VIRTUAL FENCING SYSTEM FOR REAL-TIME MONITORING AND CONTROLLING ANIMAL POSITION AND BEHAVIOUR

Natasa Kleanthous Orphanidou
Director of Studies: Dr. Abir Hussain

JMU
Liverpool John Moores University

INTRODUCTION

A Virtual Fencing system (VF) is a computerized method for creating spatial boundaries of any geometric size and shape without the use of any physical fences or barriers.

Benefits:
• Automated and efficient agriculture
• Traditional fences are very costly to maintain and move
• Transform manual labor to cognitive labor
• Prevent overgrazing and soil erosion
• More efficient land utilization

Drawbacks:
• Not 100% stock proof
• Cannot replace traditional fences when health and safety of people and animals are at risk.

AIMS

• Implementation of a real time virtual fencing system

• monitoring and controlling the position of sheep using location data and acoustic cues

• Prediction of animal behaviour based on accelerometer and gyroscope signals.

RESEARCH QUESTIONS

• Can we create a virtual fence system solely based on acoustics for positional direction of the sheep?

• What is the optimal ML method to achieve high identification performance in predicting animal behaviour?

METHODOLOGY

YEAR 1

• Identification of current technologies with respect to virtual fencing systems.

• Data analysis on secondary dataset

• Assess effectiveness of sound cues through acquisition of physiological signal patterns from sheep, attained throughout the trial of several sound cues

• Accelerometer and gyroscope data acquisition from devices attached on the collars of the animals

• Use of Artificial Intelligence (AI) approach for the classification and prediction of animal behaviour using the acquired signals.

YEAR 2 & 3

System testing and further research will be conducted on larger flocks to identify how the system can be improved:
• positional accuracy
• prediction algorithm performance
• time required of the animals to respond to the sound cues
• time complexity of the system

Wireless Sensor Network software implementation with suitable sensor nodes which will be identified through investigation.

Design and implementation of the prototype for the proposed system.

IMPLICATIONS

A real time multifunctional virtual fence system will make available information of where the animals are and what they are doing, where they mostly graze, and what their nutritional habits are during the course of a day. Therefore, decisions about animal health, animal position monitoring, distribution control, and efficient land utilization can help prevent soil erosion dangers, water pollution and spread of animal diseases.