Background

- Current interactive systems in vehicles perform have no awareness of environment of situational context
  - Location, visible landmarks, status of driver, vehicle, external environment

- To interact with drivers safely and naturally, driver support systems must be context-aware

Estimate context in highly sensed vehicle

CESAR: An In-Car Sensing and Data Collection Platform
David Cohen, Paul Märgner, Ian Lane

Internal Sensors
- Cameras: Kinect (color & depth), Gaze (640x480)
- Microphone: Headset Microphone-pair
- Mic. Array: High quality 8-channel
- Sensors: OBD connection (Rpm, Speed, ThrottlePos …)

External Sensors
- Cameras: Stereo camera-pair, 360, HD (2040x1040)
- Sensors: GPS, Gyro., Mag., Accel.

Portable rig for internal & external sensing
- Can easily shift between vehicles
- Calibrated and synchronized data collection

A Corpus of Natural In-Car Interactions

Research Questions
1) How can we better support drivers in navigation and information access tasks?
2) How do drivers and human co-pilots interact while performing these tasks?
3) Can Human-Machine-Interaction be improved using contextual knowledge?

Data Collection Setup:
10 Cars, 50 Drivers, 5 scenarios per driver
5-10 minutes per navigation scenario
Local expert acts as expert copilot

Task Scenarios
(1) Setting of way-points before departure
(2) Navigation to negotiated way-points while driving
(3) Navigation when environmental changes occur
(4) Navigation when navigation goal changes
(5) Navigation while responding to messages (e-mail)

Status of Driver:
- Audio, Video (Gaze, wide angle)

Status of Vehicle:
- Speed, Engine RPM, Brakes, Vibration

Status of External Environment:
- Location, Objects in drivers field of view

Status

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<th>Speed</th>
<th>20 MPH</th>
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<tbody>
<tr>
<td>RPMs</td>
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<td>Brake</td>
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Noise Estimates

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<th>Speed</th>
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<td>60 dBA</td>
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