Self Driving Vehicles: An Opportunity for Minnesota
Overview

• Technological Context

• Why Self-Driving Vehicles (SDVs)?

• Legal Context – Nationally and Minnesota
Technological Context
Technological Context

Laser
This sensor gives the vehicle a 360-degree understanding of its environment so the car can sense objects in front of, beside, and behind itself at the same time, all the time. The laser also helps the vehicle to determine its location in the world.

Processor
Information from the sensors is cross-checked and processed by the software so that different objects around the vehicle can be sensed and differentiated accurately, and safe driving decisions can then be made based on all the information received.

Position sensor
This sensor, located in the wheel hub, detects the rotations made by the wheels of the car to help the vehicle understand its position in the world.

Orientation sensor
Similar to the way a person's inner ear gives them a sense of motion and balance, this sensor, located in the interior of the car, works to give the vehicle a clear sense of orientation.

Safety drivers
Drivers also test the vehicles daily, reporting feedback on how to make the ride more safe and comfortable.

Radar
This sensor detects vehicles far ahead and measures their speed so that the car can safely slow down or speed up with other vehicles on the road.

Credit: techcrunch.com
Why? → SAFETY!

Minnesota 2013
– 387 Fatalities
– (~370 predicted 2014)
– 30,653 Injured
– 77,707 Traffic Crashes

Economic Cost more than $1.58 Billion

Credit: Science Digest Apr. 1958
Why? → SAFETY!

• Benefits:
  • Eliminate Driver Error
  • Focus on Crash Avoidance - NHTSA
  • Reduce Fatalities

• Caveats
  • Integrating with “driver”
  • Responding to warnings
  • Resuming Control

Credit: www.cers.umn.edu
Legal Context

• Are SDVs legal?

• What are other states doing?
  – How to handle liability?
  – What about privacy?
  – The weather?

• Does MN need a law?
SDVs might already be legal...

Bryant Walker Smith, Automated Vehicles are Probably Legal in the United States

Not explicitly prohibited equals probably permitted
# NHTSA Levels of Vehicle Automation

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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<tr>
<td><strong>Level 0</strong></td>
<td>No Automation &lt;br&gt;The driver is in complete and sole control of the primary vehicle controls (brake, steering, throttle, and motive power) at all times, and is solely responsible for monitoring the roadway and for safe operation of all vehicle controls.</td>
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<tr>
<td><strong>Level 1</strong></td>
<td>Function-specific Automation &lt;br&gt;The driver has overall control, and is solely responsible for safe operation, but can choose to cede limited authority over a primary control (as in adaptive cruise control), the vehicle can automatically assume limited authority over a primary control (as in electronic stability control), or the automated system can provide added control to aid the driver in certain normal driving or crash-imminent situations (e.g., dynamic brake support in emergencies). There is no combination of vehicle control systems working in unison that enables the driver to be disengaged from physically operating the vehicle by having his or her hands off the steering wheel AND feet off the pedals at the same time.</td>
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<td><strong>Level 2</strong></td>
<td>Combined Function Automation &lt;br&gt;The driver is still responsible for monitoring the roadway and safe operation and is expected to be available for control at all times and on short notice. The system can relinquish control with no advance warning and the driver must be ready to control the vehicle safely. At level 2, in the specific operating conditions for which the system is designed, an automated operating mode is enabled such that the driver is disengaged from physically operating the vehicle by having his or her hands off the steering wheel AND foot off pedal at the same time.</td>
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<td><strong>Level 3</strong></td>
<td>Limited Self-Driving Automation &lt;br&gt;Enables the driver to cede full control of all safety-critical functions under certain traffic or environmental conditions and in those conditions to rely heavily on the vehicle to monitor for changes in those conditions requiring transition back to driver control. The driver is expected to be available for occasional control, but with sufficiently comfortable transition time. The vehicle is designed so that the driver is not expected to constantly monitor the roadway while driving.</td>
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<tr>
<td><strong>Level 4</strong></td>
<td>Full Self-Driving Automation &lt;br&gt;The vehicle is designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. The driver will provide destination or navigation input, but is not expected to be available for control at any time during the trip. This includes both occupied and unoccupied vehicles.</td>
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Might already be legal...

- Issues remain, however:
  - What’s a driver?
  - Who’s liable?
  - International Law
What are other states doing?

- Nevada
- Florida
- Michigan
- Washington D.C.
- California
What should Minnesota do?

• Avoid conflicting, unnecessarily restrictive regulation

• Consider updating relevant statutory language
  – “Driver” is “any person . . . in physical control . . .”
    • Minn. Stats. Ann. § 169.011 subd. 24
  – But, “Operation”=“has the means to initiate any movement ”
    • State v. Woodward, 408 N.W.2d 927, 928 (Minn. Ct. App. 1987)
Opportunities for Minnesota

• Don’t regulate what’s not here
• If Volvo can demonstrate in Gothenburg, why not a demonstration in Minnesota?
• British “competition” a model?
Questions?

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