DRAFT INTERNATIONAL STANDARD

ISO/DIS 37181

ISO/TC **268**/SC **1**

Secretariat: **JISC**

Voting begins on:
2021-02-16

Voting terminates on:
2021-05-11

Smart community infrastructures — Smart transportation by autonomous vehicle on public roads

ICS: 13.020.20; 03.220.20

This document is circulated as received from the committee secretariat.

Reference number
ISO/DIS 37181:2021(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html

This document was prepared by Technical Committee ISO/TC 268, Sustainable development in communities, Subcommittee SC 1, Smart community infrastructures.

Introduction

Various countries are facing critical issues as their population ages, often at a rate higher than expected. One of the challenges is the shortage of manpower, where many sectors, including transportation, face constraints. At the same time, as their economic activities expand, travel demands have also become more diversified, thus imposing additional demand on transportation networks. These challenges are especially acute for cities, where increased transportation needs have brought about traffic congestion and led to poorer quality of life.

To overcome such challenges, cities have tried to improve transportation systems in a variety of ways, investing in mass transit ranging from light rail transit to metro as well as in public bus services. In mass transit, Automatic Train Operation (ATO) has been widely used for decades. ATO deployed are mostly at Grade of Automation 4 i.e. Unattended Train Operation (UTO) nowadays, where the system is fully run without any staff on board as introduced into the metro in Barcelona, Copenhagen, Hong Kong, Sao Paulo, Singapore, Tokyo and Vancouver.

Beyond mass transit, transportation services on public roads have potential to be automated as well. Autonomous shuttle services are in operation as a means to provide first and last mile connectivity between transport nodes and homes or work places as well as transport services within designated areas such as campuses, parks and neighbourhoods. Such services have already been deployed in Beijing, Las Vegas, Melbourne, Nice and Singapore.

Smart transportation by autonomous vehicles will work as solution to transportation issues and concerns in cities. However, the outcomes can be achieved only when autonomous vehicles are applied under organised conditions with safety as a top priority. This document describes the concept of smart transportation and aims to accelerate the proper introduction of autonomous vehicles onto public roads.

Smart community infrastructures — Smart transportation by autonomous vehicles on public roads

1 Scope

This document describes the concept and goals of smart transportation by autonomous vehicles on public roads. It provides guidelines for the successful introduction and organisation of autonomous vehicles, with the aim of enhancing safety of public road transportation and addressing city challenges such as aging population and diverse travel demands.

This document focuses on the deployment of autonomous vehicles as an operational system for actual use on public roads with indispensable arrangements thereabout. This document is provided to academia, autonomous vehicle developers, policy makers, research institutions, road infrastructure operators, public road administrators, testing inspection and certification bodies, and vehicle manufacturers.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- IEC 61851-1, *Electric vehicle conductive charging system — Part 1: General requirements*
- ISO 37154, *Smart community infrastructures — Best practice guidelines for transportation*

- ISO 37158, *Smart community infrastructures — Smart transportation using battery-powered buses for passenger services*
- ISO 37167, *Smart community infrastructures — Smart transportation for energy saving operation by intentionally driving slowly*
- SAE J3016, *Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles*
- Singapore TR 68-1, *Autonomous vehicles — Part 1: Basic behaviour*
- Singapore TR 68-2, *Autonomous vehicles — Part 2: Safety*
- Singapore TR 68-3, *Autonomous vehicles — Part 3: Cybersecurity principles and assessment framework*
- Singapore TR 68-4, *Autonomous vehicles — Part 4: Vehicular data types and formats*

NOTE 1 As of December 2020, there are no international or national standards published on the basic behaviour and safety of autonomous vehicles operating on public roads except the Singapore Technical Reference (TR) 68 series, the summaries of which are available in Annex A for information.

NOTE 2 For autonomous vehicle introduction into limited areas in a city, the following document will be useful:

– ISO 37168: 202X, *Smart community infrastructures — Guidance on smart transportation for autonomous shuttle services using Connected Autonomous electric Vehicles (eCAVs)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

– SAE J3016: 2018, *Taxonomy and definitions for terms related to driving automation systems for on-road motor vehicles*

ISO and IEC maintain terminological databases for use in standardisation at the following addresses:

– IEC Electromediated: available at http://www.electropedia.org/

– ISO Online browsing platform: available at http://www.iso.org/obp

3.1
autonomous vehicle
vehicle that is capable of sensing its environment and moving safely with no human input and is designed to be operated by automated driving systems.

Note 1 to entry: Automated driving system in this document means no human intervention system characterised as SAE levels 4 and 5 that are defined by SAE J3016: 2018.

Note 2 to entry: Autonomous vehicles in this document exclude those applied only in limited areas, such as vehicles as designated by ISO 37168.

4 Autonomous vehicles as smart transportation

4.1 General

ISO 37154 provides general guidance on smart transportation that aims to solve specific city issues. The deployment of autonomous vehicles on public roads is considered one of the ways to introduce smart transportation systems.

NOTE Any transportation technologies or services cannot be used for smart transportation systems, if their performance is not confirmed, formally documented or published as international or official standards.

4.2 Autonomous vehicles used in smart transportation

This document describes smart transportation using autonomous vehicles that have been validated for public road operations based on published international or national standards.

NOTE Autonomous vehicles had been deployed on public roads and the experiences were documented. For example, public trials were conducted for on-demand autonomous shuttles at Sentosa, Singapore in 2019[3].

5 Concept of smart transportation by autonomous vehicles

5.1 Objectives

The smart transportation system with autonomous vehicles can be introduced into a city in order to improve connectivity, mainly first and last mile, accessibility to mass transit and other transportation networks, reduce traffic congestion levels, free up land used for roads and parking lots for other purposes, alleviate manpower constraints, contribute to traffic accident avoidance and lead to improving the quality of life of citizens.

5.2 Concept and target city issues of smart transportation

Autonomous vehicles can enhance the efficiency of transportation services in a variety of ways. They help improve the regularity of conventional bus services plying fixed routes and optimise dispatching dynamically routed shuttle fleets and delivery item/freight services. Autonomous vehicles can improve the accessibility and inclusivity of public transport systems. Commuters that need point-to-point mobility, such as the elderly or people with disabilities, can hail an autonomous shuttle on demand, which can bring them to transport nodes.

Efficiently organised and highly accessible public transportation systems can reduce reliance on privately owned or personally used vehicles that are often with single occupancy and encourage a shift to public transportation, thereby reducing congestion on public roads. Goods delivery and municipal services such as street cleaning can be automated with autonomous vehicles operating during off-peak hours, enabling to disperse traffic over the course of the entire day.

Reduction in the number of vehicles will enable the use of road premises for other purposes (i.e. by parking lot premises removal). This would be beneficial for dense and land-scarce cities. Autonomous vehicles relieve the manpower constraints faced by cities when it comes to drivers, thanks to their automated operation. In addition, the number of traffic accidents should be reduced, as autonomous vehicles are designed to achieve non-collision operation. People no longer need to drive their vehicles by themselves, thus freeing them for productive use of their time while riding.

5.3 Application

Smart transportation can be applied to:

– private transportation (e.g. automobiles, trucks);

– public transportation (e.g. taxis, scheduled/chartered buses, scheduled/chartered trucks).

NOTE Private and public transportation are defined in ISO 37154, 3.8 and 3.9.

5.4 Satisfaction of United Nations SDGs

This smart transportation aims to satisfy United Nations Sustainable Development Goals, especially goal 7 “Affordable and clean energy”, goal 8 “Decent work and Economic Growth”, goal 9 “Industry innovation and infrastructure”, goal 10 “Reduced inequalities”, goal 11 “Sustainable cities and communities”, goal 12 “Responsible consumption and production”, goal 13 “Climate Action” and goal 17 “Partnerships for the goal”.