# Decentralized Multi-Drone Coordination for Wildlife Video Acquisition

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## Motivation

### *Need for High-Quality Wildlife Data*

Studying wildlife behavior through video is crucial for conservation, particularly using **aerial footage** from **drones**. Current methods rely on **manual drone** operations, which are difficult to **scale** and inefficient for covering **large areas** or **multiple viewpoints**.

## Challenges

### *Unpredictable Animal Movements*

Pre-programmed drone missions **fail** as animals move **unpredictably**, making real-time adjustments necessary.

### *Coordination and Scaling*

Managing multiple drones manually is **infeasible**, especially in **large-scale** missions.

### *Impact on Wildlife*

Drones can disturb animals, affecting their natural behavior and the quality of the data.

### *Sparse Communication Infrastructure*

In remote wildlife reserves, communication infrastructure is **limited**, complicating centralized control of drones.

## Idea

### *Autonomous Multi-Drone Systems*

Drones autonomously coordinate using a **aggregate-computing** based k-coverage algorithm.

### *Hierarchical Clustering*

Track **herds centroid** and optimize drone **positioning** for better *coverage* and *minimal* disturbance.

### *Performance Metrics*

evaluating **video quality**, **animal disturbance**, and drone **efficiency**, improving over existing methods.

## Results

### *Simulation Setup*

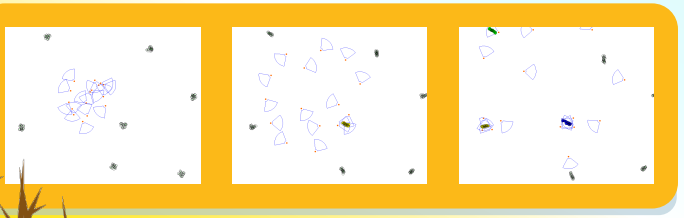
140 zebras in a 4x4 km area were tracked by drones (1 km range, 10 m/s, 100m FoV) using hierarchical clustering to optimize coverage in 30-minute simulations.

### *Metrics*

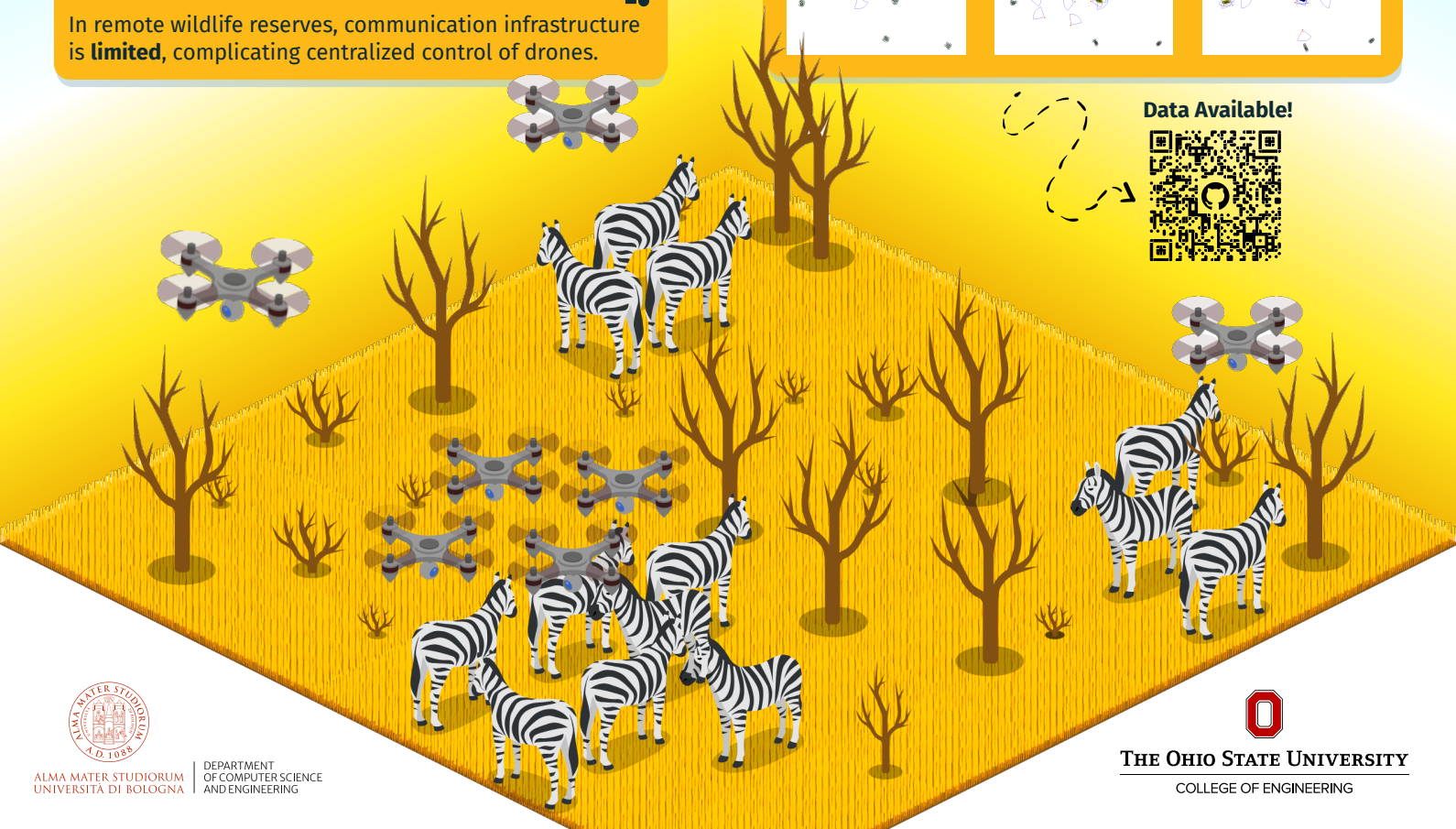
Evaluated by **FoV centrality** (animal centeredness), **body coverage** (side views prioritized), and **noise pollution** (minimizing disturbance).

### *Discussion*

Improved **coverage** and **video quality**, with slightly **higher** but **acceptable** noise. Scales effectively with larger herds and more drones.



Data Available!



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