Snapshot Report

Collaborative Robots

Collaborative Robots Evaluation and Deployment Strategy Development – Stage 2

Project Code
2021-1238

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Date Submitted
29/04/2022

Project Description

The collaborative robot is an innovative technology that has been broadly adapted to the manufacturing industry. Typical examples include assembly, dispensing, finishing, machine tending, material handling, welding, material removal, quality inspections, etc. Compared with traditional industrial robots, collaborative robots are designed to work alongside humans and are easily adaptable without major upgrades to existing facilities.

AMPC is partnered with the University of Adelaide (UoA) to investigate how collaborative robots may be deployed within the Australian red meat processing sector. UoA has generally provided suggestions on where collaborative robots can be deployed today, including a conceptual example of using collaborative robots for sharpening knives. UoA has provided the design of how the suggested use of collaborative robots can be implemented to the processing site directly without major upgrades and what are the potential technical risks. UoA has also suggested some future implementations which require some additional developments to current meat processing practices.

This project investigates the applications of using collaborative robots in the meat processing industry to design a human-robot collaborative workspace. Many meat processing tasks still require human operations, which induces a high injury rate for human labours. While full automation using the industrialised robots is difficult due to high input material variability, collaborative robots have the potential to solve this problem by performing dangerous and repetitive tasks while outclassing industrialised robots at processing material variability.

Project Content

To demonstrate using collaborative robots in the Australian meat processing industry, we developed an example of using them for sharpening knives. An electric wheel knife sharpener is attached to the end of the robot. It will approach the knives holding by a bracket, in which the human operator changes and replaces the knife in the holding bracket. The main issue of this task is how to allocate the knife precisely and safely, and what is the human involvement in this task. We have developed two approaches to achieve this function.

1. Manual positioning: The human operator places knives at the same position in the holding bracket each and every time and confirms with the robot before it goes through a pre-programmed path.
2. Automatic locating: The robot measures the position by colliding each side of the knives (Figure 1).

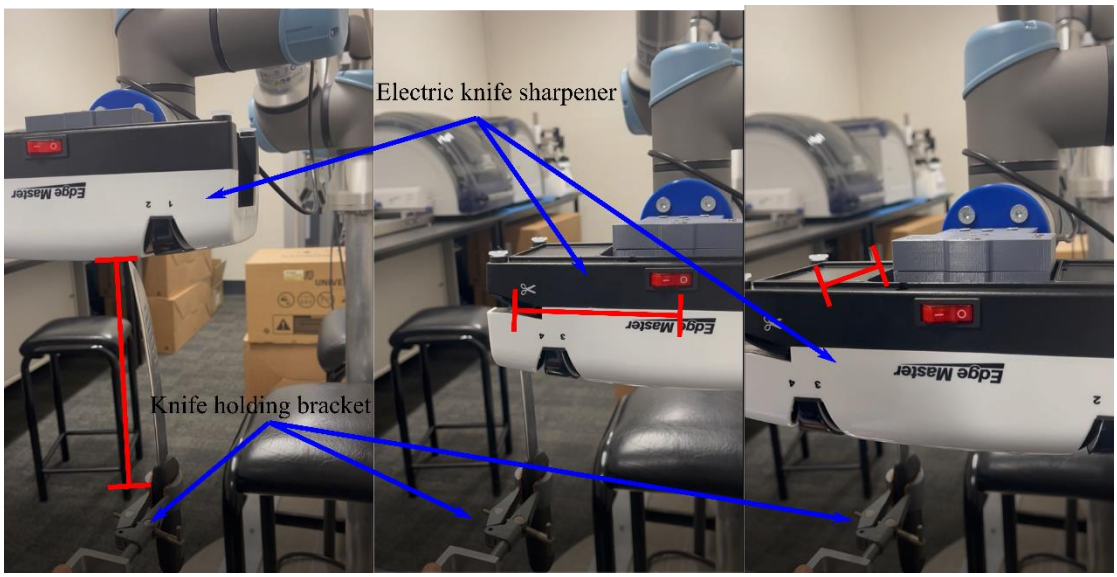

Figure 1 Knife sharpening example

Project Outcome

This project aims to find and suggest the use of collaborative robots within the red meat processing industry. Based on the investigation, we suggested four main areas that can potentially use collaborative robots to significantly improve the safety, cost, and productivity of the current process.

Suggestions:

1. Sorting, packing and palletising of vacuum-packed meat parts
2. Picking, cutting and weighing lamb shanks
3. Meat quality inspection and processing performance monitoring
4. Human-robot collaborative beef fat trimming

The details of the technical challenges of these suggested applications are introduced in the full report.

Benefit for Industry

Throughout the project, work health safety and ergonomics are considered to design a safe-to-work environment for collaborative human-robot meat processing. Suggestions from this project will help the Australian red meat-processing sector to understand how to emerge with the-state-of-art automation and robotic technologies and improve work environment safety and processing productivity. The project, however, does not consider the financial aspects of the collaborative robots for specific meat processing applications. While this limitation allows the project to focus on the functionality and feasibility of proposed implementations, the limitation also inherently creates a gap in the project for future work on the financial applicability and sustainability of the design.