

Automatic strawberry picker

Zhidan Jie

College of Automation, North China Electric Power University, China

2207442805@qq.com

Abstract

In many areas of China, fruit harvesting still relies mainly on manual work. In view of the problems existing in mass-produced fruit harvesting, such as large workload, wide operation scope (uneven distribution of fruits), high requirement of touch strength control (juicy fruits are easy to be bruised) and selective harvesting (inconsistent ripening period of fruits), This paper introduces an automatic strawberry picking truck based on color recognition and intelligent cutting. It can improve the efficiency of fruit picking, reduce labor intensity and cost, and ensure the quality of fruit products.

Keywords

Strawberry picking, automation, color recognition, intelligent cutting.

1. Introduction

With the improvement of living standards, the demand for strawberries is increasing. However, strawberry harvesting is the most time-consuming and laborious link in strawberry production. At present, it mainly depends on manual harvesting. Because of the short strawberry plant, the harvester squats down to pick the fruits. Because of the maturity of the fruits, the harvesting devices are usually ordinary baskets. This kind of harvesting method not only needs high labor force, but also maintains inefficiency [1]. in order to reduce costs and labor force, the automation of strawberry harvesting has become the focus of attention of strawberry harvesters.

2. Implementation principles of strawberry picker

2.1 Overall design

The strawberry picking truck consists of five parts: color recognition device, automatic distance forward device, lifting platform device, intelligent shearing device and collecting device. Different from the current research methods at home and abroad, this paper introduces the necessary conditions of strawberry picking truck according to the growth and picking status of strawberries. It can intelligently move along the direction of picking, intermittent automatic picking, automatically and correctly identify the color of strawberries, selectively pick mature strawberries; this design principle is simple, easy to operate, small size, but also can solve the labor-consuming problems of manual picking.

2.2 Kinematic and dynamic analysis of each device system

Automatic fixed distance forward system and lifting platform device: The serial port of the interface board is controlled by ROBO PRO programming software, so that the running time and speed of the motor are controlled, the running time and the stopping time of the motor are set, and when the motor transits to the stopping operation, the MotororXS XS horse on both sides of the picking vehicle is started. The two MotorXS XS motors rotate at the same speed. The screw rotates to drive the pusher

to move obliquely upward. The strawberry moves slowly down relative to the pusher under the push of the pusher, and the color recognition system continues to work.

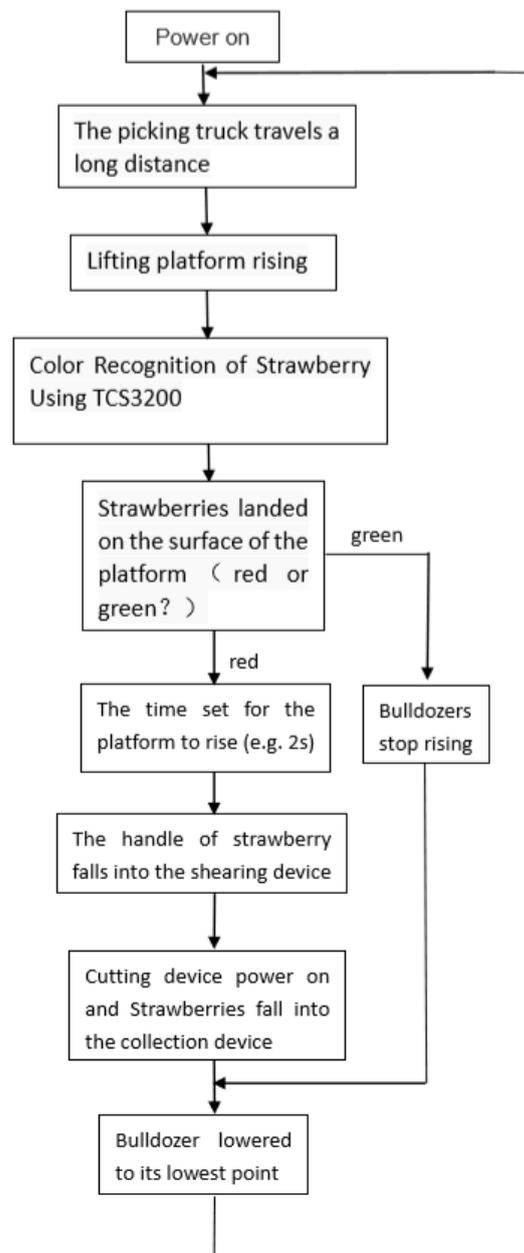


Fig.1 Running steps of strawberry picking

Color Recognition System: During the slow movement of strawberry in the platform, the color sensor uses interruption for periodic color recognition; the interface of the color sensor receives the general input I1 of ROBO TX Controller for analog signal of color recognition. The color sensor converts the collected color signal into signal value, and uses ROBO PRO programming software to program to judge strawberry color and signal.

Value (x) is roughly divided into three parts: (x < 3300) strawberry is red, (3300 < x < 3500) strawberry is green, (x > 3500) strawberry falls on the platform, three cases correspond to different work, x > 3500: the platform continues to rise until strawberry falls into the platform or rises to the highest point, then the platform stops rising, after a certain period of time MotororXS XS motor on both sides reverses, screw drives the screw. When the push platform rises to x < 3300, the strawberry handle will fall into the shearing device for a short distance. The shearing device will cut the handle and the strawberry will slide down to the collecting device. After a certain time, the MotororXS XS motors on both sides will reverse and the screw will drive the spiral push platform down. When 3300

$< x < 3500$, the MotororXS motors on both sides will reverse and the screw will drive the spiral push platform down. The pusher lowers to the lowest point, the fixed distance forward system starts to work, the motor runs, the car continues to pick, repeat the above operation.

The power of the whole system is driven by electricity, and the whole machine is moved by the combination of mechanical movements.

The process of strawberry picking is shown in Figure 1.

3. Creative Model Construction of Fischer

This design uses ROBO PRO programming software to program picking truck. The program is shown in Figure 2.

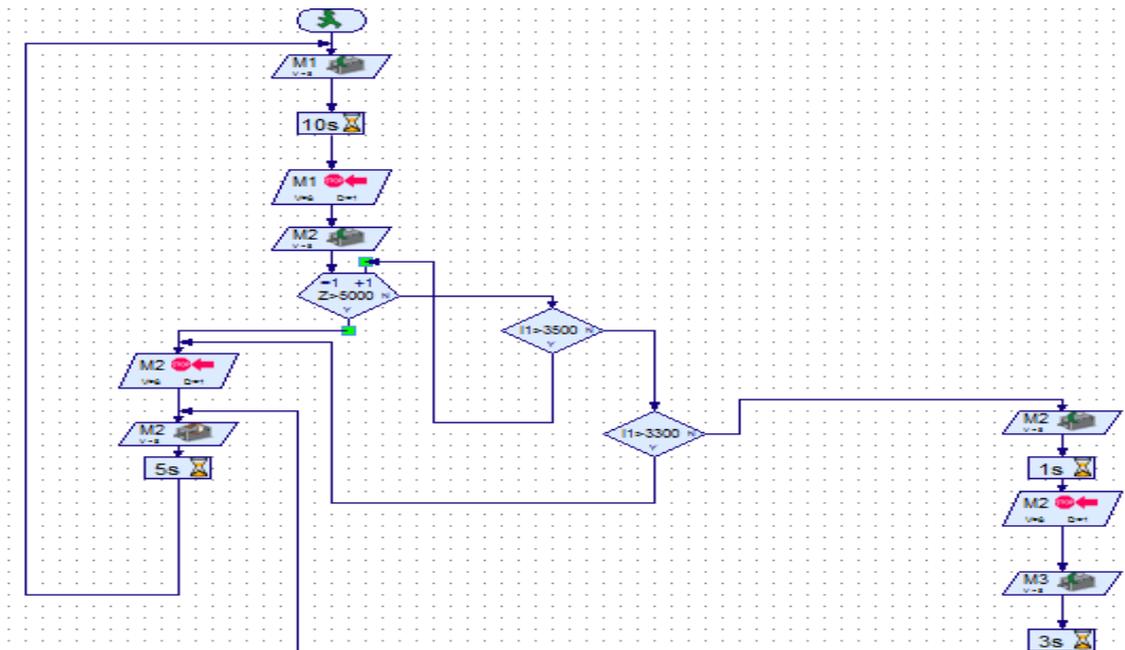


Fig. 2 ROBO PRO Flow Chart

In order to understand the working principle of strawberry picking truck more intuitively, this design uses proe to make samples, as shown in Figure 3.

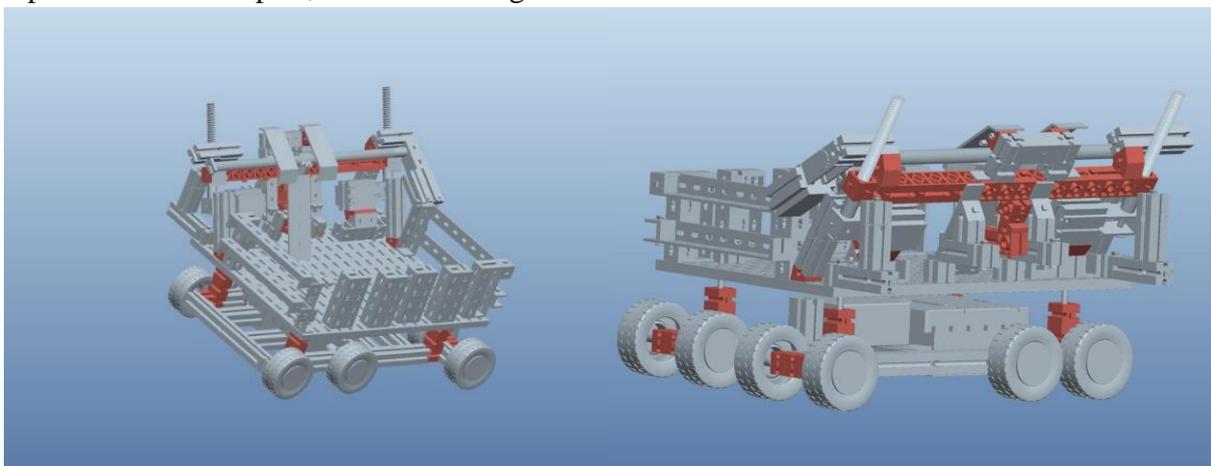


Fig. 3 Front and back drawings of picking trucks

4. Idea Source and Innovation of Automatic Strawberry Picking Vehicle

The innovative idea of this design comes from the process of artificial picking: the steps of artificial picking can be divided into: squatting (low growth height of strawberry), observing (whether the fruit

is ripe), picking (picking directly by hand or cutting with scissors and other tools), collecting (putting the fruit in the basket), advancing (the ripe fruit is picked before and after), repeating the above process; Each process is a problem to be considered by the harvester[2]:

(1) Strawberries are planted on ridges, so the requirement for harvesting machinery is to work on each road and pick them linearly rather than square like rice.

(2) Strawberry harvesting first needs to let strawberries fall into the position we set, and then further judge, cut and collect strawberries.

(3) To ensure that the strawberry is not damaged in the picking process; the strawberry fruit body is delicate, and the skin is easily damaged when it touches sharp devices, and the fruit body is directly damaged when it is serious. Therefore, the freshness and integrity of strawberries in the selling process are the important factors affecting whether people choose to buy or not[3].

5. Conclusion

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