Exposé – Cow (Animal) Identification

Automatic image-based identification of individual cows (or animals in general) is a relatively new topic. Image material has been used to identify aquatic animals since the 70s ([9]), but the process was carried out manually by comparing pictures. In recent year, research was directed towards automatic solutions that use image classification techniques to identify and match certain biometric features of the animal.

In cow identification mainly 4 approaches have been taken. Namely, these are iris pattern matching, retinal vascular pattern (RVP) matching, body pattern matching and muzzle print matching.

Across the found papers it is agreed on that iris patterns or RVPs can be used to identify individual cows but in practise are not accurate enough to produce good results. This is mostly due to real-world constraints that impair the quality of the images being taken. [8] points out, that a combination of iris pattern matching, RVP matching and muzzle print matching could be used to improve accuracy.

Muzzle prints, just like a human fingerprint, show unique patterns with grooves, valleys, and beaded structures [6]. [4], [5] and [8] explore different kinds of detection, extraction and matching methods based on image classification and machine learning techniques.

Body pattern matching as described in [1], [3] and [7] produces similar results to muzzle print matching. Though, [1] is going into detail about the limitation of their approach. Similar body patterns between cows, larger black areas that produce highlights and varying lighting situations can impair accuracy.

All the above-mentioned methods require a great deal of specialized software and fine-tuned algorithms to give accurate matching results. But with out of the box tools such as scikit learn or TensorFlow, thing like object detection and image classification became more widely available and accessible for people new to the field. TensorFlow even allows for real-time object detection based on pre-trained models on smartphones. Video tutorials such as sentdex’s TensorFlow Object Detection API series show that retraining an existing model to fit other problems allows for flexibility.

The recent progress in high-level machine learning tools suggests that a problem such as cow identification could be solved by ready-made solution given some amount of simplification. As an example, body pattern matching resembles the traditional image classification problem of identifying handwritten numbers. If you were to map the cow’s body pattern onto a 2D pixel array and use it as training data, the program may be able to identify individual cows.

The proposed research question is to assess the viability of ready-made frameworks to identify individual cows. Furthermore, what simplifications and adjustments to the problem and the image data need to be made for the framework to identify the cows.

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