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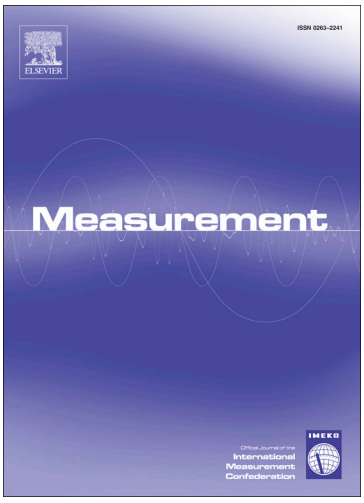

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Deep Learning Framework for Recognition of Cattle using Muzzle Point Image Pattern

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Abstract: Animal biometrics is a frontier area of computer vision, pattern recognition and cognitive science to plays the vital role for the registration, unique identification, and verification of livestock (cattle). The existing handcrafted texture feature extraction and appearance based feature representation techniques are unable to perform the animal recognition in the unconstrained environment. Recently deep learning approaches have achieved more attention for recognition of species or individual animal using visual features. In this research, we propose the deep learning based approach for identification of individual cattle based on their primary muzzle point (nose pattern) image pattern characteristics to addressing the problem of missed or swapped animals and false insurance claims. The major contributions of the work as follows: (1) preparation of muzzle point image database, which are not publically available, (2) extraction of the salient set of texture features and representation of muzzle point image of cattle using the deep learning based convolution neural network, deep belief neural network proposed approaches. The stacked denoising auto-encoder technique is applied to encode the extracted feature of muzzle point images and (3) experimental results and analysis of proposed approach. Extensive experimental results illustrate that the proposed deep learning approach outperforms state-of-the-art methods for recognition of cattle on muzzle point image database. The efficacy of the proposed deep learning approach is computed under different identification settings. With multiple test galleries, rank-1 identification accuracy of 98.99% is achieved.

Keywords: Cattle recognition, Muzzle point image, Deep learning, Convolution Neural Network, DBN, SDAE, Verification, Computer vision, LBP, SURF, PCA, VLAD, LDA

1. Introduction

Animal biometrics is an emerging research field of computer vision, wildlife science, and pattern recognition [1]. Animal biometrics-based recognition system develops quantified and efficient recognition methodologies for representing extracted visual features, detecting discriminatory features for identifying the phenotypic appearance of species or analysis of individual animal's behaviours based on its morphological image pattern and animal biometric characteristics. The phenotypic presentations consist of the composite of an organism's observable morphological features [1] [2].

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