

A Methodological Survey of Autonomous Mobile Robots and Automated Guided Vehicles in Industrial Logistics

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INTRODUCTION & AIM

INTRODUCTION

- AMRs and AGVs are key technologies in industrial logistics
- AGVs: Fixed, infrastructure-based
- AMRs: Adaptive, AI-driven

→ Shift toward intelligent automation

AIM

Survey AMRs & AGVs focusing on

- Architectures
- Autonomy

METHOD

- System-level literature survey

Analysis of key components:

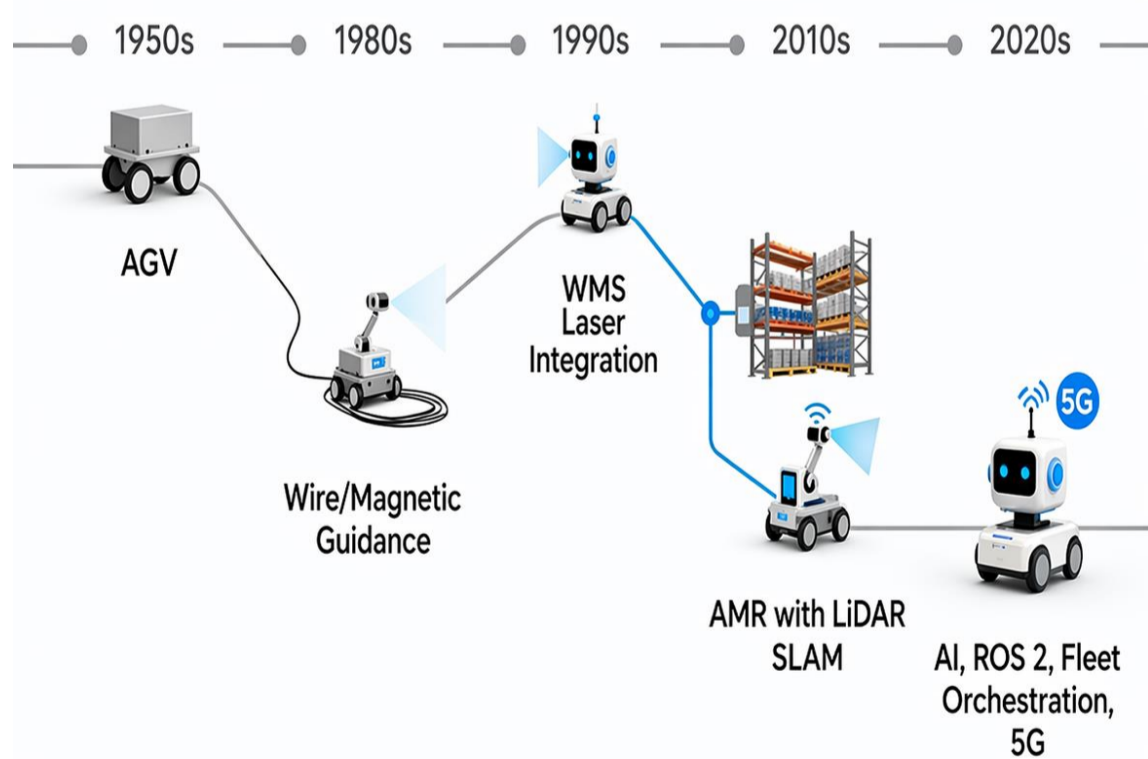
- Sensing & perception
- Localization
- Navigation & planning

- Classification of **AGV vs. AMR architectures**

- Focus on **technological evolution and autonomy levels**

RESULTS & DISCUSSION

Evolution of Automated Guided Vehicle (AGV) Technology



AGVs

- Fixed routes, infrastructure-dependent
- Reliable, cost-effective, low flexibility

AMRs

- Adaptive, perception-driven, AI-enabled
- Real-time navigation & obstacle handling
- Flexible and decentralized operations

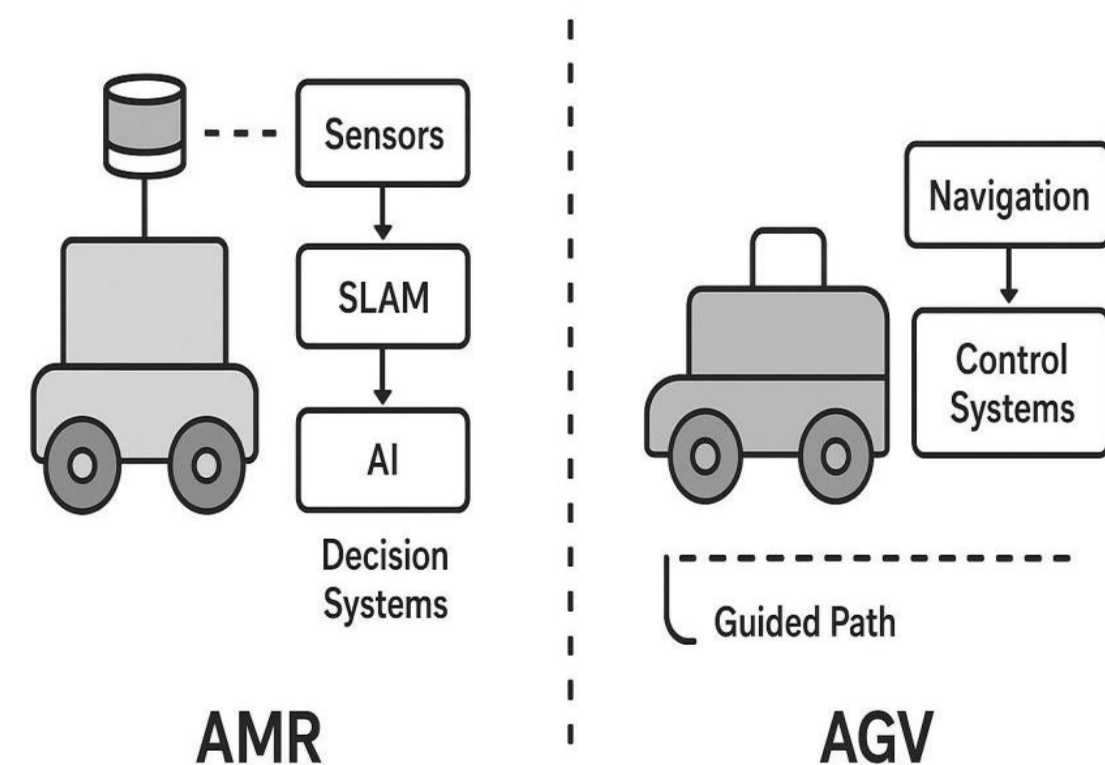
Technological Evolution

- Rule-based → Data-driven autonomy
- Cloud-edge integration for optimization
- Multi-robot coordination emerging

Key Trends

- Learning-based navigation
- Semantic mapping & scene understanding
- Human-robot collaboration
- Scalable fleet management

AMR vs AGV Architecture Overview



CONCLUSION

- AMRs and AGVs are moving towards **intelligent, adaptable, and scalable systems**
- AMRs allow **perception-based, autonomous navigation**
- Industry 5.0 alignment: **human-centered, explainable AI, sustainable**
- Future systems need: **standards, interoperability, energy efficient design, safe human-robot interaction**

FUTUREWORK

- **Federated learning** for fleet-level intelligence
- **Digital twin** integration for real-time optimization
- **Energy-efficient hardware** and battery monitoring
- **Standardization & interoperability** across vendors
- **Safe human-robot collaboration** in industrial settings

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