Snapshot Report

Bone Belt Monitoring

Bone Belt Monitoring - Stage 2

Project Code
2021-1260

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Project Description

This project presents a conceptual design to detect the proportions of lean meat left on the bones after the deboning process attained by applying various computer vision and machine learning concepts. The conceptual system is developed based on 200+ images collected on two bone parts of the beef butt. Detection models are developed based on Mask Region-Based Convolutional Neural Networks. The system is constructed by a two-layer detection model. The first layer detects and extracts the beef part in the frame, and the second layer detects the lean meat left on the detected parts. The system provides a KPI based on the percentage of lean meat left on the beef part. The results show that the system can detect the beef parts with over 95% confidence, and the majority of lean meat on the beef parts can be detected.

Project Content

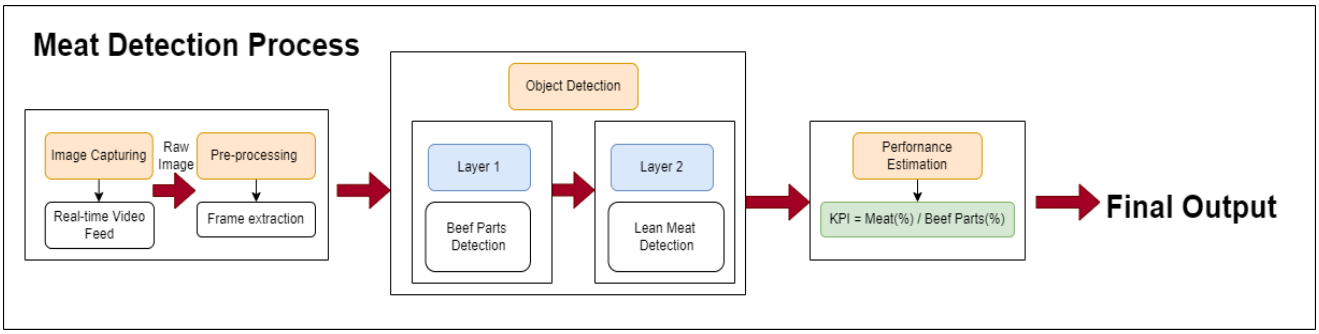

Figure 1 System Structure

Figure shows an overview of the conceptual system structure of lean meat detection system. The conceptual system is constructed by an image capturing and pre-processing module, an object detection model and a performance estimation module. The image capturing and pre-processing module gets video feeds from the camera, and frames are extracted and optimised in real-time. The processed image frames are then passed into the object detection module to detect beef parts and lean meat on these parts. This is a two-layer detection model, and it is developed based on Mask Region-Based Convolutional Neural Networks. The object detection model is developed through several steps, including dataset collection and labelling, model selection, training environment set up, and training process. Then, the detected outputs are pushed to the performance estimation module that estimates the performance of the deboning process based on the percentage of lean meat left on the beef parts.

Project Outcome

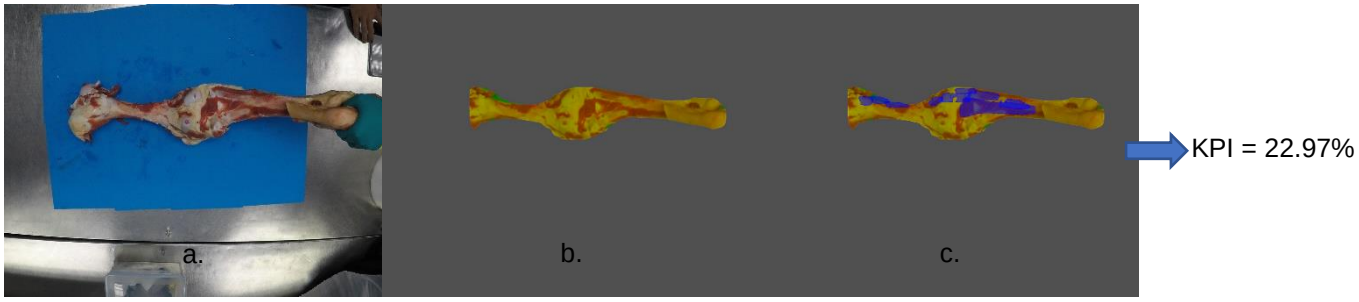

Figure 2 Example Detection

As shown in Figure 2, the system can first extract the beef part (b.) from a raw image (a.) and detect the lean meat (c.) on the part. The system then estimates KPI of the amount of lean meat on the surface of the beef parts after the deboning process.

Benefit for Industry

This project provides an example of using computer vision technologies to monitor beef processing performance. For future developments, AMPC can coordinate developments of different detection models for various functions. The detection system can be loaded to a small and low-cost device and deployed to the processing sites of AMPC members without any major upgrades or modifications. For example, AMPC can lead the development of a real-time monitoring device that can be installed on the bone belt. It will assess the quality of deboning processes and grade the performance of different deboning processes.