MINISTRY OF JIHAD-E-AGRICULTURE

Agricultural Research, Education and Extension Organization

Agriculture and Natural Resources Research
And education Center of Qom

Design and production of intelligent system for broiler weight and growth rate estimation

Research worker: Mahdi Khojastehkey

Abstract

The purpose of this study was to develop an intelligent system for estimating the weight and growth rate of broilers using machine vision technology. 900 broiler chicks were prepared from Ross, Cobb and Arbor acres strains, and during two periods the chicks of each strain were kept for 42 days under standard conditions and nutritional requirements. Chicks were weighed daily for each breeding period by weighing 50 to 60 chicks randomly using digital scales. Simultaneously, some top view images were taken from chickens using a Xenon camera (2MP 1080IP lens). Using MATLAB software, the images of the chickens were initially pre-processed and the some necessary conversions were made on the pictures. Then the required features of the images were extracted by designing the appropriate algorithm. Extracted features from the images were introduced as inputs to the artificial neural network and multilayer perceptron neural network was trained to predict the weight of chickens with error propagation algorithm. The neural network model with 16 neurons in the input layer, 14 neurons in the hidden layer and one neuron in the output layer had the best performance (98.4% accuracy) to predict weight of Ross chickens. In the practical test, the weight of the Ross chickens was estimated with accuracy of 98.5% and with an average error of 7.9 gr by ANN. For estimating Cob strain chick weight, the neural network model with 16 neurons in the input layer, 10 neurons in the hidden layer and one neuron in the output layer had the best performance (with accuracy of 99.54%)in estimating the weight of the Cob broilers. In the practical test, the weight of the Cob chickens was estimated with accuracy of 99.52% and with an average error of 0.37 gr by ANN. The neural network model with 16 neurons in the input layer, 10 neurons in the hidden layer and one neuron in the output layer had the best performance (99.67% accuracy) to predict weight of Arbor acres chickens. In the practical test, the weight of the chickens was estimated with accuracy of 99.7% and with an average error of 2 gr by ANN. In the analysis of cumulative data of all strains, a neural network model with 16 neurons in the input layer, 7 neurons in the hidden layer and one neuron in the output layer had the best performance(accuracy of 99.38%) in estimating the weight of all broiler strains including Cob, Ross and Arbor acres. In the practical test, the weight of the chickens was estimated with accuracy of 99.5% and with an average error of 7.86 gr by ANN. The results of

this study showed that the accuracy difference between artificial neural network models for estimating the weight of Ross, Cob and Arbor acres was less than 1%, and a comprehensive model based on the information of all strains can accurately estimate the weight of broilers of each strain.

Key words: Artificial Intelligence, Growth rate, Broiler chick