

Design of Tree Planting Robot Walking Device

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Abstract: due to the devouring of natural disasters such as wildfires and excessive deforestation of human beings, the earth is now facing a crisis of constantly decreasing green vegetation. The sharply decreasing forest coverage will lead to severe environmental and climatic problems, thus threatening the habitat for human survival. However, if planting trees manually to increase the green area, not only time consuming and laborious, seedling survival rate is not high, but also the surrounding vegetation will be damaged. Based on the current situation, this design puts forward a scheme of digging holes and planting trees in one.

Keywords: Plant trees, robots, walking mechanisms, control systems.

1. INTRODUCTION

The research purpose of this subject: due to natural disasters such as today's fire engulfed and human deforestation, earth is now facing a crisis of green vegetation in the shrinking, sharp decline in the forest coverage rate will lead to severe environmental and climate problems, which threaten the human beings rely on to home, so, a lot of planting reduction green vegetation is an important means to solve this problem, is imminent. However, relying on artificial planting and planting operations is of poor quality, low efficiency and great labor intensity [1]. Therefore, I want to design a tree-planting robot specially designed for large-scale operations to improve planting efficiency, increase the survival rate of saplings, reduce labor intensity, improve economic efficiency and reduce the damage to the original environment [2]. However, there are great differences in the terrain of desertification areas, such as plains, sandy lands, hills, mountains and gullies, as well as areas with large gradient and potholes. Because of the vehicular type adopted in this design, it is only applicable to a large number of planting operations in plain areas or relatively flat areas with small slope.

The significance of this topic: green is the color of life and the necessary condition for the sustainable development of human beings. We should correctly handle the relationship between economic development and ecological environment protection, strengthen the ecological concept of red line, economical and intensive use of woodland wetland resources, such as production development, life wealthy, ecology good civilization development path and speed up the construction of resource saving and environment friendly society, forming the harmonious development of man and nature new pattern of modernization construction, pushing forward the construction of the beautiful Chinese new contribution for the global ecological security.[3] For the present our country existing forest land

area of 13370 square kilometers, forest JiXuLiang 1.0137 trillion cubic meters, per capita possession of forest and JiXuLiang only 16% and 22% of the world's average, only 16.55% of China's forest coverage rate, far less than 22% of the Asian, 32% of the world, desertification is a serious problem facing the human, is expected in the next 50 years there will be 200 million people worldwide by desertification was forced to migrate [4-6]. Desertification worrying in our country, the 1950 s and 60 s, desertification of land every year extension of 1560 square kilometers, 70 s and 80 s extension of 2100 square kilometers, every year every year since 90 s has extended 2460 square kilometers, equivalent to eat a medium-sized county, increase the forest coverage rate, protect the ecological environment, windbreak and sand-fixation, must start from afforestation. Because this task workload big, cycle is long, but the poor quality of artificial afforestation work, low efficiency, slow speed, the intensity of labor is big, so are done by mechanical afforestation to maximize productivity, reduce production cost, high speed, high afforestation quality, increase the afforestation survival rate, increase the forest coverage [7]. Thus: 1. Soil and water conservation. Where the vegetation coverage is low, sediment flow during the rainy season there will be a lot of people in the river, the land destroyed, fill high, riverbed silt to haikou, great harm, resist erosion, it is necessary to afforestation, because there is no like tree canopy sample large roots, can be like a huge hand firmly seize the soil, the soil moisture was caught, and absorbed by the roots constantly accumulation. Statistics show that one mu of forest is 20 tons more water than the area without woodland. Wherever the wind blows, the countryside is buried and the city becomes a ruin. [8] To protect against wind and sand, a forest must be built to weaken the wind. Once the wind hits the shelterbelt, its speed will decrease by 70-80%. If it is separated by a certain distance, a lot of forest belts will be aligned in parallel and grass will be planted, so that the wind will blow less sand and gravel. 3. Reduce pollution and beautify the environment. According to statistics, one mu of forest can absorb dust 20,000 to 60,000 kilograms a year, and can absorb 67 kilograms of carbon dioxide and release 48 kilograms of oxygen every day. It can absorb 4 kg of toxic gas sulfur dioxide in a month, and 2 kg of bactericidal element can be secreted by 1 mu pine Berlin in two days and nights, which can kill tuberculosis, typhoid, diphtheria, dysentery and other germs and greatly improve people's living environment [9].

2. PREPARATION OF TREE PLANTING ROBOT PROGRAM

The design is to achieve in a relatively flat area of continuous equal spacing planting.

The basic parameters are:

Driving speed of the whole machine: 4m/s

Planting spacing: 5m

Number of saplings stored at one time: 5

Height of tree seedling: close to 25cm

Horizontal size of tree seedling: close to 8cm

Among them, the travelling mechanism is driven by the rear wheel, which is fixed on the rear axle through the fastening structure. Cutting institutions refer to the above example is square tube is used to punch, baffle through soil, soil compaction plate making land strong, every action a is through the cylinder to drive, walking through the fixed frame connected to the base plate institutions: seedling entities by gear and rack makes a seedling storage warehouse mobile seedlings falls to the square tube, also with motor as power [10].

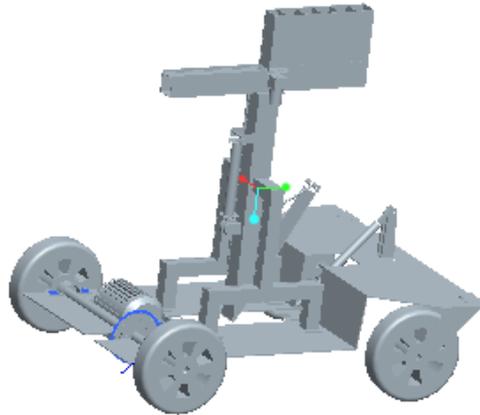


Fig. 1 3d model of tree planting robot

3. DESIGN AND CALCULATION OF THREE KINDS OF TREE ROBOT WALKING MECHANISM

3.1 Evaluation index of walking mechanism

As the moving mechanism of the robot, the walking mechanism must meet the conditions of use and guarantee certain performance.

(1) The effectiveness

Effectiveness is the most important performance index of the walking mechanism, which represents whether the walking mechanism can pass through and what attitude it can adopt in a given ground environment. When the tree planting robot encounters insurmountable obstacles, it means that the walking mechanism fails

(2) Through sexual

At present, the passing performance of the walking mechanism is evaluated by the reserve adhesion force of unit load (the ratio of the difference of adhesion force F_0 and rolling resistance F_f to the whole machine gravity W). Vehicles have backup adhesion, the greater the slope and it can overcome the greater the obstacle negotiation ability, it also can with maximum speed, such as using Π on behalf of the evaluation index, then

(3) Speed

In the design stage of the new walking mechanism, the speed performance of the imaginary walking area must be evaluated in order to compare the existing walking chassis.

Besides hard road, the maximum speed (km/h) of the travel mechanism on smooth hard road can be obtained by the power balance equation, namely:

It can be seen from the above equation that the maximum speed of the walking mechanism is a function of the road rolling resistance coefficient f when the walking mechanism remains unchanged. The surface of the road is soft. When the mechanism is running on soft ground, the driving resistance caused by soil deformation and subsidence is

3.2 Problems existing in the design and improvement direction

(1) Due to the defects of design ideas and the limitations of professional skills, this design still has the following problems:

Narrow scope of application. Because the four-wheel walking method adopted in this design is only applicable to relatively flat areas, but the wilderness terrain is complex, so it cannot be used in large

areas.

Small amount of seedling of borer. The seedling storage mechanism in this design can only store 5 seedlings at one time, which needs frequent replacement.

Additional manpower is needed and automation is not high. Because the robot can't add seedlings by itself, and it needs human operation when it needs to change places.

No automatic watering and fertilizing equipment

(2) Improvement direction

Switch from single function to multi-purpose. In China, afforestation has seasonal and regional characteristics, with short operation time and low annual utilization rate of single-function machines and tools. Therefore, in the future design, we should try to consider the problem of multiple use. The specific implementation measures are as follows. First, different drill bits are replaced to adapt to different soil conditions and working environment. the second is to design a general frame, which can complete the forest operation of other projects after replacing working parts, so as to improve its utilization rate.

Extend the scope of operations. Planters should be used not only for plains, sand and hills, but also for mountains and ravines

Create container planting equipment. The production of container seedlings has basically realized the mechanization operation, and mass production of container seedlings has been achieved. Therefore, the equipment for planting container seedlings should be developed.[11]

Mechanical systematization a single forestry machine can only be applied to one operation, while mechanical systematization can greatly improve the efficiency of operation.

4. CONCLUSION

This design is completed is the planting robot walking mechanism design. At the beginning, due to the lack of understanding of this aspect, the early process was slow and wasted a lot of time. Later, under the guidance of the teacher, I gradually had my own ideas and worked out my own plan step by step through slowly searching for information and analyzing others' designs. During the journey, I encountered many problems, such as how to fix the wheel on the axle, how to realize the steering of the front wheel, etc., but through these problems, I also learned a lot of ways to deal with problems. Later, the design and calculation of parts were carried out. There were some complicated parts, such as the rear axle and the bottom plate. Due to the large size of shape and position, the calculation was wrong for many times[12].

The main purpose of a rotary kiln hydrolyser is to convert olive pits into char fated to the production of activated char. The capacity of plant is about of wet olive pit, distribution of pyrolysis products as function of the process temperature

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