Continental
The Future in Motion

Using STPA to assure a safe operation of autonomous mobile robots in public spaces

June 2022, MIT STAMP Workshop

Danilo da Costa Ribeiro, Tim Brockmeyer, Martin Grießer

Introduction – mobile robots

Definition – Subcategories – Examples

According to the definition of ISO 19649, a mobile robot is:

"robot able to travel under its own control"

Division into two categories:

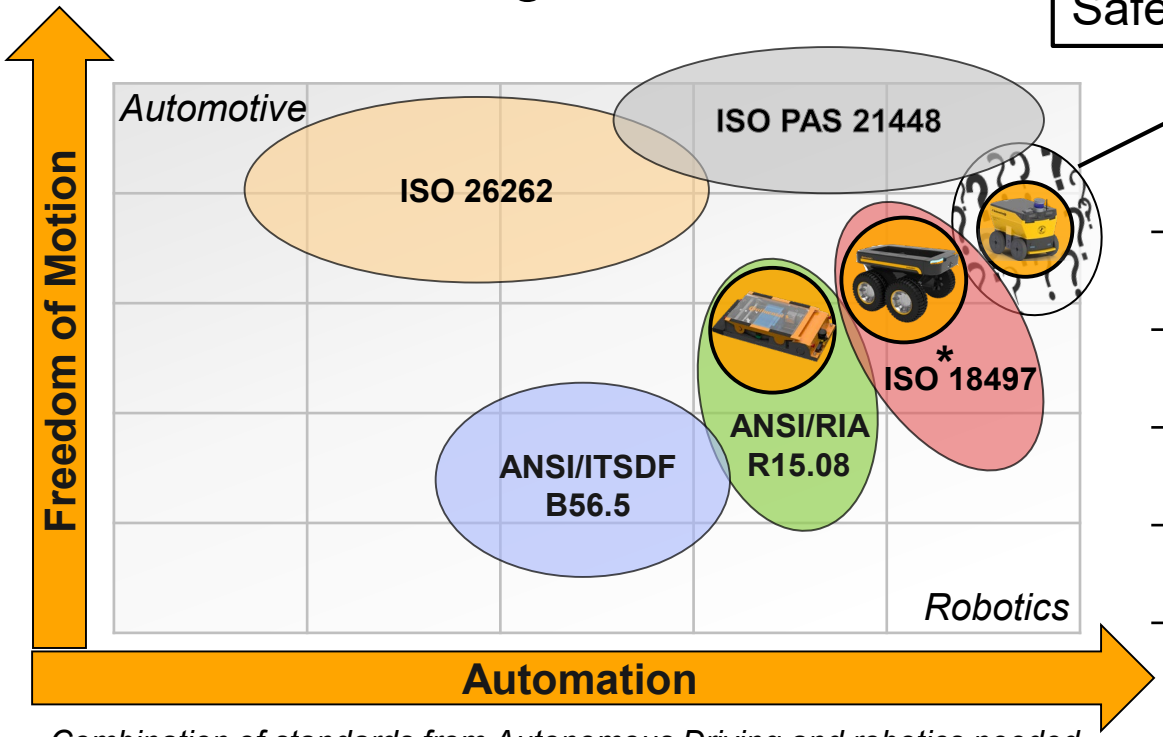
Autonomous Mobile Robots (AMR)	**Automated Guided Vehicles (AGV)**
Navigates dynamically using an environmental model	Follows fixed routes (e.g., wires in the ground)

Examples:



Overview

Standards relating mobile robots



SOTIF Safety of the intended Function	ISO PAS 21448
FuSa Functional Safety	ISO 26262
HAAM Highly Automated Agricultural Machine	ISO 18497
IMR Industrial Mobile Robots	ANSI R15.08
AGV Automated Guided Vehicle	ANSI B56.5

Combination of standards from Autonomous Driving and robotics needed

* ISO 18497 does not include higher automation than ANSI/RIA R15.08.

Conclusion

- **Early alignment** of all engineering disciplines (Systems, Safety, Software, …)
- Generic **functional architecture** derived from STPA requirements
- Safety Requirements already established in an earlier phase
  - ➔ **reduced costs**,
  - ➔ **faster development** for a variety of robotic application
- Challenge: Lack of means for **requirements prioritization** needs to be defined
- **Standardization** within Automotive to be developed
- Extending the usage of mobile robots from private to **public spaces**