1. BACKGROUND

- Parcel delivery demands are steadily increasing with the rapid development of e-commerce.
- Traffic congestion and air pollution caused by Large trucks have become one of the urgent problems that city managers need to solve.
- With the increase of labor costs and the restrictions on the working hours of the delivery staff, it is very difficult for delivery companies to provide customers with cheap, efficient and round-the-clock courier services.
- From these perspectives, unmanned electric transportation become a good choice for city logistics.

2. RESEARCH TARGET

1. Synchronizing unmanned transfer/delivery ground vehicles (and drone) in a city distribution network.
2. Providing an reliable solutions for unmanned delivery system. Verifying the effectiveness of unmanned delivery systems.

New Technology

Drone delivery

Unmanned ground vehicle delivery

3. RESEARCH METHOD

Exact
- Branch and bound algorithm.
- Dynamic programming algorithm.
- Local Search.

Heuristics
- Variable Neighborhood Search.
- Evolutionary Algorithms.

4. RESEARCH LEVEL AND DESCRIPTION

- The unmanned transfer ground vehicle carries unmanned delivery ground vehicles, send out and pick up them at meeting nodes.
- The unmanned delivery vehicle services the customers.
- The drone is used for resupply the unmanned delivery ground vehicle for increasing the maximum delivery capacity of the vehicle.

REFERENCES