Approach Document

Suraj

DVARA
E-Dairy

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Contents

DVARA E-Dairy

1. Terminologies and Concepts.

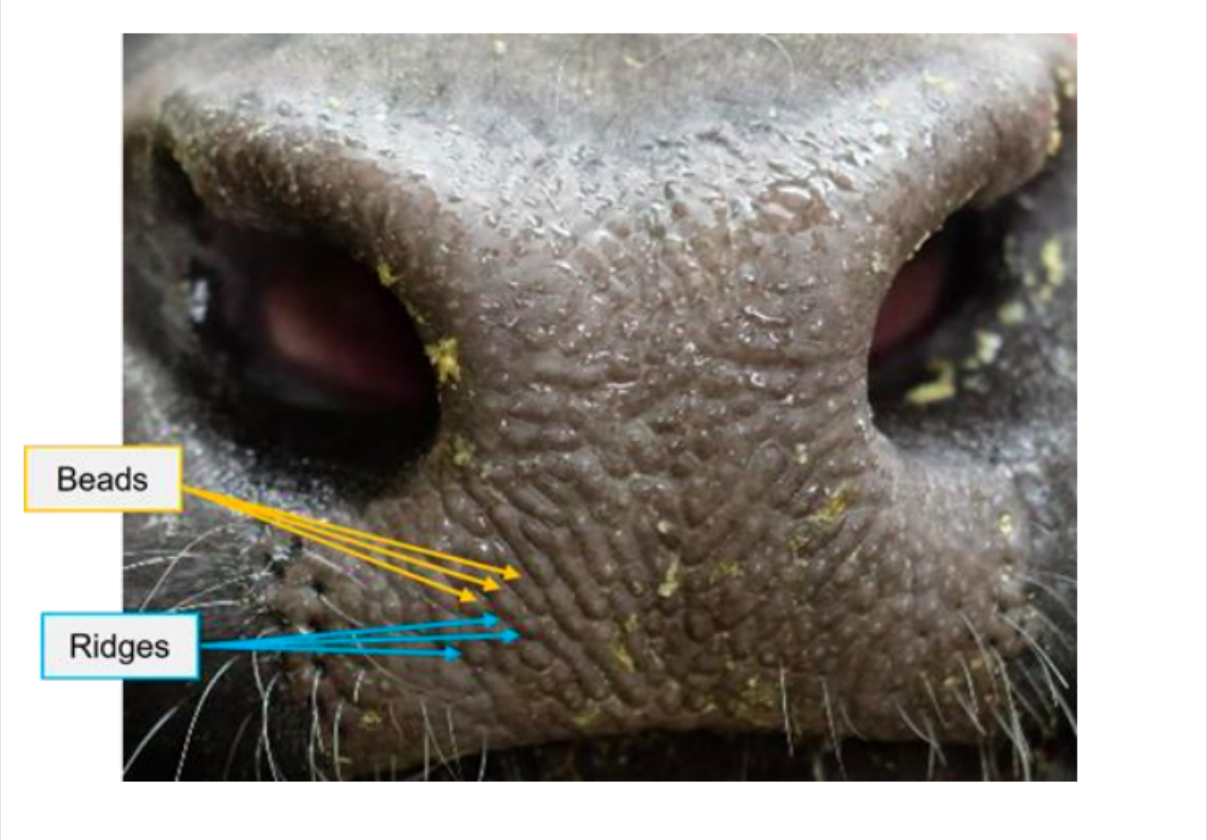

Figure 1: Beads and Ridges of a Cow.

The little round, oval, or irregular-shaped protuberances on the nose area of the cow or buffalo are defined as beads, while the elongated grooves and valleys arranged in a particular manner are defined as ridges. Muzzle pattern is a cattle dermatoglyphic trait equivalent to human fingerprints. These uneven and distinct features make the muzzle identification for individual cattle possible.

2. Approaches.

A. Conventional digital image processing algorithms like SIFT, Box-counting fractional dimensional models. These methods matches features including colour, texture, shape, and edge among different muzzle images and achieved high identification accuracy within small image sets and controlled conditions

   The major limitation of these approaches are that they are highly sensitive to the illumination and background and similar appearance of the same animal's muzzle at different phases, low resolution and occlusions.

B. Machine learning classification models like SVM, KNNs and decision trees are mostly embedded with image processing based feature extractors like Weber local descriptor to further boost the performance of muzzle identification.

   The major limitation of these approaches are that these often require sophisticated hand-crafted features which are difficult to develop and optimise.

C. Open Source Approaches.

3. Results.

Refer the Google Drive Link

4. Future work.

A. Increasing the number of samples per cattle in the current dataset along with collection of a separate dataset within varying illumination and background.

B. Conduct a more extensive literature survey and shortlist the algorithms that yield more than 95% accuracy in the wild on unseen images. Alternatively, Explore the potential of tweaking the architecture of various open source implementations for achieving the same.

C. Fit the dataset on algorithms(Image processing, Machine learning and Deep learning) on the ones shortlisted in B and expose microservices API which can be integrated into web platforms (Platform as a service) or mobile applications.

D. Optimise algorithms as per need over various sessions in the QA/QC stage.

5. Open source Resources.

Hybrid-image-matching
(MIT Licensed, Evaluated)

Android and Python Backend Source code
(No Licence, Not Evaluated)

6. References(Publications and Books)

A. Individual Beef Cattle Identification Using Muzzle Images and Deep Learning Techniques - Guoming Li 1 , Galen E. Erickson 2 and Yijie Xiong 2,3,*

B. Biometric for Cattle Identification using Muzzle Patterns.

C. Individual Cattle Identification Using a Deep Learning Based Framework

D. Animal Biometrics: Techniques and Applications.

E. Cattle Identification Based on Muzzle Images Using Gabor Features and SVM Classifier

F. A Robust Cattle Identification Scheme Using Muzzle Print Images.

G. Automated Muzzle Detection and Biometric Identification via Few-Shot Deep Transfer Learning of Mixed Breed Cattle

H. Muzzle-based Cattle Identification using Speed up Robust Feature Approach

I. Deepmatching: Hierarchical deformable dense matching