

Robot Implementation on the Casino Food Coop site

AGVs (with articulated legs) - Stage 2 & 3
Services

Project Code
2021-1271

Prepared by
Haydn Bradfield

Date Submitted
18/05/2022



Disclaimer The information contained within this publication has been prepared by a third party commissioned by Australian Meat Processor Corporation Ltd (AMPC). It does not necessarily reflect the opinion or position of AMPC. Care is taken to ensure the accuracy of the information contained in this publication. However, AMPC cannot accept responsibility for the accuracy or completeness of the information or opinions contained in this publication, nor does it endorse or adopt the information contained in this report.

No part of this work may be reproduced, copied, published, communicated or adapted in any form or by any means (electronic or otherwise) without the express written permission of Australian Meat Processor Corporation Ltd. All rights are expressly reserved. Requests for further authorisation should be directed to the Executive Chairman, AMPC, Suite 2, Level 6, 99 Walker Street North Sydney NSW.

Project Description

The scope of this project included robot setup, training, a site visit from the DroneDeploy team as well as the deployment of a robot on an active site to validate and prove out potential use cases.

Project Content

The objective of this project was to conduct testing and experimentations with different use cases where robots could be practically applied to an active meat processing facility. A wide range of use cases were defined, and missions were planned and executed on the Casino Food Coop site.

Use cases included

- Confined areas and restricted areas
- Emergency Response
- Planned inspections of Veal floor or similar Processing area (non-active)
- Ammonia Detection
- Engine Room Maintenance Inspection
- Thermal Imagery of Servers, Switches, and Computers.
- Lairage - Working with live animals
- Transporter Robot - Moving consumables around the site
- Last Check Pallet Scanning and Truck loading Inspection
- Geospatial Data (Point Cloud) LiDAR gathering

Project Outcome

Robots in the form of Spot, in the current Casino Food Coop facility, can be of benefit as an extension to the workforce but may be limited when operating in an autonomous capacity due to the robots' current capabilities as a quadruped to successfully navigate busy areas or access areas where doors or obstacles aren't designed to autonomously open and require human efforts. At this stage, the access tracks, entries into the processing area, and other areas are limiting factors for robot movements. This can be resolved in future and in Stages 3b and 4 where facility layouts are modified to incorporate robots.

The day-to-day operations in the processing areas are still heavily focused on manual efforts and would require the process, in general, to be rethought to accommodate robots and automation where practical and where productivity gains can be identified.

IoT devices may be an easy addition for advanced monitoring and inspection capabilities within areas such as the freezers, engine room, or where other mechanical needs to be inspected routinely.

From our testing and the described use cases, Spot can be used as a multipurpose robot to automate very repetitive tasks, further research into the numerical and financial value of the selected use cases will need to be done.

Other robot form factors may be of high value, especially in the areas where Order Picking, Palletisation, Storage, and loading into transport vehicles which are still heavily focused on manual labour efforts.

Testing Completed

Initial Site Mobility Testing

Spot was put through some comprehensive testing of Spot's mobility capabilities around the site. This included testing Spot's walking ability up staircases, on moving conveyors and recording long Autowalk that the robot could execute in an autonomous manner. Although Spot collapsed on many occasions in very tricky conditions, there was no damage that occurred that resulted in any downtime. This proved how durable and robust this AGV solution is.

Engine Room Inspection

Spot was programmed to navigate to areas of interest to capture still images and a 360 walkthrough for an Engine room inspection. This included documenting a few gauges and switches as well as the documentation of frozen condensation on ammonia cylinders and piping. Once these images were captured and the robot had returned to the docking station, this collected content was then pushed through to the DroneDeploy platform for storage, visualization, and reporting.

Veal Floor Inspection

Spot was programmed to navigate to areas of interest to capture still images and a 360 walkthrough. This included conveyor belts, the hide puller, and some mechanical tools such as the brisket cutter and carcass saw. The environment had comprehensive network connectivity and the mission could be observed on the platform from any location in the world with an internet connection. Once these images were captured and the robot had returned to the starting location, this collected content is then pushed through to the DroneDeploy platform for storage, visualization, and reporting.

Delivery Mission

Spot was set up to autonomously deliver consumables from the IT department to Tannery, more than 500m away. The Casino Food Coop Engineering team was able to quickly construct a transport tray that bolted onto Spot with the purpose to carry PPE supplies, Covid testing supplies, IT equipment, or general maintenance tools. The mission was executed but due to some technical issues and time constraints, this mission was never completely executed successfully.

Cattle Herding in Lairage

Spot was taken into the Lairage area where the robot's walking capability was tested in an environment with tricky conditions such as the uneven concrete floor, gutters, and stairs. Spot was then moved to a larger outdoor area that was sand based to test the robot's capability in the sand and to see how cattle would respond to it in a bigger environment. The robot proved its capability to "self-right" without human intervention and carry on the mission should it fall over. The robot was successful at herding cattle in a larger outdoor setting, with notes that this could improve with operator practice.

LiDAR Collection of Data (BETA)

Using the existing LiDAR (Laser Scanning) on Spot, the DroneDeploy team ran a test on the solution's capability to record LiDAR for visual mapping purposes. The purpose of LiDAR scanning is to capture geospatially accurate data in the form of high accuracy point clouds to enable the digital team to understand the facility's current geospatial setup and use this point cloud in their CAD systems for design and planning.

Benefit for Industry

The industry is now more aware of the current state of quadruped robots and what might need to change in the future to allow for the more productive implementation of automation and robotics.

For ground robots to become an effective tool in the industry there is collaboration required from the industry and its trades, not to find a means to replace current jobs and tasks, but to innovate together towards newer effective ways to achieve a higher quality result and record.

Useful resources

DroneDeploy. (2022). *DroneDeploy Walkthroughs*. Retrieved from https://www.dronedeploy.com/app2/sites/61db678950f6b78627805dd3/maps/624224e898398f4a0d190792?jwt_token=eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzUxMiJ9.eyJpZCI6IjYyNDIyNTBhMzcyYmE0NTk0Y2ZiYWVwNCIsInR5cGUiOiJQdWJsaWNTaGFyZVYyIiwiaWF0IjoiYWNjZXR5X3R5cGUiOiJwbGFuIn0.gvFOnfA4jH

Photo Inspection Mission - Veal Floor

Photo Inspection Mission - Engine Room

Image Summary

