

SMART CITY LOGISTICS AND HOME DELIVERY

Driverless Vehicles and Drone Delivery Will Have a Profound Impact on Last Mile Deliveries

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Given the rapid recent development of driverless vehicle technologies, it is interesting to speculate as to what their impact will be with respect to the last mile delivery of goods to homes in urban environments. Ultimately, the combination of driverless delivery vehicle and airborne drone delivery should make it possible eliminate the need for all non-recreational shopping by allowing general merchandise, hot meals and groceries to be delivered to the home at a low cost. This will be especially important for the disabled and the elderly, as it would allow them to live in a typical sprawling U.S. suburban neighborhood and still have their shopping needs met without the requirement to drive.

While drones make it possible to quickly deliver products to a home, there are difficulties associated with providing enough clearance to make a delivery. Furthermore, many low-value bulky products are not cost-effective for drone delivery. As a result, ground delivery via driverless vehicles is likely to be the primary means for most urban last mile deliveries.

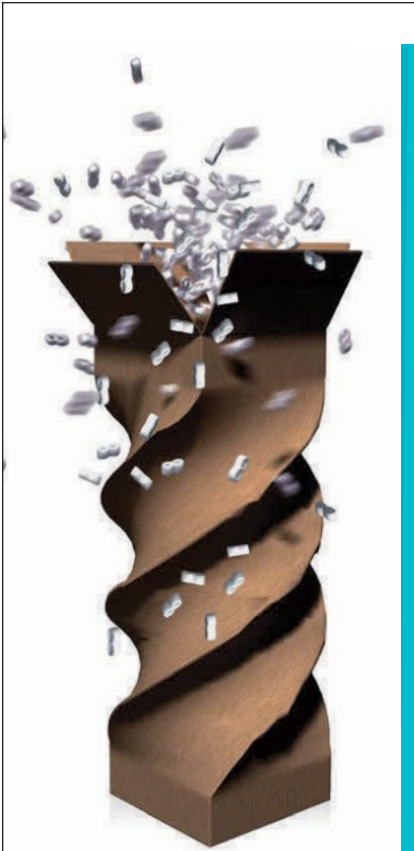
The big advantage of a driverless vehicle is that without a human driver it becomes economic to have direct delivery to a home from a distribution center (DC) only at a time when a person is at home and is able to unload their order from the vehicle. When a human driver is involved in a home delivery, the high labor cost necessitates routing multiple

home deliveries that cannot be scheduled on demand, resulting in either leaving the order outside unattended or giving the driver access to the home.

The key to having fast and efficient direct home delivery is to have the DC located close to the home in order to effectively provide urban fulfillment.

Figure 1 shows the side view of a hypothetical design of a DC that could enable last mile home delivery. The overall footprint of the DC would be small enough so that it could occupy repurposed parking lot space in small residential retail locations (there will be lots of unused parking space available as

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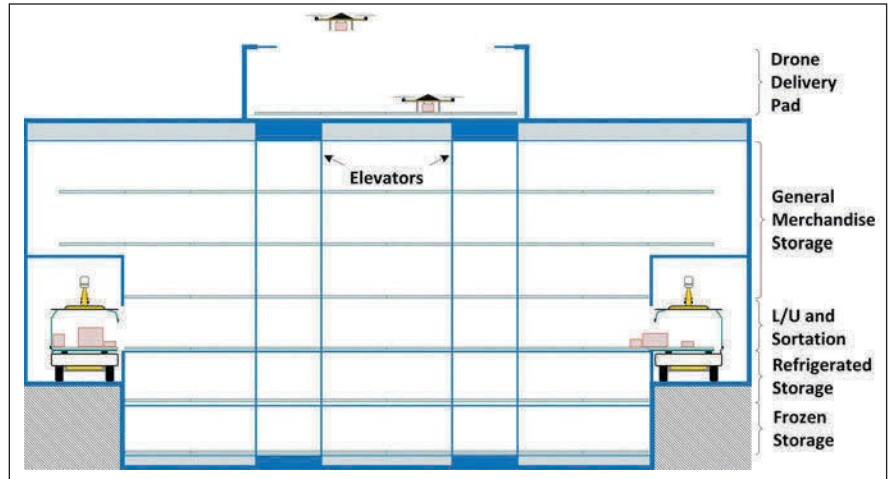


Figure 1. Side view of DC.

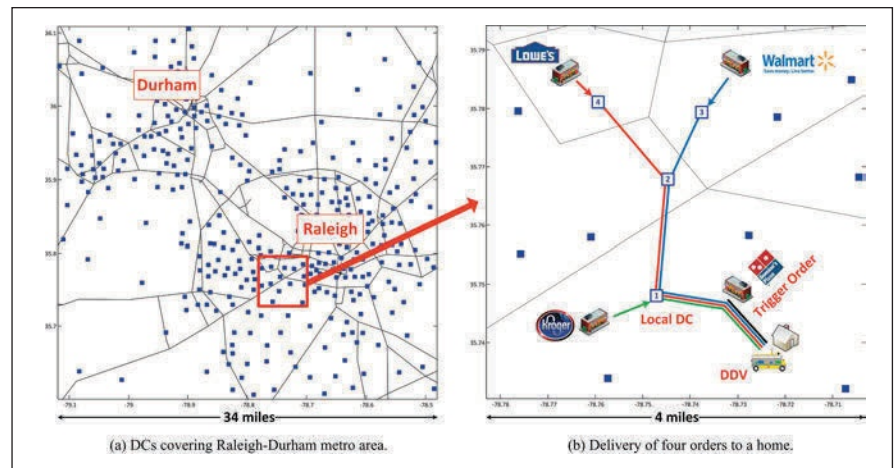


Figure 2. Home delivery logistics network.

people switch to ridesharing via self-driving vehicles).

Figure 2(a) shows how these DCs would cover a metropolitan area. Figure 2(b) shows three orders originating from stores located far from the home would be sent a DC close to each store and then transported through a sequence of DCs until reaching the DC close to the home. If these orders do not need immediate delivery, they can accumulate at the local DC, and when a new order needs immediate delivery (e.g., a take-out order from a restaurant), it serves to trigger the delivery of all of the accumulated orders to the home in one trip. Since the final DC is located close to the home, the lead time for delivery is short and since the trigger order is presumably of no value until it is in the hands of the person, it doesn't matter that it has to be unloaded from the vehicle as opposed

to it be already at home waiting for the person.

In order to make it cost effective to operate many small DCs, the loading and unloading of the vehicles would have to be fully automated. Also, there would be opportunities to design new types of material handling devices to help assist with the loading of the vehicles from supply points (e.g., current big-box retailers whose stores would be converted into urban fulfillment centers) and for the unloading of vehicles at the home. Once a vehicle makes a delivery to a home and is heading directly back to the nearest DC, its payload is available to recycle previous delivery containers, thereby eliminating most packaging waste.

There are many other technical challenges associated with last mile logistics network design, and the material handling industry is well poised to be important part of this development. ●