Graph ML for Flight Delay Prediction due to Holding Manouver

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Summary

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Motivation

- Growing importance of efficient last-mile delivery logistics.
- Use of drones (Unmanned Aerial Vehicles, UAVs) for overcoming traffic constraints, reducing delivery times, and lowering operational costs.
- Significant increase in literature on Delivery Drones in recent years [1].

Introduction to Last-Mile Delivery Drones

Figure: Drones Congestion in a high-traffic Last Mile Delivery context.
Source: [4]

Introduction to Last-Mile Delivery Drones

Last Mile Delivery Drones (LMDD)

- Heterogeneous research area:
  - Combining drones and trucks.
  - Linear integer modeling.
  - Fuzzy logic for uncertainties.
  - Multi-objective optimization.
  - Exclusive drone-based solutions.
- **Complex Systems Decentralized Approach**:
  - Tradable permit model for multi-agent airspace use [5].

Related Work and Centralized Control

- **Necessity of Air Traffic Management**:
  - Most centralized models don't address collision avoidance [1].
  - Ensuring optimal path planning and efficient airspace control.
- **Centralized Control and UTM**:
  - **Centralized Control**:
    - Federal Aviation Administration (FAA) and NASA's Unmanned Aircraft System Traffic Management (UTM) [2].
    - Ensures organized, legislative-backed airspace control.
  - **Decentralized Models**:
    - Novel but complex in scalability and regulatory compliance.

Proposed Approach

- **Aispace Control and MAPF Approach**:
  - Multi-Agent Path Finding (MAPF) is a solution for addressing spatial characteristics and collision avoidance.
- **Proposed Strategy**:
  - Employing MAPF strategy for Last Mile Delivery Drone problem.
  - Three approaches: MILP, heuristic and hybrid.
  - Use of prioritized planning [6] and conflict-based search [3] to manage computational complexity in the heuristic.
  - Comparing the MILP with the heuristic.
  - Qualitative comparison between centralized and decentralized approaches.

Summary

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