ROBUST MAXIMUM COVERAGE FACILITY LOCATION PROBLEM WITH DRONES

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Usage of Drones

Problem Characteristics

• Goal: Maximize coverage

• Questions:
  • Locating facilities
  • Assigning drones to open facilities
  • Delivery assignments for each drone

• Constraints:
  • Number of facilities that can be open and number of drones available
  • Capacity constraints for facilities
  • Battery capacity constraint for drones
  • One-to-one delivery by drones
Problem Considerations

• Key contributions:
  • Uncertainty in energy consumption during deliveries
  • Uncertainty in available battery energy level for each drone

• Robust Optimization is used to model uncertainties

• Solution Approaches:
  • Exact solution using an MIP solver
  • Robust Three Stage Heuristic (R3SH) taking advantage of the principles of decomposition and fast local search
Results

Deterministic Model (No uncertainties considered)
Results

Robust Model (all uncertainties considered)
Value of adding robustness

OC : Coverage obtained after solving the model
Avg. AC : Average Actual Coverage through Monte Carlo Simulations
Computational Efficiency

R_3SH : Robust Three Stage Heuristic
Conclusions

• The proposed R3SH achieves 93% of coverage obtained through MIP solver on average with 97% reduction in median computational time

• Robust model provides a more realistic estimate of the coverage

• Robust model also provides with more reliable drone delivery assignments
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