Animal Aware - Smart Trail Camera

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Overview of Project & Need

The Smart Trail Cam (STC) is an intelligent, AI-powered trail camera designed for remote locations without cellular service. It classifies animals in real time, sends personalized alerts via low-power long-range radio, and eliminates unwanted image spam. Traditional trail cameras often rely on cellular networks and flood users with irrelevant images. The STC addresses these issues by offering accurate animal detection and alerting in off-grid environments, making it ideal for hunting, camping, and wildlife monitoring.

Marketing Reqs.

M1. The STC System shall use smart trail cameras to detect squirrels, dog, birds, and cats via the Edge Node's Camera.
M11. The STC System must work in remote areas without access to the internet.
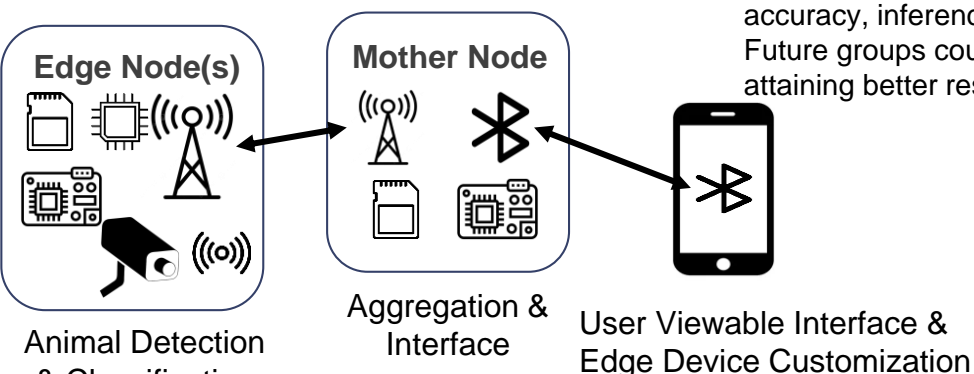
Background

WiseEye was able to develop a platform that allowed for more flexible camera traps for wildlife researchers [1]
A study looked into the integration of artificial intelligence into trail cameras to identify animal species. [2]

Proposed Solution

The STC uses an edge node to classify animals, send data via LoRa to a mother node, and alert a mobile app via Bluetooth.

Edge Node(s)

Animal Detection & Classification

Mother Node

Aggregation & Interface

User Viewable Interface & Edge Device Customization

References

[1]. Nazir, S., Newey, S., Irvine, R. J., Verdicchio, F., Davidson, P., Fairhurst, G., & Van Der Wal, R. (2017). WiSeEYe: Next generation expandable and programmable camera trap platform for wildlife research. PLoS ONE, 12(1), e0169758. [1]

[2]. Green, S. E., Rees, J. P., Stephens, P. A., Hill, R. A., & Giordano, A. J. (2020). Innovations in camera trapping technology and approaches: the integration of citizen science and artificial intelligence. Animals, 10(1), 132. [2]

Results

The STC achieves 85% mean average precision of classifying dogs, birds, squirrels, and cats against training data. The system can send information between each node and to the application. Classification, confidence score, and personalized alerts have been configured. Information can be sent using LoRa and bluetooth without the need of cellular service which eliminates the need for a cellular plan. Cyberattacks and cyberdefenses have been tested against the STC system.

Conclusions

The STC aims to provide trail camera functionality in remote locations and eliminate the need for a cellular plan through radio and bluetooth communication. The STC achieves high accuracy and performance when classifying dogs, birds, squirrels, and cats against testing data and can transmit images to the mobile application without the need for cellular service or WiFi. The mobile application has the functionality to select priority of animals for alerts. The most important results related to this topic are real world accuracy, inference speed, and success in sending data. Future groups could look for more efficient solutions in attaining better results by changing hardware for inference.

Acknowledgements