ASAM OpenSCENARIO v1.1.1

Release Presentation

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ASAM Association for Standardization of Automation and Measuring Systems

Bugfix Version V1.1.1 – 1/2

The release version of V1.1.0 included two small topics that are fixed in the bugfix version **OpenSCENARIO V1.1.1.**

1) Missing comma (“,”) in a pattern in the schema. This caused the validation to fail in certain cases.

Change:

additional_content/Schema/OpenSCENARIO.xsd

View file @a7dfefba

```
...  ...  @@ -19,7 +19,7 @@ See www.asam.net/license.html for further details.
19   19           </xsd:simpleType>
20   20           <xsd:simpleType name="expression">
21   21                   <xsd:restriction base="xsd:string">
22      -                        <xsd:pattern value="[$][{][ A-Za-z0-9_\+\-\*/%$\(\)\.]*[\}]"/>
        22 +                     <xsd:pattern value="[$][{][ A-Za-z0-9_\+\-\*/%$\(\)\.,]*[\}]"/>
23   23                   </xsd:restriction>
24   24           </xsd:simpleType>
25   25           <xsd:simpleType name="Boolean">
...  ...
```

This change affects Enterprise Architect model (.eapx), HTML export, XSD schema and XSD strict-schema.

Bugfix Version V1.1.1 - 2/2

2) In chapter 5 of the documentation the state *standbyState* was wrongly replaced by another existing state. This led to an inconsistent state between schema and documentation.

V1.1.0

5. Scenario at runtime

This section covers the expected runtime behavior of the
elements in a simulation.

5.1. States

The lifecycle of a `StoryboardElement` instance includes five states.

initState and ***endState*** are implementation-specific and represent the creation (*initState*) and the cleanup (*endState*) of a `StoryboardElement`. All other states may be monitored with a `StoryboardElementStateCondition`.

- `completeState`: During the `completeState`, a `StoryboardElement` waits for a start trigger. Only elements that define a start trigger or inherit a start trigger define a `completeState`.
- `runningState`: Represents the ongoing, unfinished execution of the `StoryboardElement`.
- `completeState`: With transition into `completeState`, a `StoryboardElement` has reached its goal or was stopped.

V1.1.1

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5.1. States

The lifecycle of a `StoryboardElement` instance includes five states.

initState and ***endState*** are implementation-specific and represent the creation (*initState*) and the cleanup (*endState*) of a `StoryboardElement`. All other states may be monitored with a `StoryboardElementStateCondition`.

- `standbyState`: During the `standbyState`, a `StoryboardElement` waits for a start trigger. Only elements that define a start trigger or inherit a start trigger define a `standbyState`.
- `runningState`: Represents the ongoing, unfinished execution of the `StoryboardElement`.
- `completeState`: With transition into `completeState`, a `StoryboardElement` has reached its goal or was stopped.

Agenda

Introduction

OpenSCENARIO is used in driving simulation and in virtual development, test and validation of driving assistance functions, automated and autonomous driving.

Within these use cases, OpenSCENARIO describes the dynamic content of the world, i.e. the entities acting on or interacting with the road network. OpenSCENARIO does not describe the road network, road infrastructure or road surface. A scenario can be created with a scenario editor and serves as input for driving simulators.

OpenSCENARIO was transferred to ASAM by an industry consortium in late 2018. It evolved to the ASAM standard OpenSCENARIO v1.0.0 within the ASAM OpenSCENARIO Transfer project, which was released in March 2020.

ASAM OpenSCENARIO v1.1.0 is the result of the direct follow-up project “OpenSCENARIO 1.x”.

Motivation

Many driving simulator and scenario editor vendors made their tools compatible to the ASAM OpenSCENARIO v1.0.0 standard

The project served to address the unclarities, errors and feature wishes by implementers (e.g. integration of scenarios into a scenario-based test workflow)

Harmonization with the new OpenX standard ASAM OSI (driving simulator output) was necessary

Change statistics

~ 60 open issues at project start

126 issues created during project

119 addressed issues for OpenSCENARIO v1.1.0

62 open issues remaining

New Features

Support for logical scenarios (Coverage)

- Parameter value distributions for scenario variation / automated generation of concrete scenarios
- Stochastic and deterministic distributions
- Single- and multi-parameter distributions

More flexible maneuver modelling

- Arithmetic calculations and logical expressions
- External object referencing in road network
- Trajectory coordinate system and positions

Compatibility to more road network formats

- Geographic coordinate system and positions

New Features

Improved overall test support

- Parameter value constraints (ranges) prevent misuse / misunderstanding of scenarios in test design
- Consistency with ASAM OSI (weather conditions)

Improved sensor test support

- 3D model referencing
- Precipitation

Improved controller test support

- Wind, atmospheric pressure, outside temperature (for external force on vehicle calculation)

Improved exchangeability of scenarios

- Licensing information can be included

Other Changes

Clarifications

- Actions (traffic, lane change, lane offset, longitudinal/lateral distance, synchronize, controller assignment/activation…)
- Conditions ((relative) distance, time headway, time to collision)
- Distance calculation
- Controller concept (control strategy)
- Init actions and end of simulation/scenario
- Default values
- Restrictions on entity selection references for actions and conditions
- Parameter usage
- Runtime behavior of scenarios in an environment simulator
- System boundaries of OpenSCENARIO

Other Changes

Fixed examples

- Consistency of scenario files to user guide
- Validation of scenarios and road networks against schema
- Executability in environment simulators

Better structured user guide

- Applied consistent structure throughout ASAM OpenX standards

Backward Compatibility

100% backward compatible to OpenSCENARIO v1.0.0

OpenSCENARIO v1.0.0 scenarios are still valid in the OpenSCENARIO v1.1.0 schema

Deprecation mechanism introduced

Strict v1.1.0 validation schema gives errors for deprecated elements in v1.0.0 scenarios

Relation to Other Standards

Logical road network

- ASAM OpenDRIVE
- HERE Navigation Data Standard (NDS)

Road surface elevation and friction

- ASAM OpenCRG

3D models of road, scenery and objects

- CityGML
- OpenSceneGraph
- glTF (Khronos Group)
- FBX (Autodesk)
- 3DS (Autodesk)

Deliverables

Documents

- User guide
- UML modelling rules

Supplementary Files

- UML data model
- HTML documentation of the UML model
- XSD schema file
- Examples
- Migration scripts v0.9.1→1.0.0, strict validation schema v1.1.0