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SWEDISH STANDARDS INSTITUTE

Mobila robotar – Terminologi (ISO 19649:2017, IDT)

Mobile robots – Vocabulary (ISO 19649:2017, IDT)

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The International Standard ISO 19649:2017 has the status of a Swedish Standard. This document contains the official English version of ISO 19649:2017.

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Denna standard är framtagen av kommittén för Robotik, SIS/TK 278.

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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).

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This document was prepared by Technical Committee ISO/TC 299, *Robotics*.

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Introduction

With the increase of mobile robots in both industrial and non-industrial applications, there is a growing need to define terms relating to mobile robots. ISO 8373 defines fundamental terms relating to robotics, but it does not define terms relating to mobile robots fully. This document defines terms for mobile platforms and mobile robots based on the definitions in ISO 8373:2012.

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Mobile robots — Vocabulary

1 Scope

This document defines terms relating to mobile robots that travel on a solid surface and that operate in both industrial robot and service robot applications. It defines terms used for describing mobility, locomotion and other topics relating to the navigation of mobile robots.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

— IEC Electropedia: available at http://www.electropedia.org/

3.1 General terms related to mobile robots

3.1.1
mobile robot
robot able to travel under its own control

Note 1 to entry: A mobile robot can be a *mobile platform* (3.1.2) with or without manipulators.

[SOURCE: ISO 8373:2012, 2.13]

3.1.2
mobile platform
assembly of all components of the *mobile robot* (3.1.1) which enables *locomotion* (3.1.10)

Note 1 to entry: A mobile platform can include a chassis which can be used to support a load.

Note 2 to entry: Because of possible confusion with the term “base”, it is advisable not to use the term “mobile base” to describe a mobile platform.

[SOURCE: ISO 8373:2012, 3.18]

3.1.3
mobility
ability of the *mobile platform* (3.1.2) to travel within its environment

Note 1 to entry: Mobility can be used as a measure, e.g. an *omni-directional mobile mechanism* (3.3.6) usually has higher mobility than a *differential drive* (3.3.7) wheeled mechanism.

3.1.4
steering
control of the direction of travel of the *mobile platform* (3.1.2)

3.1.5
configuration
set of all joint values that completely determines the shape of the robot at any time

[SOURCE: ISO 8373:2012, 3.5]

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3.1.6
alignment configuration
reference configuration
specified *configuration* (3.1.5) of the *mobile platform* (3.1.2) defined by the manufacturer

EXAMPLE Zero-steering configuration for a wheeled robot, specified stand-still configuration of a legged robot

3.1.7
travel surface
terrain on which the *mobile robot* (3.1.1) travels

[SOURCE: ISO 8373:2012, 7.7]

3.1.8
travel surface contact area
ground contact area
area of one or more wheels, tracks, or legs in contact with the *travel surface* (3.1.7)

3.1.9
support polygon
convex hull of all the *travel surface contact areas* (3.1.8)

3.1.10
locomotion
self-propelled travel of the *mobile platform* (3.1.2)

3.1.11
turret
rotating structure mounted on a *mobile platform* (3.1.2) to give independent orientation to any devices attached on the structure

3.2 Terms related to locomotive structure

3.2.1
suspension
system or structure which absorbs shock or vibration from the *travel surface* (3.1.7)

Note 1 to entry: The purpose of suspension can be to maintain the stability of the *mobile platform* (3.1.2) and to overcome roughness of the travel surface by maintaining contact to the travel surface.

3.2.2
active suspension
suspension (3.2.1) whose damping and/or spring characteristics can be controlled

3.2.3
Zero Moment Point
ZMP
point, on the *support polygon* (3.1.9), with respect to which the moment, resultant from all the forces exerted from the *travel surface* (3.1.7) to the *mobile robot* (3.1.1), has zero components in the horizontal direction

3.3 Terms related to wheeled robots

3.3.1
steer wheel
steered wheel
wheel whose orientation is controlled to change the direction of travel

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3.3.2
drive wheel
driving wheel
wheel that propels the *mobile platform* (3.1.2)

3.3.3
idler wheel
follower
trailing wheel
wheel that does not propel the *mobile platform* (3.1.2) and is not actively steered

3.3.4
swivel castor
castor
assembly including one or more wheels in a housing which rotates freely around a vertical axis that has a horizontal offset from the wheel's axis of rotation

3.3.5
omni-directional wheel
wheel with rollers attached on its outer surface which allows a displacement in any direction, even perpendicular to the wheel itself

EXAMPLE Omniwheels (rollers oriented in 90° angle to the wheel axle), Mecanum wheels (rollers oriented in 45° angle to the wheel axle)

Note 1 to entry: An *omni-directional mobile mechanism* (3.3.6) is often constructed using three or more omni-directional wheels.

3.3.6
omni-directional mobile mechanism
wheeled mechanism which enables instantaneous travel of the *mobile robot* (3.1.1) in any direction

[SOURCE: ISO 8373:2012, 3.19.]

3.3.7
differential drive
mechanism and method of motion control in which *drive wheels* (3.3.2) along an axis are controlled independently, the speeds of the wheels effecting translation and the difference thereof effecting rotation

Note 1 to entry: This term can also apply to tracked robots.

3.4 Terms related to legged robots

3.4.1
gait
pattern of cyclic motion of the leg(s) for legged *locomotion* (3.1.10)

3.4.2
stride length
stride
travel distance of legged robot for one cycle of *gait* (3.4.1)

3.4.3
walking period
gait period
time of one cycle of *gait* (3.4.1)

3.4.4
leg phase
ratio of time delay of the start of *swing state* (3.4.6) of a leg from that of the reference leg to the *walking period* (3.4.3)

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3.4.5
support state
stance state
state of a leg in which the leg is in contact with the *travel surface* (3.1.7)

3.4.6
swing state
recovery state
transfer state
state of a leg in which the leg is not in contact with the *travel surface* (3.1.7)

3.4.7
duty factor
ratio of the duration of the *support state* (3.4.5) of a leg to the *walking period* (3.4.3)

3.4.8
gait diagram
diagram of cyclic motion of the legs in time for legged *locomotion* (3.1.10)

EXAMPLE A gait diagram for crawl *gait* (3.4.1) of a quadruped is shown in Figure A.1.

3.5 Terms related to locomotion

3.5.1
travel surface reaction force
ground reaction force
force exerted to the *mobile platform* (3.1.2) from the *travel surface* (3.1.7) through the *travel surface contact area* (3.1.8)

3.5.2
travel surface contact pressure
ground contact pressure
pressure exerted to the *mobile platform* (3.1.2) from the *travel surface* (3.1.7) with wheels, tracks or legs through the *travel surface contact area* (3.1.8)

3.5.3
overturning moment
minimum moment required to overturn a *mobile robot* (3.1.1) from a statically stable *pose* (3.6.1)

Note 1 to entry: This moment is dependent on surface conditions, e.g. slope.

3.5.4
traction
maximum frictional force that can be produced between *travel surface* (3.1.7) and *mobile robot* (3.1.1) wheels, tracks or legs

3.5.5
mobile platform coordinate system
coordinate system referenced to one of the components of a *mobile platform* (3.1.2)

Note 1 to entry: ISO 9787:2013, 5.5, specifies a mobile platform coordinate system, O_p - X_p - Y_p – Z_p. The origin of the mobile platform coordinate system, O_p, is the mobile platform origin. The $+X_p$ axis is normally taken in the forward direction of the mobile platform. The $+Z_p$ axis is normally taken in the upward direction of the mobile platform. See Figure A.2

[SOURCE: ISO 8373:2012, 4.7.6, modified – Original Note 1 to entry has been deleted and new Note 1 to entry has been added.]

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3.5.6
steer angle
angular displacement of the axle of a *steer wheel* (3.3.1) about the $+Z_p$ axis

Note 1 to entry: Steer angle is usually zero when the wheel axle is aligned with Y_p direction of the *mobile platform* (3.1.2).

Note 2 to entry: See *mobile platform coordinate system* (3.5.5).

3.5.7
forward travel
movement of the *mobile platform* (3.1.2) along its $+X_p$ axis

Note 1 to entry: See *mobile platform coordinate system* (3.5.5).

3.5.8
reverse travel
backward travel
movement of the *mobile platform* (3.1.2) along its $-X_p$ axis

Note 1 to entry: See *mobile platform coordinate system* (3.5.5).

3.5.9
traverse
lateral travel
movement of the *mobile platform* (3.1.2) along its Y_p axis

Note 1 to entry: See *mobile platform coordinate system* (3.5.5).

3.5.10
diagonal travel
movement of the *mobile platform* (3.1.2) as a combination of *forward travel* (3.5.7)/*reverse travel* (3.5.8) and *traverse* (3.5.9)

3.5.11
omni-directional travel
movement of the *mobile platform* (3.1.2) whose direction of travel can be changed instantaneously and arbitrarily by means of an *omni-directional mobile mechanism* (3.3.6)

3.5.12
turning
movement of the *mobile platform* (3.1.2) causing a change of the orientation of the *mobile platform coordinate system* (3.5.5)

Note 1 to entry: Turning is typically accompanied by the change of the direction of travel of the mobile platform.

Note 2 to entry: Table A.1 provides a comparison of turning, *pivoting* (3.5.13) and *spinning* (3.5.14).

3.5.13
pivoting
pivot turning
rotating with translation during which one wheel, track or leg contact point stays in one place on the *travel surface* (3.1.7) to be used for the centre of *turning* (3.5.12)

Note 1 to entry: Table A.1 provides a comparison of turning, pivoting and *spinning* (3.5.14).

3.5.14
spinning
spin turning
in-place rotation, or rotation about the *mobile platform* (3.1.2) origin without translation

Note 1 to entry: Table A.1 provides a comparison of *turning* (3.5.12), *pivoting* (3.5.13) and spinning.