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Homework 2

Refined Idea

Executive summary: My idea is a fully-automated quadcopter package delivery system for short-distance transfer of packages. Initially, this would be based out of the back of a modified delivery van, much like a UPS or FedEx truck, which would be driven by a human operator, deploying quadcopters for delivery as needed. However, with the advent of driverless cars, this idea could advance to become a fully automated delivery system.

The first and most important stakeholder in this type of product would be the owner and operator of said delivery service, such as FedEx or UPS. They require that such a system should be reliable (so as not to lose or damage packages), low cost (compared to the traditional system of having a driver deliver packages), and fast.

The second stakeholder would invariably be the user of said package delivery services. They require that this system should be able to deliver packages to their doorstep reliably, that this system should not raise rates for package delivery, and that this system should be able to deliver their packages quicker and more efficiently than a manual delivery system.

A third stakeholder would be the designer and maintainer of said product. They'd require that the design shouldn't necessitate constant replacement of components, that the design minimize deployment cost, and that the design should minimize the cost of updating the current fleet of delivery vehicles.

The project is indeed practical for the time constraints given in a two-semester senior design project. However, it will require some tweaking. The project itself would be more of a proof-of-concept, as it would be infeasible to re-vamp an entire delivery truck with the proposed system. The proof-of-concept would consist of a prototype design for a package storage and transfer system, which would connect up to an output pad, where the quadcopters would then pick up and deliver said packages. The quadcopters themselves (as well as some of the package storage and deployment system) would be 3D printed, to minimize the cost of component parts and assembly time. In this manner, the proof-of-concept design could be made mobile (on, perhaps, a movable platform made out of plywood) in order to simulate the delivery of packages.

Some skills that would be required for such a project is experience using a 3D printer, an electrical engineer for the assembly and set-up of the electrical remote materials, and a few mechanical engineers to handle assembly and design of the quadcopters themselves. We may also need to pull in some additional CS help to handle the programming of both the automated delivery system and the drones themselves.

This project has the potential to really change the way that delivery systems function. While Amazon is trying to tackle the issue of long-distance transfer of packages via drone, this idea would allow delivery companies to continue the use of their current fleet of trucks while increasing the last-hop efficiency of package delivery, namely, that every time a package is delivered, the truck must be stopped, the driver must get out, get the package out of the back of the truck, and then finally deliver that package to the doorstep. With this system, the driver would continue driving down the street, while the fully automated

deployment system would deliver the packages via drone, increasing delivery efficiency dramatically.

Some of the potential downsides of this project are the fact that this delivery method is interfered with when dealing with apartment complexes or large buildings, where deliveries are made via interior doorways, which drones cannot deliver through. In addition, there is the issue of battery life: the drones would have to be constantly recharging, which would necessitate some kind of supercapacitor system by which they could reliably charge and discharge continuously throughout the day with no downtime. In addition, there would be a need to have additional replacement parts for the drones in case something broke, which would necessitate that the driver be somewhat skilled in repairing said drones. In addition, the software for guiding the drone to the door would require significant work, and it would need to be very precise.

One could scale this system up or down as needed for other projects of a similar delivery nature. Imagine a drone system for automatically delivering fast food. Or perhaps this project could be scaled down for inter-office deliveries from a centralized mail cart. This type of technology could even be used in manufacturing to move components to one section of a factory to another. The possibilities for the application of this type of technology to moving things around either a controlled or uncontrolled environment are endless.

Some threats to this project's success are the possibility that Amazon will "get there first" by succeeding in their idea of cutting out the middle-man of the delivery companies and delivering packages right to the door of customers. Another threat could be the possibility that the sensors required for such precise maneuvering of the quadcopters

might not currently be sensitive enough to manage and detect proper delivery of packages.