The Potential Unintentional Harm of a Drone-Based Food Delivery Service

The project that I will be discussing is a food delivery service using drones as the delivery vehicle. Customers will place an order from a restaurant to a specific location using the what3words app (what3words, n.d.), and a drone will then plan a route using an algorithm to pick up the order, and deliver it to the specified location. In the project's current state, only one drone is used, orders can only be made within one hour of day, and the drone operates within a confinement zone. This project is also currently only being developed by myself. For the purposes of this essay, I am extending this concept to a city-wide delivery system using a network of drones, available throughout the day, that is developed by a full team. It is very possible that systems like this may develop in the future, and in fact some drone delivery services are already highly certified by the Federal Aviation Administration in the USA (UPS, n.d.).

There are several ethical issues associated with drone use, and many uses of drones are even banned by law (Civil Aviation Authority (CAA), 2021). The main issues with drone use can be categorised as follows.

- Privacy

Fortunately, by not needing cameras on our drones, we can avoid many of the potential privacy issues associated with drone use (Bilton, 2016). Drones could still access private areas, however, and we need to ensure our system acknowledges and avoids these areas.

- Safety

Drones for this purpose use rapidly-rotating propellors to keep themselves airborne. In order to be able to carry the added load of food orders, the drones for this project would need to be large and generate a lot of power. If these propellors came into contact with people, they could cause potentially fatal accidents, and these would not be the first accidents caused by drone propellors (BBC, 2015). Drones could also cause this calibre of damage to the environment such as fauna and wildlife, which we have a responsibility to not damage. The drones would also be heavy and could be at significant height when in transit, so if a drone fell for any reason, it could cause damage to people and property

alike. Collisions with obstacles could be caused by malfunction, or by our algorithm not taking the full environment into account. We therefore have a responsibility to ensure there that our algorithm ensures the drone paths do not pass through buildings or large obstacles, that there are systems in place to detect and avoid obstacles and to navigate to a safe place if the battery power is low.

- Disruption

Drone propellors can generate a lot of noise, and the larger the drone, the louder the noise it generates. This noise could disrupt humans and wildlife alike. If our algorithm favoured certain paths over others then this may unintentionally create areas that were far more regularly disturbed by these drones, and businesses in this area may lose customers as a consequence of this. More harmful than that though, is the potential for drones to cause hearing damage. Some commercial delivery drones can produce upwards of 90dB (Paine, 2019), and considering the proximity to customers that these drones would have to enter to deliver their food, this could be quite unpleasant. Short exposure to noise at this level can even cause temporary hearing impairment (FAA). This is unlikely, and the exposure time to this noise level should not be able to cause any long-term damage to customers. The businesses providing the food, however, would be interacting with the drones much more regularly, so we would have a responsibility to fully inform our users of the risk to their hearing and provide suitable equipment to protect those handling the drone orders. We also have a responsibility to not disrupt people outside of the scope of our system. The process of ordering a drone to a specific location could be abused, and used to intentionally disturb public events or target and harass people. We have a responsibility to prevent this as well as we can, and to consider alternative, less easily abused methods to declare delivery locations.

Apart from drone use, there are other parts of this project that could cause harm. The project will require access to customer data such as their names, payment information and precise location for ordering. We would also need to store this data about the businesses using the system. By holding and using this data, we have a responsibility to keep it secure, and be transparent with our users about how we are utilising it, specifically if these uses span outside of the standard functions of the system. Insecurely storing this data, or using it irresponsibly, could result in situations where third-parties are using this data

against our users, such as the Cambridge Analytica data breach (Cadwalldr & Graham-Harrison, 2018).

Finally, we owe it to our stakeholders to make sure our system works and performs its functions to a high quality. If this system malfunctions or performs poorly, this may not just reflect badly onto our system, but onto the businesses that our using our service to reach their customers. By delivering these businesses' orders, we gain a partial responsibility for their reputation based on the quality with which we deliver their food, and we could easily harm this reputation.

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