had to purposely force them over to another lane.
- Can distinguish between tasks of different complexity; e.g., primarily with navigational task. Other measures include eye height.
- Right now on a desktop, they're trying to get it into their sim. Came from Daimler-Chrysler, ATOM project.
- Scott – representative from UPS could like a manual transmission simulator.
  - Training – where to park so they don't get rear-ended while parked.
  - Most are novice drivers-shifting issue; blind spot, hit and rear scenario. Variations on the intersection scenarios: pedestrian scenario – which way you steer; how to quantify that.
- Tate Kubose (U of Illinois)
  - Would like dilemma zone traffic signal task
    - Get decision process
    - Also reaction time and vehicle control
    - Can do this repeatedly and it seems natural to have traffic signals change.

- Bobbie Seppelt
    - Parked vehicle pullout
    - On coming vehicle crossing center line
    - Pedestrian walking out between parked cars.
- We need to look at left hand turns; visual fields. Pre and post training; cognitive training.
- Need standardized sickness rating form and reporting criteria.
- Anchor points where we can do collaborative work together. We do not want to compare apples and oranges.