Automated methods for recording body condition score and animal location

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Summary

- Automated body condition scoring is accurate and objective.
- Wireless sensor networks have the potential to provide accurate localization of animals at pasture.

Introduction

As dairy farms in Ireland continue to expand, the availability of labour and the time a farmer has to spend on each cow decreases. Digital technologies can provide a solution to these problems. Two digital technologies are being tested in Teagasc: i) automatic measurement of cow body condition score; and ii) precise localization of animals while at pasture.

Body condition score (BCS) is a measure of how much fat an animal has stored and is a very useful tool for management. Fertility is a key aspect of cow performance affected by BCS, and BCS loss is an indicator of negative energy balance and susceptibility to metabolic disorders. Teagasc are currently testing a device that aims to automatically record BCS using multiple cameras.

The second technology aims to track animal movements while at pasture. This information could improve our understanding of grazing behaviour, and aid farmers to locate animals in need of attention more efficiently. This is achieved using a wireless sensor network of masts placed throughout the grazing platform communicating with ear tags worn by the animals.

Automated body condition scoring

Currently, the standard method for body condition scoring involves a trained observer assessing an animal on a scale from 1 to 5 with 1 being extremely thin and 5 being excessively fat. Scores are based off the fat cover around the backbone, pins, tail head and ribs. The problem with this method is that often two scorers can give the same animal a different score; additionally body condition scoring a large number of animals can be labour intensive. The automated BCS system uses cameras to create a 3D image of the animals back as the animal walks past the system (Figure 1). Each animal can then be identified by their electronic identification (EID) tag. An experiment conducted on the research farm in Kilworth aimed to investigate the accuracy of the automated BCS system compared with the current standard (manual BCS). Two independent, highly experienced scorers recorded BCS measurements on approximately 500 cows, and these were directly compared to the output of the automated BCS device. The results indicated that the BCS device was highly accurate, and that the agreement between two experienced operators was equivalent to the agreement between a scorer and the BCS device. This indicates that the automated BCS device could be used to accurately and objectively measure BCS with little effort.

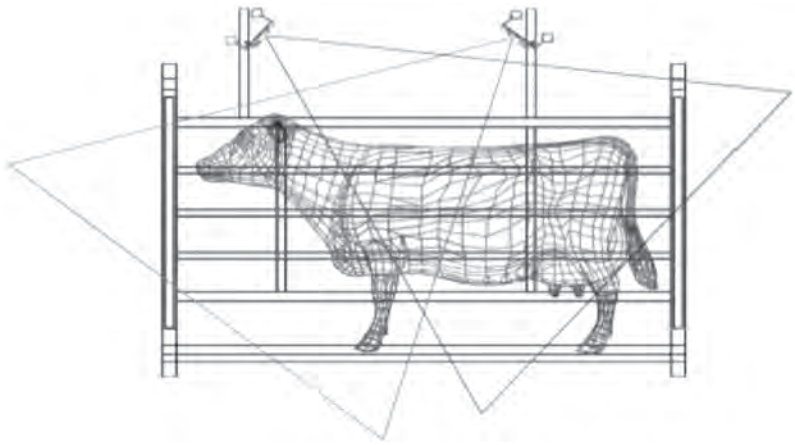

Figure 1. *Camera positioning of the automated BCS system*

Localization of cows at pasture

There is currently a wireless sensor network in place on the automated milking system on the Kilworth research farm. The system consists of a series of masts spaced evenly across the grazing platform. An ear tag is worn by each cow that can communicate with each mast in order to identify the location of each animal. Every mast has a solar panel and a battery to power all the necessary electronics on the masts. One other sensor technology that currently exists for locating animals at pasture is GPS collars. To calculate the position of an animal, GPS relies on satellites orbiting the earth, which the farmer does not have control over and therefore inaccuracies can occur. GPS tracking can be quite accurate when an animal is moving, but when stationary, the difference between the true location and the GPS location can increase up to 5.5 m, which is known as drift.

An experiment was undertaken in Teagasc to investigate the accuracy of the wireless sensor network and whether drift occurs. Tags were evenly spaced across the entire grazing platform and each tag was left in place for 10 minutes. These locations were compared to a calibrated GPS device that recorded the true locations. The results indicated that the wireless sensor network could identify the locations of the tags to within 2.75 m 95% of the time. These results show that the wireless sensor network could be a useful localization tool for commercial and research purposes.

Conclusions

Digital technologies have the possibility to increase labour efficiency as dairy farms in Ireland expand, and improve decision making processes. Two of the technologies that have potential applications are automated body condition scoring and automated localization of cows at pasture.

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