Status update for the 18th VMAD session

Web Conference

18 May 2021

FRAV

- Aim to address safety across all ADS applications
  - ADS differ in configurations, intended uses, user roles and limitations on use
  - Application of requirements depends on understanding of ADS ("guidelines")
- "Five starting points" (Framework for elaborating safety requirements)
  1. ADS should drive safely. (Ensure safe behavior of the ADS as "the driver")
  2. ADS should interact safely with the user. (Ensure safe use of ADS and safe interactions with the user such as transfers of control, user override, etc.)
  3. ADS should manage safety-critical situations. (Differentiate between normal driving and emergency situations to ensure safe responses to the latter)
  4. ADS should safely manage failure modes. (Ensure safe responses to system malfunction, physical damage, etc.)
  5. ADS should maintain a safe operational state. (Ensure safety throughout the useful life of the ADS, such as safety critical updates, response to obsolescence)

- FRAV-12-08 consolidated comments on the safety topics
  - 43 safety elements cross-referenced with stakeholder comments
  - 16 references to "DDT"
  - 71 references to "User"
  - Seven references to "other road users"
- Elaboration of safety topics requires understanding of DDT, user roles, and nature of other road users
  - DDT = functions required to operate vehicle in traffic
  - Users → in-vehicle, fallback, remote, passenger, …
  - ORU → human drivers, VRU, emergency vehicles, law enforcement, …

- DDT functions
  - Perception, Planning and Decision, and Control
  - Ensure safe performance of the DDT

- ADS users
  - Different user roles depending upon ADS vehicle configuration and relationship to user(s)
  - Role of user may vary even during a single trip
  - Ensure correct use and prevent misuse

- Other road users
  - ORU have different physical, functional, and behavioral properties
  - Safety needs and nature of interactions depend on these properties
  - Ensure safe interactions and ADS responses

- Common understanding of DDT, ADS users, and ORU
  - Frameworks for understanding DDT, users and ORU

- Consensus on related (and interrelated) safety needs
  - Correlate the DDT, ADS users, and ORU output with the Safety Topics
  - What are the safety roles of the perception, planning and decision, and control functions?
  - What safety needs arise in the various ways ADS may interact with users?
  - What might be the safety needs of the various ORU based on their common properties and their special properties?

- Requirements to address safety needs
  - Mapping of general safety requirements

General expectations

- Reach general safety requirements stage mid-to-late summer
- Apply available methods to derive specifications for requirements
    - "Careful and competent human driver"
    - "State-of-the-art" based on technological feasibility
    - "Safety envelope" mathematical formulas
    - Statistical "positive risk balance"
- Determine information needs to understand ADS configuration
    - ADS intended uses and limitations on use
    - Operational Design Domain elements
    - Guidelines for ADS documentation

- EDR/DSSAD informal group request
  - Data collection requirements for ADS vehicles
- Account for diversity of ADS configurations
  - ADS operational data
  - ADS user roles and interactions
- Account for different purposes/uses of data
  - Crash event analysis and reconstruction
  - ADS performance data for research, NATM development (in-service pillar)
- Account for technical aspects
  - Data locked on board vehicle
  - Data transmitted for analysis and reporting

Data Elements Matrix

Purpose of Data Collection	Applicability of Data	Data Set	General Description
Accident analysis/ reconstruction	All vehicles	A	Data on vehicle state/performance
	Conventional vehicles (no ADS)	B	Data on actuation of manual driver controls
	Vehicles equipped with an ADS	C1	ADS data on DDT performance
	Vehicles equipped with an ADS designed to interact with a user	C2	Data on user behavior/interactions with ADS
Evaluation of system operations/research/ assistance with accident analysis (L3-L5)	Vehicles equipped with an ADS	D1	Non-crash ADS operational performance data
	Vehicles equipped with an ADS designed to interact with a user	D2	Non-crash user interactions with ADS

Elements in the data sets are mutually exclusive (i.e., no duplication) and may be combined depending upon the vehicle configuration, for example:

- Conventional (manual only) vehicle → A + B
- ADS with human driver controls → A + B + C1 + C2 + D1 + D2
- Driverless passenger vehicle → A + C1 + C2 + D1+ D2
- Driverless commercial vehicle (no occupants) → A + C1 + D1

- Correlate safety topics to DDT, ADS users, and ORU frameworks
- Data collection needs and applicability (EDR/DSSAD)
- Identify general safety requirements to address safety needs
- Apply methods/models to determine performance specifications/ranges
- Define relevant information for mapping safety requirements to individual ADS under assessment
- Package covering safety requirements, guidelines for ADS documentation, and application of safety requirements to ADS.