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Quick Look At Redefining Safety

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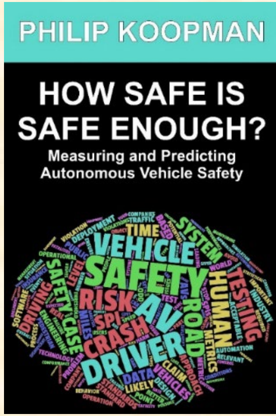

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HOW SAFE IS SAFE ENOUGH?

Measuring and Predicting Autonomous Vehicle Safety

Absence of Unreasonable Risk

Carnegie Mellon University

- Automotive definition of safety (e.g., ISO 26262)
  - Absence of Unreasonable Risk (AUR)

- Thought question:
  which would you want to eat?
  - Poison
  - Non-toxic (i.e., absence of poison)
  - Edible

- AUR means not dangerous enough to be recalled
  - Acceptable safety requires more than AUR

Definition of a Safety Case

- Safety case: structured argument, supported by evidence, intended to justify that a system is acceptably safe for a specific application in a specific operating environment.

- Autonomous system challenges:
  - Who/what ensures no misuse of intentional abuse?
  - Who/what handles departure from specific operating environment?
  - Safety case needs to address these issues to be complete

A Non-Engineering View of Safety

- Public acceptance is weakly linked to engineering analysis
  - Stories matter more than statistics

- Hypothesis:

  For each crash, the public will judge safety by whether they think they themselves would have avoided that particular crash as a human driver.

Collected Definitions: See: https://bit.ly/44qjrs3

- Loss: an adverse outcome, including damage to the system itself, negative societal externalities, damage to property, damage to the environment, injury or death to animals, and injury or death to people
- Risk: combination of the probability of occurrence of a loss, or pattern of losses, and the importance to stakeholders of the associated consequences
- Safety constraint: a limitation imposed on risk or other aspects of the system by stakeholder requirements
- Safety engineering: a methodical process of ensuring a system meets all its safety constraints throughout its lifecycle, including at least hazard analysis, risk assessment, risk mitigation, validation, and field engineering feedback
- Safety case: structured argument, supported by a body of evidence, that provides a compelling, comprehensible, and sound argument that safety engineering efforts have ensured a system meets a comprehensive set of safety constraints
- Acceptable: meets all safety constraints as shown by a safety case