Snapshot Report

BBFB – Stage 2

Robotic Removal of Button Bone and Flat Bone after Striploin Chine Bone Removal – Stage 2 First Integrated Cell

Snapshot

Project Code
2021-1202

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Project Description

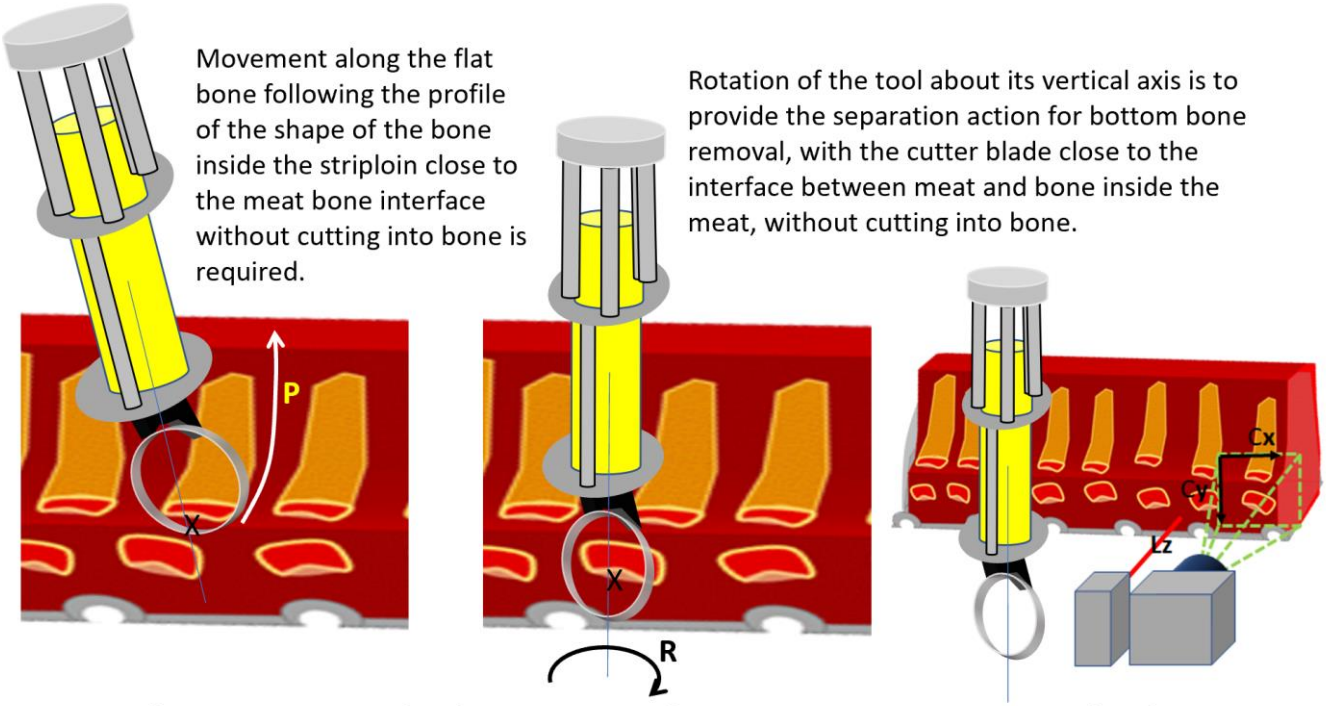
Deboning of flat bone and button bones after chine separation of a striploin primal is generally performed using a combination of a powered rotatory wizard cutter for button bones and a standard boning knife for flat bones. In some instances, use of a knife for button bone separation is observed.

This project is the world first to consider using a robotic method for performing button bone and flat bone separation attempting the integration of a robotic cell that may be used to assess automation possibility of the deboning process for the first time in a commercial setting at some point in the future.

The following has been achieved by the project:

- Definition and implementation of a holding or fixation method of the striploin for the purposes of robotic handling and presentation of the primal.
- Implementation of a sensory solution combining computer vision and laser measurement device (OD sensor).
- Implementation of a mounting solution for attachment of a standard trimming tool to a robot.
- Integration of the tool, fixation-handling arrangement, and sensory devices in a robot cell.
- Robot programming for button bone and flat bone separation supporting practical trials.
- Comparison of performance of robot in achieving deboning as comparable with manual boning.
- Evaluation of the results based on trials adjacent to the processing line.

The basic approach is shown in the following illustration.



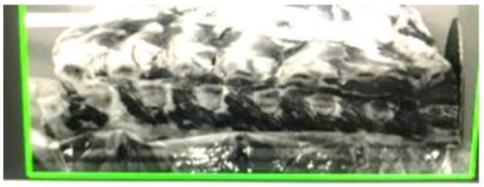
Project Outcome

The project has reached and revealed the following relevant and important in the pathway to the creation of automation for button bone and flat bone deboning:-

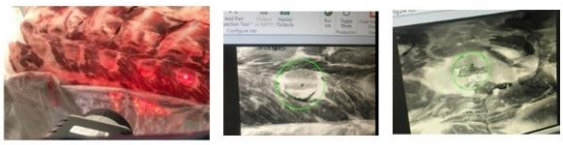
- A world-first implementation of a robotic cell for trials has been reached and tested.
- The Integration provides a low-cost approach, using proven devices including OD sensing and computer vision.
- A standard trimming tool has been used, the design of which has proved to have significant impact on yield. New approaches for developing more effective tools have been highlighted by the project.
- The robotic process as defined by the project provides a new method for using sensory information to guide cutting tools for deboning button bones and flat bones.
- Trials reveal the sensory process and the method, combined with novel robot programming to archive desired trajectory or robot path definitions for tool guidance.
- Trials also revealed that there is further R&D required to define more appropriate separation tools for deboning the flat bones and a deeper examination of the blade shape used for button bone separation. The current tool restricts the possibility to achieve the appropriate yield performance in deboning emphasising the need for further work in cutter tools for deboning flat bones and button bones.

An integrated robot cell has been implemented, which applies computer imaging and laser measurement to sense button bones and flat bone in a beef striploin, the programs that drive a rotary wizard cutter to remove each bone. Aspects of sensory and robot integration have been successfully reached.

New robot set up integrated for testing

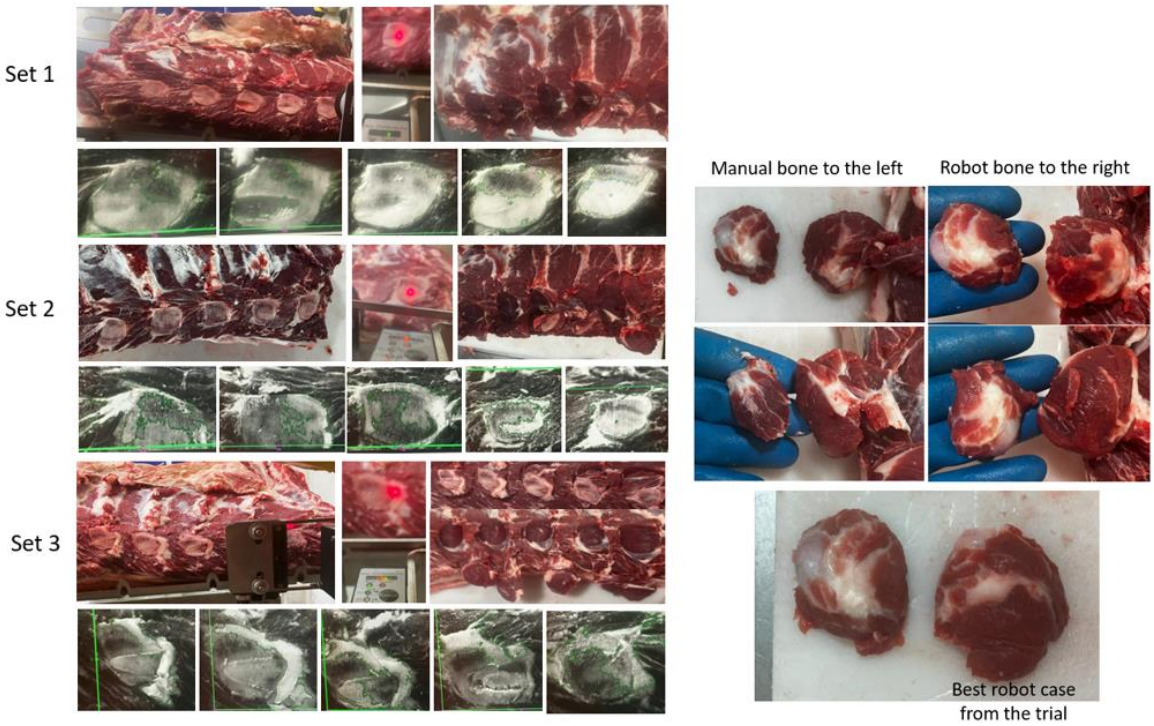


Wide image is processed, and approximate bone positions determined in robot workspace.



Camera is moved and positioned to determine bone face centers with the use of OD distance measurement

First testing of approach on button bones (left) and flat bones (right) with integrated set up



R&D leading to the creation of more appropriate robotic cutting tools for deboning flat bones and button bones is recommended based on the trials performed.

Benefit for Industry

The automation under development will improve efficiency and throughput of the processes of striploin deboning, avoiding operator exposure to cutting tools and repetitive work.