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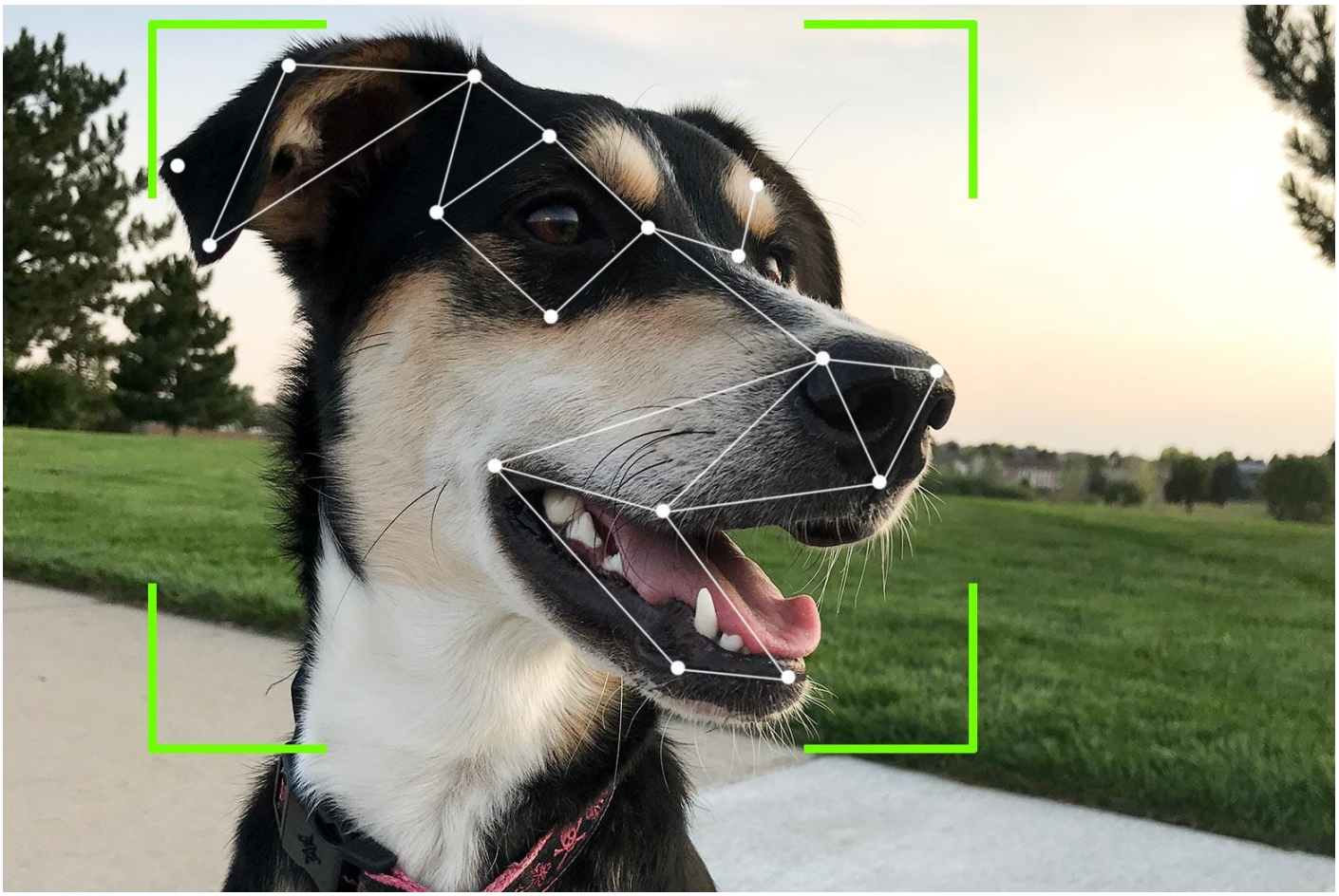
Popular Article

Biometric Identification of Animals

A short communication

P. N. Chaudhari, A. R. Ahlawat and M. D. Odedra



Animal biometrics is an identifying method that recognises animals through the use of pattern recognition software. It entails gathering biometric data from each animal, including voice and facial photos, and sifting out distinctive characteristics. Following a comparison of the extracted features to a database of features that have already been saved, a decision is made. Animal biometrics, which uses distinctive visual characteristics of each animal, such as the face or coat patterns of zebras and penguins or the muzzle point pattern of cattle, is utilised in a variety of domains, including the study of animal behaviour, ecology, population, and genetics. These distinctive characteristics, which resemble a person's fingerprints, can be used to identify particular animals.

Types of Biometrics based identification approaches

Behavioural biometrics: These biometrics are based on information obtained from a physical action, such as the way a person speaks, signs their name, or types on a keyboard.

Physiological biometrics: These biometrics are based on measurements taken directly from a portion of the body, such as fingerprints, iris, retina, or face patterns, as well as patterns on the body coats of some animals, such zebras or cows.

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Enrollment: A photograph of the animal's face is taken, and it is saved in a database as a guide for upcoming identification.
Key face traits including the distance between the eyes, the nose's shape, and the jawline's contour are extracted by the algorithm from the facial image. The extracted features are used to generate a special template, which is then saved in the database. When an animal's face is provided to the system for identification, its features are retrieved and put in comparison with the template(s) that have been saved in thedatabase.
Decision: The system then decides whether to approve or reject the identification attempt depending on how similar the supplied face is to the templates that are alreadystored.

These are the main stages involved in facial recognition for animal biometrics. The image capture stage involves capturing an animal's face image using a sensor like a camera, followed by image processing techniques like resizing, augmentation, and enhancement. Feature extraction involves selecting facial features based on pixel intensity values, and using techniques like Principal Component Analysis and Local Discriminant Analysis to extract unique data from the sample and create a template. The comparison stage involves comparing the template with a new test sample, and the match/non-match stage involves the system deciding whether the features extracted from the new sample are a match or non-match, and whether two faces belong to the same animal or not.

The recognition rates of animal faces for biometric identification still depend on a number of variables, including lighting, position, and image quality, despite the fact that animal facial expressions are typically more stable than human ones. Additionally, the accuracy of facial recognition may vary depending on the species of animal, and recognition rates may also be influenced by the technology and biometric identification algorithms utilised. Therefore, despite the potential benefits of animal facial recognition, it is still a work in progress, and the effectiveness will rely on the application and environment.

Challenges of Face Recognition in Animals

- To overcome the challenges of pose and illumination, several techniques have been proposed in the literature. One of the popular techniques is to use 3D models of animal faces, which can help in handling variations in pose and illumination. Another technique is to use multiple views of the animal face, which can help in handling pose variations. Additionally, image enhancement techniques, such as histogram equalization and noise reduction, can be used to improve the quality of animal face images captured under poor illumination conditions.
- Moreover, deep learning-based methods have shown great success in handling variations in animal face images. Convolutional Neural Networks (CNNs) can learn robust features from the images and can be trained on large datasets to improve the recognition accuracy. Transfer learning, which involves using pre-trained CNNs on large datasets such as ImageNet, can also be used to improve the recognition performance on smaller animal face datasets.
- In summary, although there are challenges in recognizing animal faces due to variations in pose, illumination, and image quality, several techniques such as 3D modeling, multiple views, image enhancement, and deep learning-based methods can be used to overcome these challenges and improve the recognition performance.

Animals, on the other hand, are notoriously uncooperative users of biometrics, thus attention should be paid to creating and implementing a pose and expression invariant algorithm. Because of the various lighting circumstances, external factors, and weather conditions, illumination variance is a significant difficulty. New illumination invariant techniques must be created as a result. It will be crucial to validate the correctness of the method using a bigger dataset that only contains images with significant variance, such as those gathered across a number of longer time periods. The adoption of a clustering technique might make it possible to conduct population surveys more quickly or make it easier to set up new research locations.

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