Connected Vehicles

The use case for Cooperative Driving Automation

Norifumi Ogawa（Mazda Motor Corporation）
Task force on V2X communication for Cooperative Driving Automation

11.Nov.2020

SIP

Cabinet Office

INDEX

◆ **Current status and issues toward the realization of Cooperative Driving Automation (CDA)**

Current status of ITS wireless communication in Japan

- ETC / ETC2.0 (DSRC): Toll collection and Expressway information since 2000
- ITS Connect (DSRC): Support for safe driving at general road intersections since 2015

Challenges for realizing CDA

- Can ITS communication, which has already been put into practical use, be used for CAD?
- What kind of communication method is needed in the era of automated driving?

- **TF on V2X communication for CDA has been established in SIP since 2019**
- **Started researching communication methods for CDA**

SIP

◆ **Activities of TF on V2X Communication for CDA**

- Define CDA
- Develop CDA use cases based on the definition

Phase1

Done

- Define communication requirements based on use cases
- Examination of applicability of existing ITS communication

Phase2

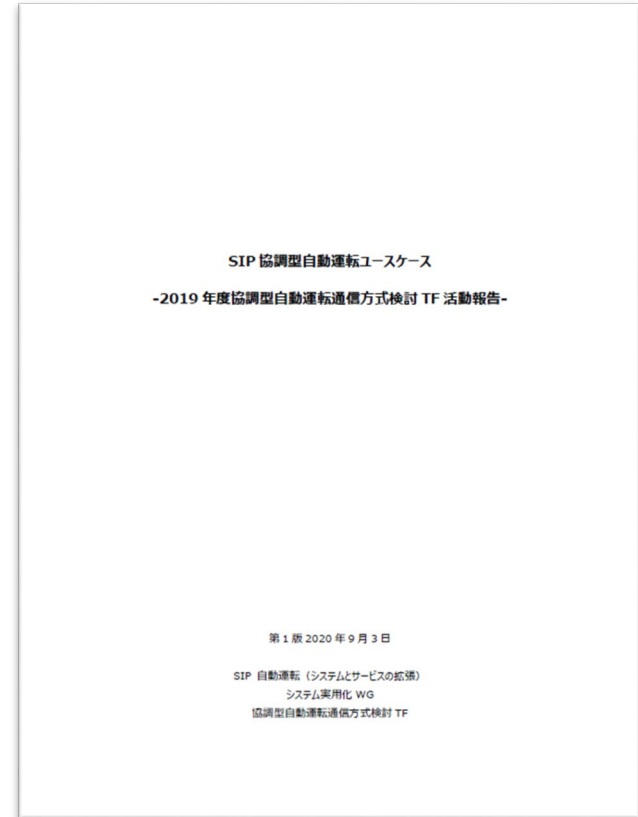- Technology verification for Communication methods (frequency / bandwidth) for CDA
- Proposal of communication method and the roadmap

Phase3

SIP Cooperative Driving Automation Use Case 1st Edition

table of contents

1. Introduction

2. Definition of terms

3. CDA system definition/ Scope of study

4. Use case review process

5. SIP CDA use cases

6. Conclusion

7. References

SIP 協調型自動運転ユースケース

-2019 年度協調型自動運転通信方式検討 TF 活動報告-

第 1 版 2020 年 9 月 3 日

SIP 自動運転（システムとサービスの拡張）
システム実用化 WG
協調型自動運転通信方式検討 TF

◆ Cooperative driving automation system definition

CDA system is that enables safer and smoother automated driving control based on the autonomous driving system, by obtaining the information not detected by the in-vehicle sensor, by providing the information possessed by the vehicles, and by communicating mutually by using V2I and V2V.

◆ Scope of research

⑴ Passenger Car

⑵ Logistics / Mobile service car

SIP

4.1 Use case survey

Survey and collection of use cases used in CDA and ADAS projects in Europe, the United States, and Asia (including Japan) (FY2018)

4.2 Concept of SIP use case selection

Considering the effective use of communication resources, we selected use cases for practical use.

1) Consider the preconditions for selecting CDA system

   ⑴ All traffic participants shall basically comply with the law.

   ⑵ Do not include use cases that can be realized by autonomous driving systems

2) Conforms to the definition of CDA system

   ① by obtaining the information not detected by the in-vehicle sensor

   ② by providing the information possessed by the vehicles

   ③ by communicating mutually by using V2I and V2V

5. SIP use case selection results

◆ **Select 25 feasible use cases**

① obtaining the information not detected by the in-vehicle sensor(14)

- a. Merging and lane change support (2)
- b. Traffic signal information (2)
- c. Look-ahead information: Collision avoidance (4)
- d. Look-ahead information: Trajectory change (5)
- e. Look-ahead information: Emergency vehicle avoidance (1)

② providing the information possessed by the vehicles (4)

- f. Information collection and distribution by infrastructure (4)

③ communicating mutually by using V2I and V2V(7)

- a. Merging and lane change support (4)
- g. Formation / following running (2)
- h. Remote control (1)

5. SIP use case selection results

① **by obtaining the information not detected by the in-vehicle sensor**
a. Merging and lane change support
a-1-1. Preliminary acceleration / deceleration merging support

Functional classification	a. Merging and lane change support		
Use case name	a-1-1. Preliminary acceleration / deceleration merging support		
location	Expressway + general road	**Applicable Car**	Passenger vehicle
Overview	Information such as the speed of vehicles traveling at the measurement point on the main line and the estimated time of arrival at the confluence is provided from the infrastructure to the merging vehicle to support preliminary acceleration / deceleration at the confluence.		

Use case image

Spot measurement of speed and length of vehicles traveling on the main line

Providing information on vehicles traveling on the main line (sensing information, estimated time of arrival at the confluence)

infrastructure

Points to note	communication	V2I	data partition / Information content	message	Estimated arrival time at the confluence (main line car)
	Connection	One-to-many		Sensor data	Speed (main line car spot measurement), Vehicle length
	Control application	Preliminary acceleration / deceleration		Rich content	—
	Responsiveness	need	amount of data		small

8

6. Next step

- Define CDA
- Develop CDA use cases based on the definition

Phase1

Done

- Define communication requirements based on use cases
- Examination of applicability of existing ITS communication

Phase2
FY2020

- Technology verification for Communication methods (frequency / bandwidth) for CDA
- Proposal of communication methods and the roadmap

Phase3
FY2021

SIP

◆ Organization

TF on V2X communication for CDA

Phase**1**
-ITS-related ministries
-Academic experts
-Japan Automobile Manufacturers Association

Phase**2**/Phase**3**
-National Institute for Land and Infrastructure Management
-UTMS Society of Japan
-Japan Electronics and Information Technology Industries Association
-ITS Info-communications Forum
-Society Automotive Engineers of Japan

7. Summary

- Started researching communication methods for CDA in SIP

- Completed the development of use cases to be the basis for the next research

- Use cases opened to the public

  (SIP homepage: https://www.sip-adus.go.jp/rd/rddata/usecase.pdf)

- Started researching the definition of communication requirements based on use cases and the applicability to existing ITS communication.

- Consider a new communication method if it is not applicable to existing ITS wireless communication

- Provide the proposal of communication methods for CDA and roadmap until the end of FY2021

Thank you