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Intelligent transportation systems - Adaptive cruise control systems - Performance requirements and test procedures

智能运输系统 自适应巡航控制系统 性能要求与检测方法

(English Translation)

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1 Scope

This document specifies the operating principle and types, system states and transitions, functional requirements, performance requirements, and test methods for adaptive cruise control systems.

This document applies to Category-M and Category-N vehicles equipped with adaptive cruise control systems.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of dated references, only the version with the specified date applies to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 44298 Intelligent and Connected Vehicles - Symbols for Controls, Indicators and Tell-tales

3 Terms and Definitions

The following terms and definitions are applicable to this document.

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3.1 Adaptive cruise control; ACC

Monitor the driving environment ahead in real time, and within a set speed range, automatically adjust the running speed to adapt to changes in the driving environment caused by forward vehicles and/or road conditions.

[source. GB/T 39263-2020, 2.3.10]

3.2 Active brake control

Braking control action applied by the ACC system, instead of the driver.

3.3 Brake

The process of generating a force (braking force) that hinders the movement or tendency of a

Figure 1 -- Time Gap

3.11 Steady state

The vehicle state in which relevant parameters do not change with time or distance.

3.12 Full speed range adaptive cruise control; FSRA

Monitor the driving environment ahead in real time, and within a set speed range, automatically adjust the running speed, and with the function of decelerating to a stop and automatically starting from a stop, so as to adapt to changes in the driving environment caused by forward vehicles and/or road conditions.

[source. GB/T 39263-2020, 2.3.11]

3.13 Limited speed range adaptive cruise control; LSRA

Monitor the driving environment ahead in real time, and within a set speed range, automatically adjust the running speed, and with the function of decelerating to the designed minimum speed, so as to adapt to changes in the driving environment caused by forward vehicles and/or road conditions.

4.1 Symbols

The following symbols apply to this document.

alateral_max. maximum designed lateral acceleration on a curve, expressed in (m/s^2).

astopping. longitudinal acceleration of the target vehicle during automatic parking capability test, expressed in (m/s^2).

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CTT. parameter of infrared reflectivity of the test target, expressed in (m^2/sr).

c. clearance, expressed in (m).

cmin. minimum clearance at all vehicle speeds in a steady state (including the hold state), expressed in (m).

d0.critical interval for determining whether it is necessary to detect the target vehicle, expressed in (m).

d1.critical distance for determining whether it is necessary to measure distance or relative speed, expressed in (m).

d2.distance required for measurement, expressed in (m).

dmax. maximum detection range on a straight road, expressed in (m).

R. curve radius, expressed in (m).

Rmin. minimum curve radius, expressed in (m).

RCS. scattering cross-sectional area of radar signals, expressed in (m^2).

v. instantaneous vehicle speed, expressed in (m/s).

vcircle. maximum vehicle speed on a curve with an acceleration of alateral_max, expressed in (m/s).

vcircle_start. initial vehicle speed when entering a curve of radius R, expressed in (m/s).

vlow. minimum vehicle speed required for automatic acceleration and deceleration, expressed in (m/s).

vset_max. maximum selectable set speed, expressed in (m/s).

vset_min. minimum selectable set speed, expressed in (m/s).

vstopping. speed of target vehicle during automatic parking capability test, expressed in (m/s).

vvehicle_end. vehicle speed at the end of the test, expressed in (m/s).

vvehicle_max. maximum vehicle speed during the test, expressed in (m/s).

vvehicle_start. vehicle speed at the start of the test, expressed in (m/s).

tau. time gap, expressed in (s).

taumax(v). at vehicle speed v, maximum time gap obtained, expressed in (s).

taumax. maximum time gap, expressed in (s).

taumin. minimum time gap, expressed in (s).

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4.2 Abbreviations

The following abbreviations apply to this document.

ABS. Anti-lock Braking System ACC. Adaptive Cruise Control FSRA. Full Speed Range Adaptive Cruise Control LSRA. Limited Speed Range Adaptive Cruise Control

5.1 Operating Principle

The main function of the ACC system is to perform longitudinal control of the vehicle based on the driver's operating commands, the subject vehicle's motion state, and the distance information between the subject vehicle and forward vehicle, thereby adapting to the motion of the forward vehicle, and simultaneously provide feedback of the system state to the driver. The onboard equipment can provide the driver with speed-setting suggestions. The operating principle is shown in Figure 2.

Figure 2 -- Operating Principle of Adaptive Cruise Control System

5.2 System Types

The ACC system is classified into FSRA and LSRA systems based on the applicable operating speed range, as shown in Table 1.The vehicle user's instruction manual shall describe the deceleration capability of the ACC system, and all ACC types shall include active brake control.

Table 1 -- ACC System Types

6.1 ACC System States

6.1.1

The ACC system has three states. ACC off, ACC standby, and ACC active. The ACC system states and their transitions are shown in Figure 3.

Figure 3 -- ACC System States and Transitions

6.1.2

If the ACC system is off, it shall stop working.

6.1.3

If the ACC system is in standby state, it shall be able to be triggered and enter ACC active state or be turned off and enter off state.

6.1.4 If the ACC system is active, it shall be able to adjust the subject vehicle's speed and/or

time gap.

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