TERMINAL AREA NAVIGATION AND CONTROL OF UAVS FOR PACKAGE DELIVERY SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to US Patent Application No. 17/076,506, filed October 21, 2020, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] This disclosure relates generally to navigation and control of unmanned aerial vehicles (UAVs), and in particular but not exclusively, relates to navigation and control of UAVs in proximity to a terminal area.

BACKGROUND INFORMATION

[0003] An unmanned vehicle, which may also be referred to as an autonomous vehicle, is a vehicle capable of travel without a physically present human operator. Various types of unmanned vehicles exist for various different environments. For instance, unmanned vehicles exist for operation in the air, on the ground, underwater, and in space. Unmanned vehicles also exist for hybrid operations in which multi-environment operation is possible. Unmanned vehicles may be provisioned to perform various different missions, including payload delivery, exploration/reconnaissance, imaging, public safety, surveillance, or otherwise. The mission definition will often dictate a type of specialized equipment and/or configuration of the unmanned vehicle.

[0004] Controlling unmanned vehicles can be problematic especially when there are a large number of vehicles in close proximity. For unmanned aerial vehicles (UAVs), the terminal area from which the UAVs are staged (e.g., loaded, charged, stored, etc.) can be a high congestion choke point requiring specialized procedures to maintain an efficient, safe, and orderly orchestration of their movements and behavior.

SUMMARY

[0004a] According to a first aspect of the present invention, there is provided a method of controlling unmanned aerial vehicles (UAVs) operating in proximity to a terminal area from which the UAVs are staged, the method comprising:

charging a plurality of the UAVs on charging pads disposed in a staging array at the terminal area, wherein merchant facilities for preparing packages for delivery by the UAVs are disposed about a periphery of the staging array; and

relocating the UAVs under their own propulsion from interior charging pads of the staging array to peripheral loading pads of the staging array as the peripheral loading pads become available and the UAVs are deemed sufficiently charged and ready for delivery missions.

[0004b] According to a second aspect of the present invention, there is provided at least one machine-accessible storage medium that provides instructions that, when executed by one or more machines, will cause the one or more machines to perform operations comprising:

charging a plurality of the unmanned aerial vehicles (UAVs) on charging pads disposed in a staging array at a terminal area from which the UAVs are staged, wherein merchant facilities for preparing packages for delivery by the UAVs are disposed about a periphery of the staging array; and

relocating the UAVs under their own propulsion from interior charging pads of the staging array to peripheral loading pads of the staging array as the peripheral loading pads become available and the UAVs are deemed sufficiently charged and ready for delivery missions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Non-limiting and non-exhaustive embodiments of the invention are described with reference to the following figures, wherein like reference numerals refer to like parts throughout the various views unless otherwise specified. Not all instances of an element are necessarily labeled so as not to clutter the drawings where appropriate. The