CNG 476 System Simulation

Spring 2024-2025

Assignment Type: Proposal Report

Project Title: Drone Air Show Controller System with LoRa

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1. Project Explanation

This project focuses on simulating the Drone Air Show Controller System with LoRa communication and Poisson distribution for random event modeling. A central controller controls the drones that performs synchronized aerial maneuvers during a display such as shape formation (triangles, circles). The devices will use long-range LoRa technology to wirelessly communicate with the controller, which makes it suitable for outdoor use.

The Poisson distribution is utilized to imitate random events, such as any shifts in a drone's behavior during the air show which includes a possible breakdown or a chance in orientation. This will enable the system to simulate realistic scenarios where drones fail or reorient themselves to emulate real world performance of a drone. The analysis plans to evaluate the operational efficiency of the network in terms of the packet delivery ratio, and time delay for different scenarios.

The system components include:

• **Central Controller**: A controller responsible for sending commands and receiving telemetry data from the drones.

• **Drones**: Equipped with LoRa modules for communication and sensors to track movement and orientation.

• **LoRa Communication**: Long-range wireless protocol to manage communication between drones and the controller.

• **Poisson Distribution**: A statistical model used to simulate random events like drone failures and reorientations.
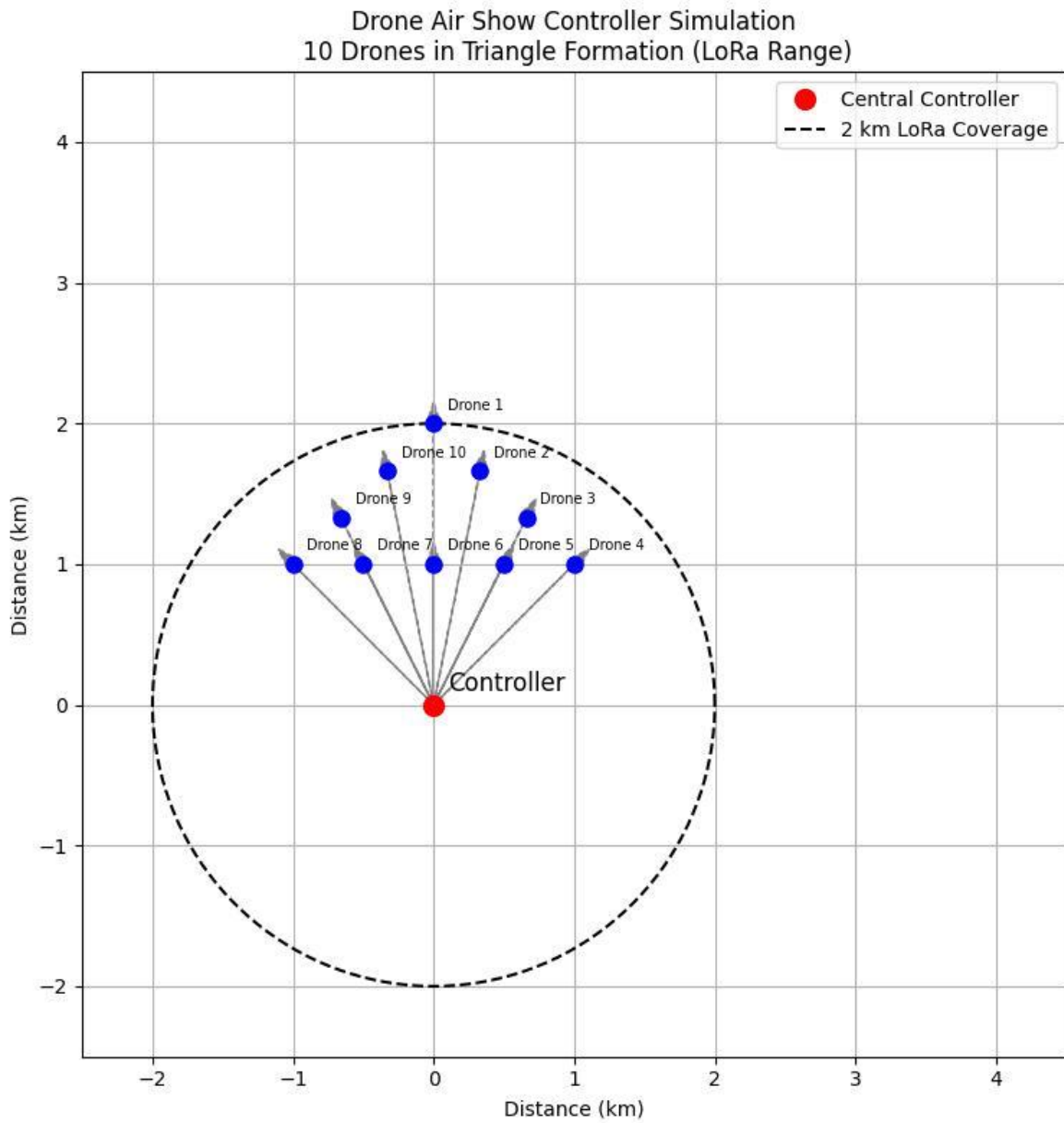
2. Diagrams & Visuals

Figure 1.Drone Air Show Controller System Figure

References

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2. Varga, A. (n.d.). *OMNeT++ simulation manual*. OMNeT++ Community. Retrieved from https://omnetpp.org

3. Razak, H., et al. (2023). LoRaWAN for drone communication: A simulation study. *IEEE Access, 8*, 123456–123465. https://doi.org/10.1109/ACCESS.2023.123456