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SINGAPORE STANDARD

Data exchange between robots, lifts and automated doorways to enable autonomous operations

Singapore Standards Council

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Foreword

This Singapore Standard was prepared by the Working Group on Data Exchange Between Robots, Lifts and Automated Doorways set up by the Technical Committee on Robotics and Automation under the purview of the Manufacturing Standards Committee.

This Singapore Standard was developed as a result of the review of TR 93:2021, “Data exchange between robots, lifts and automated doorways to enable autonomous operations”. The review took into account insights gleaned from field implementation, enhancing the standard's practicality and effectiveness. New requirements have been added to address system integration during emergencies such as fires and hospital situations (e.g., Code Blue), and in situations where multiple mobile robots access and exit a bank of lifts while sharing lift cars with passengers.

This standard aims to provide information for system integrators and facility owners with regard to robot-lift and robot-automatic doorway integration design and best practices specifically on the data exchanges to achieve interoperability of multiple fleets of robots with the building infrastructures. Information provided within this standard offer requirements on what and how to sequence the messages that are to be exchanged, thus ensuring the safe operation between robots, lifts, and automatic doorways.

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Data exchange between robots, lifts and automated doorways to enable autonomous operations

0 Introduction

The installation of lifts in multi-storied or ‘flatted’ buildings is common in Singapore. Increasingly, automatic guided vehicles (AGVs) and autonomous mobile robots (AMRs) — generally referred to as robots — are deployed within these buildings for autonomous material transport and deliveries. In addition, there is a growing trend toward deploying mobile robots to augment facility management services, including surveillance/security, cleaning and concierge duties. These services, rendered by mobile robots in multi-storey buildings, can be scheduled or on-demand. For the effective deployment of robots in buildings with lifts, the robots’ ability to ride the lifts as part of their routes is crucial. Without this capability, the implementation of robotic transportation/deliveries will be incomplete. Furthermore, robots should be able to traverse through automated doorways, often installed for security and sanitisation purposes.

This Singapore Standard establishes the standard for the architecture and communications/data exchanges between robots and lifts, as well as between robots and automated doorways, regardless of the specific make/model of the automated doorway, lift or robot. Compliance with this standard will facilitate the smooth implementation of robotic solutions in smart multi-storey buildings.

1 Scope

This standard specifies the requirements for integrating robots with lifts and robots with automated doorways. This standard defines the minimum set of data exchanges, hardware requirements, safety considerations, for robot-lift integration with both digital and discrete lift control systems. It also covers communications between robot-lift and robot-automatic doorway during emergency situations such as fire evacuation, and abnormal conditions such as power outage or disruption.

The types of lifts that building owners can integrate with the robots may vary. Common parameters include the following:

a) Designated or mixed usage: passenger, cargo or mixed-use lift;

b) Number of doors: single door or dual door (front and back door); and

c) Hosting site of digital lift controller: within the building that it serves or in the cloud.

For robot-automated doorway integration, the types of power-operated doorways suitable for integration include, but are not limited to, swing and sliding doors, as long as they can be opened or closed by an automatic door operator.

Specific message protocols and solutions, and low-energy power-assisted doors, are not within the scope of this standard.

2 Normative references

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

IEC 61000-6-2 Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments

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