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Image Processing is Used to Recognise the Visceral Contours of Poultry Carcasses

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Introduction

In the poultry slaughter industry, automatic evisceration is a critical application technology. This study describes a machine-vision-based method for locating the viscera of poultry carcasses. The image recognition system uses machine vision to segment colour images in the HSV (hue, saturation, value) and LAB (lightness-A-B) colour spaces. The images of viscera from poultry carcasses are segmented using an active contour segmentation algorithm, a threshold segmentation method, and image operations. Following that, the visceral contour is extracted and its position is determined for common supermarket poultry such as Three-Yellow Chicken and Cherry Valley Duck [1].

A custom poultry carcass image acquisition chamber was built and mounted above a conveyor similar to those used in the on-line DELTA robot evisceration equipment. Inside the image acquisition chamber, the camera and light source were placed, and the camera captured RGB (red, green, blue) images of poultry on the conveyor. An industrial camera with GigE Vision, standard Genie series camera CRGEN3M640x (camera resolution 640 480, pixel dimension 7.4 m), image acquisition card (OK-C30A, Beijing Joinhope Image Technology Ltd.), computer, image acquisition chamber, LED light sources, conveyor, and other items comprise the acquisition system [2].

Because the image is corrupted during production, transmission, and recording, the surface of poultry carcasses collected by the industrial camera may contain noise that reduces image quality. As a result, a median filtering algorithm is used to improve the quality of each image before employing gray-level threshold segmentation to recognise the poultry carcass. The grey value of each pixel in the image is compared to the threshold value in this process, and the binary image is obtained [3].

The LAB (Lightness-A-B) model is applied to the original image, and the B component is extracted. Using the graylevel threshold method, the optimal threshold value is chosen based on the distribution of gray-level values in the B component image to obtain the image of the visceral fatty area [4].

The poultry carcass image is made up of a coloured carcass area and a dark background area with homogeneous and consistent pixel values. The carcass area is in the centre of the image, with the background area surrounding it. In the LAB image, there are more significant differences between the target and background brightness than in the RGB image. In the LAB colour image, the background is darker and the target area is lighter. As a result, the original RGB image is converted to LAB colour in this study [5].

Description

The viscera of poultry is divided into two distinct areas with distinct colours. The red upper part contains the heart and liver, while the yellow lower part contains the visceral fatty area and primarily the digestive tract. Because their colours differ, they should be treated separately.The image of the poultry's entire viscera is obtained by combining the images and morphological operators (dilation and erosion) from the heart-liver area and the fatty area image.

Conclusion

Cherry Valley Duck has a larger body size than Three-Yellow Chicken and is more affected by adjacent regions, implying that its recognition rate is lower. In fact, all of these potential factors could cause image recognition errors, resulting in incorrect internal organ recognition. As a result, in future studies, we will attempt to develop a new method for improving the recognition rate. In this study, we proposed a method for determining the position of poultry visceral organs using the accurate colour characteristics of poultry carcass images. The active contour model and iterative threshold segmentation are used to efficiently obtain the target contour, and the internal organs are accurately located using the multi-finger robot hand.

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