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Tree Trimmers

Attachment used for Tree Trimming

Introduction

Tree branches are a big concern for service wires and are a main cause of damage that requires them to be fixed. Cutting and clearing vegetation around service wires can make them more reliable for customers by decreasing service interruptions. This project will attempt on using a drone with some sort of blade attachment that will be used to cut vegetation around service wires. Using drones do this will help service crews that would have to climb up to power lines and fix them during outages. This paper will go into further detail on the attachment to the drone that will be used to cut vegetation. Software and hardware will have to be added to the drone in order to cut branches. This paper will go into the hardware side that will have to be added.

Commercial Applications of Branch Cutting Attachment

There are no saws or loppers (branch cutter) that are specifically made for drones, which means that a regular saw or lopper will have to be purchased or built to add to the drone. There are hundreds of different designs for each tool that are all widely sold and manufactured. Chainsaws are one of the most common ways of cutting branches. Chainsaws use a 16-20-inch blade that can be powered by gas or by rechargeable batteries. They can weigh anywhere from 15-25 pounds and can achieve cutting speeds of 6800 mph. The EGO Power+ CS1604 chainsaw kit has a 16-inch blade, weighs 16 pounds, and is powered by a 56 volt battery for the price of US$300 [5]. Reciprocating saws can use blades from 2-12 inches, weigh around 5-12 pounds, and are usually powered by batteries. The Dewalt DCS367B reciprocating saw weighs 5 pounds, is 13 inches long without the blade, and is powered by a 20V battery for US$179 [4,6].

A lopper can also be used to cut branches, but it would have to be powered by another tool since it is a manual tool. Loppers are usually 1.5-2.5 feet in length, have around 2 inch cutting diameter, and are made for cutting branches. The Westward bypass lopper is 27 inches in length, has a 1 ½ inch cutting diameter, and costs US$45.75 [7].

Underlying Technology of Branch Cutting Attachment

Vegetation is the most common cause of outages other than weather for electric power systems. Every 3-5 years, the trees around power lines and poles must be trimmed so they do not grow into the lines and damage them. [3]. The attachment used to cut branches has to be light enough to be carried by a drone, powerful enough to cut branches while moving, and be able to be controlled remotely. The operator of the drone will also be up to 50 feet away from the drone which means the tool should be easy to use and not require precise precision [1]. The branches that the drone will be cutting will most likely only be a max of a couple inches in diameter which means a tool like a chainsaw might be a little overkill to add to a drone. However, most saws such as a chainsaw or reciprocating saw require a lot of user force in order to cut wood. A chainsaw works by spinning a blade a couple hundred times per second and would easily cut a 2-3-inch branch. A reciprocating saw moves a blade back and forth dozens of times per second [2]. It requires much more force than a chainsaw to cut wood. A drone might not be able to cut a two-inch branch with a reciprocating saw which might mean a chainsaw is necessary to cut branches from a drone. A bigger blade would also be easier for the drone operator to cut branches with from so far away. A branch cutter such as a lopper would be the other route to trim trees. They are not automated and require the user to push the handles together in order to cut branches. They also can only cut branches up to 1 ½ to 2 inches in diameter which means it might not be able to cut every branch needed. Furthermore, a lopper can sometimes get stuck on the branch it is cutting which could end up crashing the drone. A lopper only has an opening of up to two inches to cut branches, which means the user would have to be very precise in order to cut branches. This is difficult from far distances even with a camera attached to the drone. A lopper would also require a separate motor to pull the handle and cut branches [1].

Implementation of Branch Cutting Attachment onto Drone

The obstacles of using a trimming tool on a drone is the size of the tool and powering the tool from a distance. A large drone would have to be used to carry a chainsaw or reciprocating saw. The saw must also be harnessed or welded to the drone. A chainsaw or reciprocating saw could both be potentially turned on while the drone is still on the ground which would be easy to use from a distance. A lopper would be more difficult to implement onto a drone. It would have to be attached to a motor powerful enough to cut tree branches, and the motor would have to be controlled by the drone operator from a distance [1]. This means an embedded system might have to be implemented in conjunction with the lopper in order to function as intended.

References

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