CPE-322 Homework 6

Autonomous Drone Delivery

Prof. Hong Man
Due: 3/4/14

"I pledge my honor that I have abided by the Stevens Honor Code"

Group Members:

Michael Paulauski _____
Eddie Bowlby _____
Matt Leslie _____
ShaQuill Thomas _____

Section 1

Summary of Group Work Assignments

Michael Paulauski will be covering the quadcopter portion of the project. He will be discussing the various implementations of quadcopter design, as well as manufacturing and assembly of quadcopters via 3D printing.

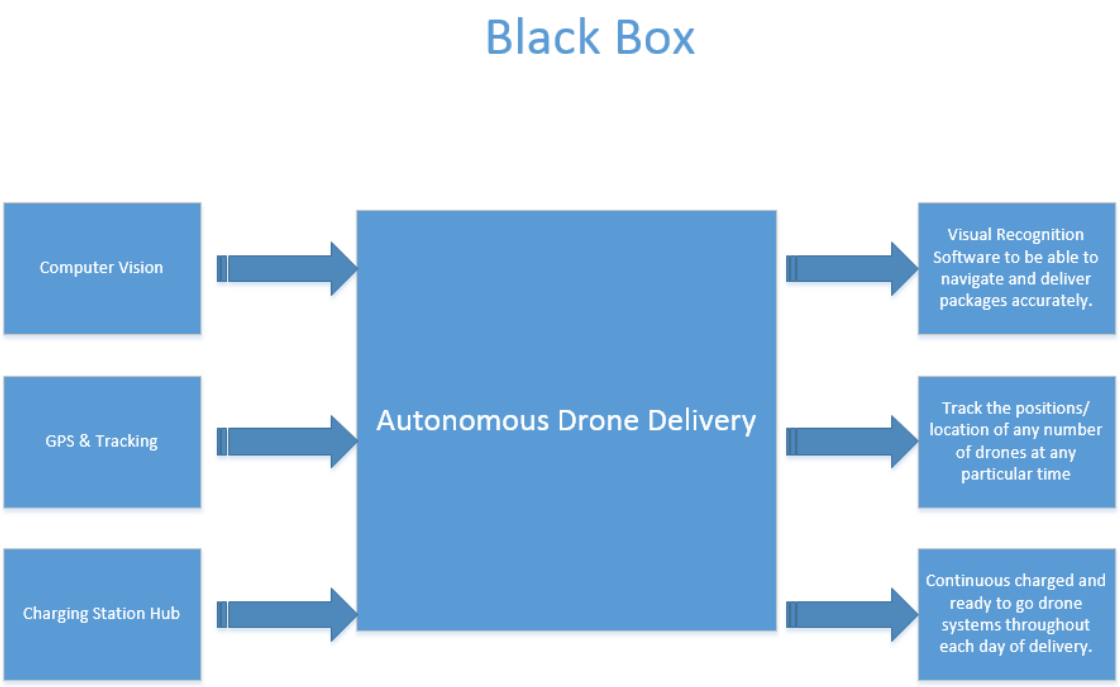
Edward Bowlby will be covering the computer vision portion of the project. He will be discussing existing visual recognition advances and technologies as well as how they could be applied to an autonomous delivery drone.

Matt Leslie will be covering the GPS and tracking portion of the project. He will be discussing how GPS tracking can be applied to this type of drone project, as well as how parcel tracking is performed in modern shipping.

ShaQuill Thomas will be covering the charging station hub portion of the project. He will be discussing the implementation of the charging station that will be used to charge the autonomous drone system throughout the day in order to minimize downtime and latency between deliveries.

	Michael Paulauski	Eddie Bowlby	Matt Leslie	ShaQuill Thomas
Percentage of effort towards this assignment	25%	25%	25%	25%

Section 2

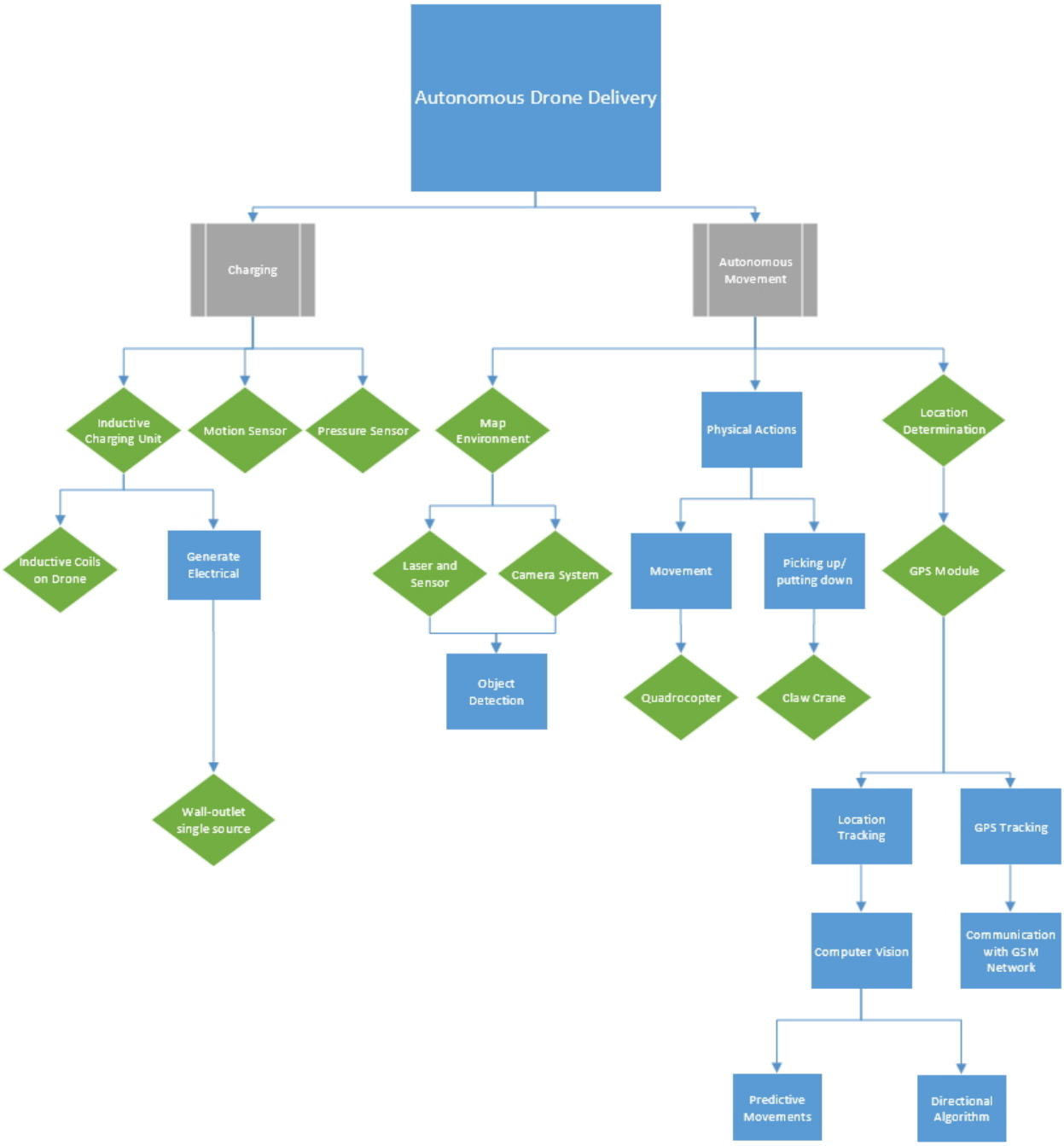


The black box diagram for the quadcopter is quite straightforward. The drone uses a combination of computer vision and GPS tracking to navigate the obstacles in front of it in order to deliver the package to the desired destination. The drone charges back at its home base on the delivery truck via the charging station hub.

The visual recognition software will be run remotely within the central server on the delivery truck, which will process the visual information provided by the onboard cameras of the quadcopter. The quadcopter will be tracked via GPS and wifi triangulation from the delivery truck.

The charging station will allow for quick and continuous charging for the drones which have completed their delivery and have returned to the delivery truck. This will allow a constant supply of delivery drones rather than having to wait for them to charge before being released again.

Function-Means Tree Diagram



The function-means tree, as its name suggests, is a high-level chart that details all of the functions the autonomous delivery drone must be able to perform and what corresponding component provides the means to perform them. The blue and gray squares represent functions that the drone must perform and the green diamonds are components and hardware that allow for the drone to perform these functions. The highest level function of the autonomous delivery drone is for it to have the ability to autonomously deliver packages. In order for the drone to do this, it must perform two sub-functions: it must be able to move and act autonomously and it must be able to recharge.

Within the autonomous movement function, there are many sub-functions the drone must perform including generating a 3D map of the environment, object detection, GPS tracking, movement decision making, and the physical movements and actions themselves. The robot accomplishes these functions with components such as a laser, a camera system, a GPS module, and quadrocopter hardware. The other main function the drone must perform is to charge its battery. This function is accomplished by means of a basic inductive coil and outlet system as well as sensors for detecting charging and their respective functions. It is together that all of these subfunctions, and the means by which they are performed, collectively perform the overall function of autonomously delivering packages from a delivery truck to customers' front porches.

References

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