

AGVs

AGVs (with optional integrated collaborative robots) - Stage 2

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Project Description

Autonomous Guided Vehicles (AGVs) are vehicle systems that follow the desired path and move around the operating areas autonomously. They are designed and implemented with advanced perceptive sensors and mechanical parts for functions with minimal human coordination. With the advancement in their sensing and perceptive technologies, they are broadly used in manufacturing or warehousing facilities and are feasible to be used under any dynamic environment conditions.

The Australian red meat processing industry has deployed, by Scott Technology Ltd, the industry's first successful AGV system with Kilcoy Global Foods. This example system controls 14-16 AGVs that operate fully autonomously for transporting packed meat products within the packing and distribution zone. This system is specifically designed for and limited to the application within an indoor chilled environment, not freezing or outdoor environment. These AGVs are usually referred to unit loaded fixed wheel platforms, and they are usually guided based on magnetic strips installed in the ground. All AGVs operate with the same closed-loop procedures, from loading palletised items to wrapping and barcode scanning and then delivering to the distribution zone.

Project Content

In this project, AMPC partnered with the University of Adelaide (UoA) to investigate potential application scenarios in which AGVs can be used to support the Australian red meat processing industry. This report introduces all constraints that will limit the function and performance AGVs in the meat processing facility. The report also provides examples of how can AGVs be used in the meat processing sites and potential implementations. Based on the knowledge introduced and the project findings, UoA suggests using existing conventional development/systems of 1) using forklift AGVs for loading and stacking pallets, and 2) self-guided AGVs for handling material in existing facilities; investigating AGVs implemented with tools for additional functions, including 1) collaborative robot integrated AGVs, and 2) fully/semi-autonomous facility cleaning AGVs; and UoA also introduced a human-AGV collaborative system with its main characteristics. It introduces the design of an AGV system while remaining humans in their roles. A high-level system design of the system is introduced in this report.

Based on these suggestions, UoA proposed four research and development projects for developing and demonstrating the single unit proof of concept in meat processing scenarios for the suggested tasks in the meat processing environment, which will be tested in meat processing facilities.

UoA also introduced an unconventional multi-AGV collaborative system with its five main characteristics. It is presented based on benefits that will potentially improve productivity in meat processing facilities while remaining humans in the roles. A high-level system design of multi-AGV collaborative systems is introduced in this report.

Project Outcome

This project aims to find and suggest using AGVs within the Australian red meat processing industry to improve processing efficiency and safety. We find that there are several constraints that limit the use of AGVs in meat processing facilities. We also suggest some scenarios in which AGVs can be used through our investigation.

Constraints:

- ◆ Dynamic operational environment
- ◆ Limitations in AGV functions

Suggestions:

- ◆ Forklift AGVs
- ◆ Delivery AGVs

◆ Cleaning AGVs

All suggested example applications of AGVs do not have any technical challenges yet need to be carefully considered with limitations and constraints introduced in section 5.1. However, they will need to be tailored and tested in meat processing scenarios. Several critical issues need to be assessed in the real environment. Based on the suggestions, UoA proposed four innovative projects for developing and demonstrating the single-unit concept of the suggested tasks and one discovery project for further investigations on the conceptual multi-AGV collaborative robot used in meat processing facilities.

Benefit for Industry

The project investigated on AGVs with their applications and suggested example applications in the meat processing industry. It helps the industry understand the AGVs and how they can be used in the Australian red meat processing industry. The project also proposed the design of human-AGV collaborative system that is designed to handle the complexity of meat processing sites and provide adequate support by the AGV in a human-vehicle shared workspace.