Peng Yingqi

Thesis title Japanese Black Cattle Behavior Pattern Classification Based on Neural Networks Using Inertial Sensors and Magnetic Direction Sensor
(慣性センサと磁気方位センサのデータを用いたニューラルネットワークに基づく黒毛和種牛の行動パターンの分類)

Abstract of Thesis

In this study, I aimed to develop a recurrent neural network (RNN) with long short-time memory (LSTM) and convolution neural network (CNN) model to monitor and classify cattle behavior patterns using inertial sensors and magnetic sensor. Those models were trained using data obtained from sensor attached to the neck of Japanese black cattle. LSTM-RNN and CNN models were trained to measure and classify cattle's behavior patterns across different length of slicing data (3.2 s, 6.4 s, 12.8 s). I classified behavior patterns including; feeding, lying, ruminating (lying), ruminating (standing), licking salt, moving, social licking and head butt. The results revealed LSTM-RNN models classification performance was superior to CNN models. The LSTM-RNN models had best performance when using length 3.2 s (accuracy 88.7%). Using established LSTM-RNN model, seven calving associated behavior patterns were classified with a highest overall accuracy of 79.7%. Standing and lying patterns in calving day, which associate very close with calving prediction, were classified with accuracy of 70.6% and 74.7%. Moreover, individual feeding behavior patterns of six fattening steers (10 month and 23 month old) were classified. The overall accuracy of feeding patterns of younger cattle (97.0%) was superior to that of the older ones (88.3%). In conclusion, LSTM-RNN proved as a reasonable method in cattle behavior pattern classification. In the future, more devices will be fitted into the cattle behaviors monitoring system to improve the classification performance. The cattle behavior classification could be connected tightly with the indicators of cattle's welfare, growth, reproduction and disease prediction.