Silent Herdsman;
Automatic Classification of Eating and Ruminating in Cattle using a Collar Mounted Accelerometer

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Outline

• Silent Herdsman
• Collar
• Illness
• Algorithm Development Methodology
• Classification
• Performance
• Conclusions
A neck mounted collar technology platform for animals continuously monitoring individual animal’s activity and automatically detecting behaviour patterns
Silent Herdsman Platform

Software Management Application

Base Station

Event

Collar
Sensor Platform
Model Outputs
Wireless Transmission

Remote Connectivity

Data Management
Smart Collar

Location for collar sensor

Weight
Best Indicator of Illness?

- Activity
  - sick cows tend to be less active
- Eating
  - sick cows tend to eat less
- Rumination
  - sick cows tend to ruminate less
  - is this because they eat less?
Can Eating Predict Illness?

• Is it possible to detect eating through changes in acceleration in a collar?
• Is it possible to relate those changes to differences in food intake?
• How well do these correlate?
• How well do they tie in with illness?
Feed Intake versus Time
Truthing Data

- **Hoko Feeder**
  - time stamps only give indication that cows head is in the feeder
- Video analysis is good but open to interpretation and very labour intensive
- Need another sensor that give alignment with collar.....
‘Rumiwatch’ Halter
Raw 3-axis Accelerometer Output
Feature Extraction

• Features relate to energy expended by cow in carrying out different functions
• Signatures are identifiable to the eye
• Problematic to quantify because they are non-stationary
  • global head shifts massively distort statistics
Classification Results

![Classification Results Diagram]

- Ruminating
- Other
- Eating
Performance
Conclusions

• Multiple behavioural states of individual animals can be derived from the raw data captured by a neck mounted 3-axis accelerometer
  • Heat detection
  • Eating times
  • Rumination times
  • ........

• A single sensor collar implementation can be used to provide multiple strands of valuable information on individual animal’s conditions that supports the farmer in optimising the efficiencies of his business