

DEVELOPER PERSPECTIVE

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HUMAN DRIVING TODAY

The balance between safety & efficiency



HOW WOULD YOU DEFINE “SAFE DRIVING” FOR AN AV?

First try: A statistical argument

Self-driving cars should be statistically better
than a human driver

MILES DRIVEN

The more miles I drive without a crash, the safer I am

Miles driven here



Not the same as here



DISENGAGEMENTS

Minimize the number of times the system fails and requires a takeover

Why it's insufficient

Similar to miles driven,
depends on where & when
Incentive to avoid the
tough environments likely
to trigger disengagements



HOW WOULD YOU DEFINE “SAFE DRIVING” FOR AN AV?

Second try: A rules-based argument

The AV only needs to strictly obey
the rules of the road

FOLLOW THE RULES OF THE ROAD

Even if we strictly follow the rules,
others around us may not do the same

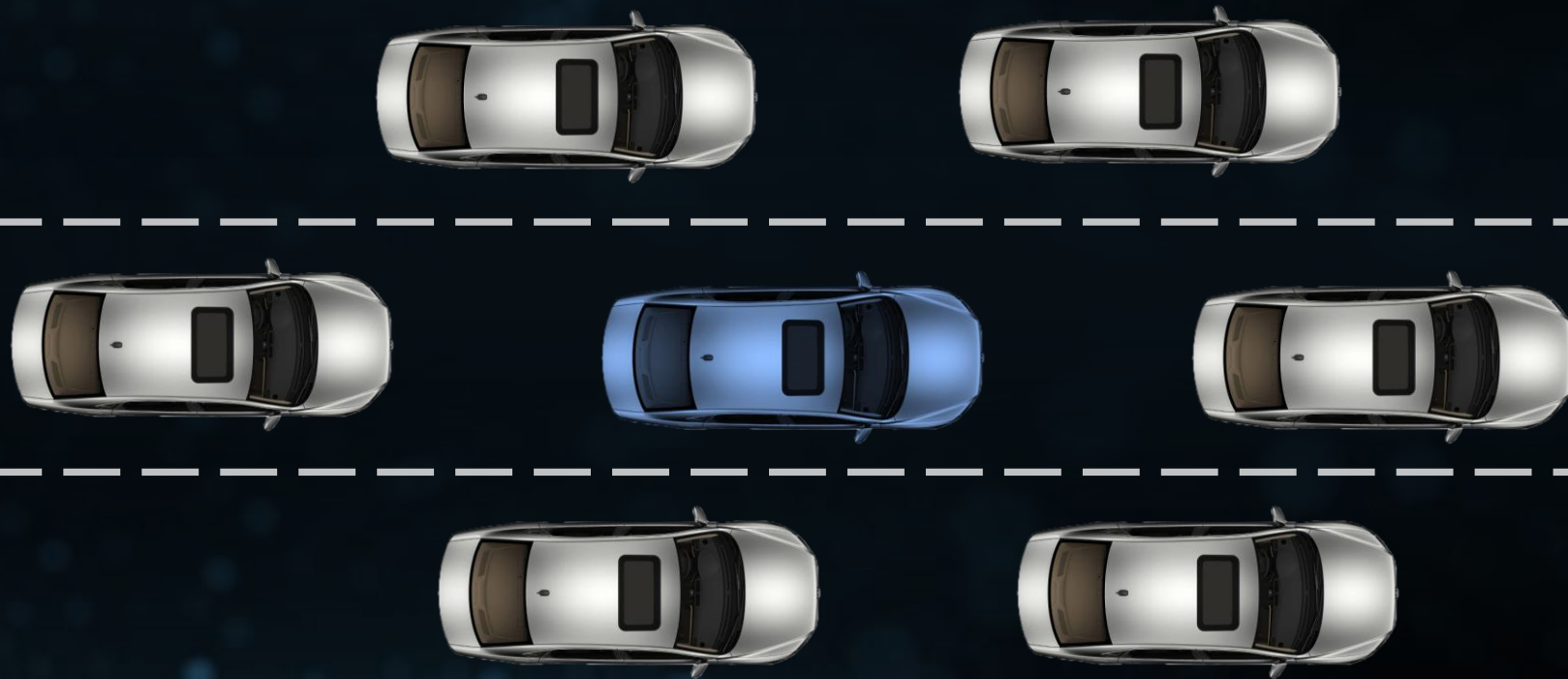


HOW WOULD YOU DEFINE “SAFE DRIVING” FOR AN AV?

Third try: A catch-all

Avoid collisions at all costs

THE AV MUST AVOID COLLISIONS AT ALL COSTS



HOW WOULD YOU DEFINE “SAFE DRIVING” FOR AN AV?

Fourth Try: Enumerate All tests

Scenario Based Testing

SIMULATION BASED SCENARIO TESTING

Enumerate all possible scenarios and test in Simulation

Why it's insufficient

There is always one more test
Encourages developing to the test
How to compare simulators?
Simulated agents must accurately
match the real world

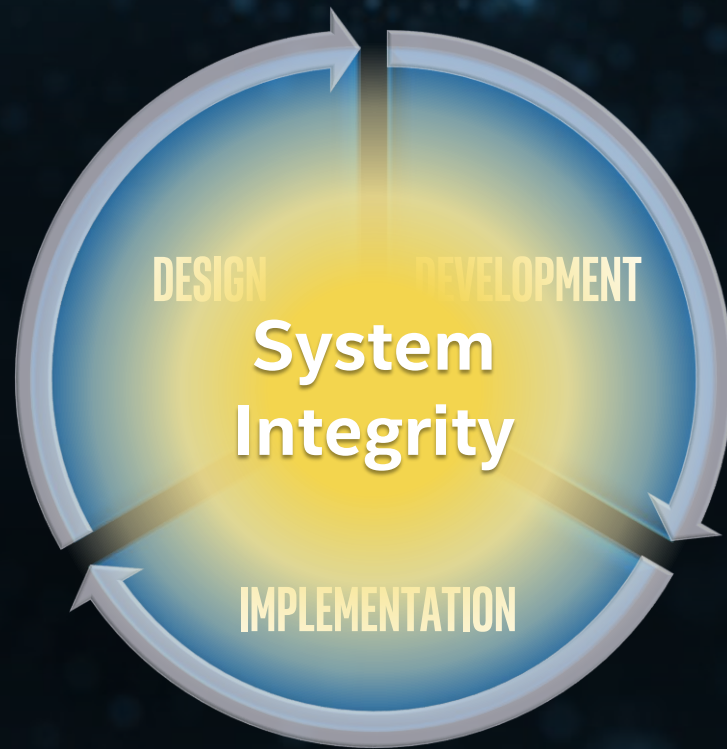


WE CANNOT PROVABLY SIMULATE THE REAL WORLD

What about Industry Standards?

FUNCTIONAL SAFETY STANDARDS

System-level Safety



ISO 26262 guides electric, electronic, and software quality

Reduce chance of system faults, mitigate those that do occur

Essential, but not the full picture

NORMATIVE SAFETY STANDARDS

Algorithm-level safety

Process to identify classes of safety violations not covered by ISO 26262

Open to interpretation, which would result in different definitions of “safety”



**SAFETY OF THE
INTENDED FUNCTION (SOTIF)**

SAFETY REPORT STANDARDS

A Checklist for Safety Reports

Proposes to standardize the content in a Safety Assessment Report

Argumentation is based on your definition of “safety”

Who decides if your definition is correct or if your argument is sufficient?



UL 4600

There does not (yet) exist an industry standard that defines what it means for an AV to “drive safely”

**WE BELIEVE THERE MUST EXIST A COMMON AV SAFETY
PERFORMANCE AND ASSESSMENT STANDARD, DEFINED
COLLABORATIVELY BETWEEN INDUSTRY AND GOVERNMENT**

DRIVE SAFELY

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