Technical Assistance Request

Identify Low Power Techniques for Grass Cutting/Mulching

Mowing grass and chopping heavy foliage takes considerable energy. Current mowing systems are developed to minimize the amount of time it takes to mow and to leave little chaff on top of the cut grass. Power has been less of a concern and systems have added more horsepower over the years to improve mulch quality. The systems we are designing use batteries and energy from solar power to operate. Reducing the power required for mowing and chopping grass has a significant influence on the amount of area that can be mowed on a single charge. Currently, drive power requires about 1/7 of the total power used on flat ground, with grass cutting and mulching requiring about 6/7 of the energy used. A small power change can add acres to cutting capacity.

Autonomous systems provide a shift in the criteria for optimizing performance versus traditional systems. In addition to power usage being a significant factor, maintenance intervals play a key role in the acceptance of the systems. Blade changes and blade sharpening must be minimized along with directing maintenance to specific intervals. Autonomous systems can operate day or night, and can mow more often if needed. However, a limiting factor is overall battery life, usually around 1200 charging cycles. This must be considered in the process of optimization.

Many types of grass cutting methods exist today. An analysis of current cutting methods and how they fit to the important criteria of cut optimization would be the first step in the project. Methods include: rotary, reel, sickle bar, double sickle bar, double rotating blade, drum, disc, string and possibly several other methods that may have been developed more recently.

The specific project would be to identify the best mowing technology for low power usage, maintenance intervals, cut frequency, and noise levels while maintaining high cut quality.

Identify Techniques for Autonomously Trimming Around Posts & Fence Lines

Utility-Scale solar fields can be quite large exceeding 1,000 acres. Maintaining vegetation next to posts and fence lines is an exhausting and difficult job. Most companies address this plant growth by applying large amounts of chemicals to kill the vegetation. The cost of manual trimming would not make it feasible. A trimming attachment to address this vegetation growth would find great favor and reduce the need for herbicides.

Many mechanical trimmers have been developed to be used manually or to be attached to tractors and monitored by personnel during use. They use blades or strings to cut grass. While they work well in some applications, the systems do not prove to be reliable, nor require low maintenance and can be damaging. Alternate systems could improve the opportunity and performance as a tool attached to our robotic tractors.

The specific project would involve the search of methods that when promoted with autonomous robotics would serve as a low maintenance, non-chemical, reliable solution to address growth adjacent to posts, fence lines, equipment, buildings and landscape. Once identified, testing requirements would be established to verify operation and compare different technologies in order to identify the most promising method.

Possible solutions would likely use a combination of sensors, cameras and software to identify infrastructure objects and vegetation growth. Mechanical means would pull or cut the vegetation to remove it from the location. However, there may be many alternative technologies that could be considered with different modes of operation.

The purpose of the study would be to identify the most promising technologies, prototype and perform initial tests and set a development plan in place to prepare the technology for commercialization and implementation on our autonomous electric tractors.