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Weeding Robot for Vineyard: A Review

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ABSTRACT: Grape cultivation is a significant painstaking and critical work since the grape is a very sensitive crop. Weather monitoring and weed removal are the essentials to maintain vineyards. The deployed system should be quick for automated precision weed removing. However, intra-row weed removal is the most exigent task. The conventional solution for weed removal is to use a hydraulic system, while more recent systems use an electric motor along with mechanical parts. While some system does the refurbishing of mechanical parts to reduce the weight of the system, some suggest having linear electric motors to perform the side shift, the height, and the tilt adjustment. Even though the primarily intended crop is Grape, it should be deployable in delicate and fragile crops like Tomato, Pomegranate, or Cabbage.

This paper presents various types of a robot which are used for weed removing. In that same various technologies are developed like spraying, mechanically removing, uproot like that, and which method is used in the robot.

I. INTRODUCTION

India positions second worldwide in ranch yields. According to 2018, horticulture utilized half of the Indian workforce and contributed 17–18% to the nation's GDP [1]. Weed is a noteworthy unfortunate plant developing alongside the ideal developed yield, which contends with the ideal harvest, influencing its development vitally. Weed control is the farming vital of nuisance control, which endeavors to stop weeds utilizing techniques like fueled development utilizing cultivators, hand development with diggers, covering by mulch, deadly withering by high warmth, consuming, and compound control with herbicides and pesticides [1].

The preventive weed control technique proposes sans weed seed. The social weed control strategy is involved harvest pivot while keeping up soil richness. The customary mechanical weed control strategy utilizes ranch gear and procedures. Mechanical weed control can be coordinated between the tree/crop columns (between line) and inside the tree/crop lines (intra-line). The essential obstacle of mechanical weed control is the execution of the intra-line region. Organic weed control proposes the contribution of common foes of weed plants to control the germination of weed seeds. Substance weed control includes the utilization of dangerous mixes, for example, bromoxynil, paraquat. Be that as it may, the effect of compound pesticides turned into a significant worldwide consideration issue for the suitability of the food creation framework. Analysts have discovered that weeds could be liable for a reduction of up to 40% of yield, which makes weed control is a significant part of cultivating. This utilizes a computerized robot as an ideal answer for weed evacuation. Robots with coordinated progressed column direction frameworks utilizing antennas, separation sensors, and cameras can be a quintessential strategy. The fundamental impediment for the acknowledgment of these robots is the encapsulation of insight to separate developed greenery from weeds and progressively, to destroy the weeds in an exact way. These robots can possibly control intra-line weeds and fundamentally lessen the dependence on herbicides and hand weeding. Additionally, weeding robots can build work profitability, refine the rural creation condition, improve work quality, improve asset the executives, and help ranchers to enhance their working techniques and conditions [2].

Self-administering portable robots in farming are reliant on the regular biological system and the structure of the offices in which the weed is available. There were various self-sufficient machines and robots created in the previous decade. They utilized machine vision to identify crop plants and a side move system to move along the yield lines. The intra-line weeds were worked by moving cultivators that could open and near forestall harm to the sensitive yield. The principal objective of the flow research is to create and test the presentation of a pivoting electrical turner weeder system, worked for computerized intra-line weeding for grape plantations. The framework ought to be implanted in an independent robot stage and ought to be assessed under controlled soil container and genuine cultivating conditions. The force necessity of the revolving cutting edges system and the complete force for the independent automated machine requests uncommon consideration for subtleties [1, 2].

II. LITERATURE REVIEW

David Reiser Et Al. built up an independent turner weeder for intra-line weeding in grape plantations and tried at the University of Hohenheim. The framework was mounted on a portable robot stage and developed utilizing a business rotating turner weeder. For the side move of the framework, direct electrical engines were utilized. The storage compartment location was performed with two unique techniques, utilizing a sensor and a sonar. The two techniques performed well and didn't hurt any trunks. The general plowed zone between the trunks with the sonar was higher than with the sensor, brought about by vibrations and the plan of the antenna [1].

Prof. V. A. Kulkarni and Mr. Ajit G Deshmukh showed the undertaking comprising of two distinct instruments. The main component contains the creation of a get together of the vehicle and its movement, though the subsequent instrument is slicing the weed in the middle of to trim lines. The microcontroller is utilized to control and observing the cycle of the framework movement of the vehicle. It is controlled with assistance of a DC engine and servo engine. This framework likewise distinguishes an impediment present in the way of the vehicle by an infrared sensor [2].

ABHISHEK PA TNAIK and R.NARA Y ANAMOORTHY introduced their concept of a Robot which is explored through the developed field for weed recognition and evacuation activity and the picture preparing methods which is utilized for recognizing weeds with plants and characterizing the directions of their position [4].

Aravind R Et Al. gave a calculation to distinguish weeds among ranches effectively. A model of the Automatic Weed recognition and Smart Herbicide Sprayer Robot was planned and executed effectively. The robot is included equipment that can uphold and successfully shower herbicides on the identified weeds progressively [5].

Toshiaki WATANABE done the improvement in ultrasonic heterodyne technique, which can quantify the ducks total speed, and it additionally gets the diverse sign from a trail between rice paddies or paddy rice leaves. The control calculation of the autonomous kind weeding robot which can continue with the work is worked with making a weeds map in the paddy field as a future arrangement in the one-chip microcomputer and affirming a weeding plan and impact on weed [6].

Hisashi Igawa Ey al. utilized the strategy for root assuming as a visual detecting procedure. They concocted the grape-trunk region by considering existing likelihood dependent on assumed mistake and information spread of point bunches on estimation planes. Also, so as to remunerate this visual detecting procedure they applied tangible detecting strategy utilizing a multi-interface controller. These two estimation frameworks mean to build up a powerful detecting arrangement of weeding robot in grape plantation. They demonstrated the effectivity of control law and of visual and tangible acknowledgment of grape tree with sound system camera and multi-connect controller [7].

III. PRODUCT REVIEW

There are various techniques to remove the uncontrolled weed in the farm in the year 2018 and 2019.

[1] **Weed picking robot (AgBot):** AgBot, published on May 28, 2018, is the top prize winner in 2018. Fig 1.1 show the photo of the boot. It has a camera to capture and locate the different types of weed present in the field. It captures the image, recognizes and sprays the pesticide, fertilizer, herbicide, or weedicide depending on the requirement. The robot looks like a tractor which is implemented with the help of Artificial Intelligence (AI). The tractor has a cutter having two blades to cut the weed from the root.



Fig: 1.1



[2]**RIPPA Werribee Victoria, Australia:**
It discovered RIPPA, the farm robot. It is mainly used to cultivate vegetables like cauliflower. The robot is solar powered with the four wheels like a tractor. It works on neural networks (NN) to which sensors are connected to actuate the system on its own in real-time. It destroys the pests and weeds by constantly moving nozzle spray. Anything obstacle comes in between then the suction pipe catches the obstacle. The cultivator removes the weed by scratching the identified weed. This system fails to recognize seedling or the growing seeds of weed under the ground.



Fig: 2.1

[3] **Agrobotix:** In August 2018, it is claimed by AgEagle flying framework which is a believed accomplice to significant food and item makes and accuracy ranchers looking to adjust and uphold gainful horticulture ways to deal with better cultivating practice which limit the effect on common asset, diminish dependence on info, and material increment crop returns and benefits. It utilizes LASER innovation to consume the weed present in the field in less time. The pH level can likewise be checked. The automaton helped crop the executives recognizes weeds and yields. It is primarily utilized for collecting of yields like grain. This farming method is currently joined in the fields of nations like Brazil, Thailand, Italy, Japan, Turkey, Mexico, Israel, Sweden, and Canada.

[4]**Rotavater:** There is a different type’s rotavator depending on the blades and structure. It is established in 2002 by India. It includes plow, disc plow, and cultivator. It smoothly works on the clod and mixes the upper layer of soil with fertilizers to remove the weed. Its size varies from two and a half feet to seven feet.

[5]**EcoRobotix:** The Swiss company establishes the robot in 2019 figure 5.1 shows the photo of EcoRobotix, which uses twenty times fewer herbicides. The solar-powered robot kills weed for twelve-hour straight. The artificial intelligence (AI) with the libraries and cameras predicts, identifies, and spots the difference between crop and weed without hurting the crops nearby. The two cultivators apply a microdose of herbicide. To get more accurate results it uses blue river technology for spraying.



Fig: 5.1

IV. CONCLUSIONS

In this paper, we review weed removing methods, while explicitly focusing on those which constitute the autonomous robot. The basic classification is used to differentiate various studies with the aspects of theoretical work and practical implementation of the robot system. Also, this article signifies the effectiveness of robotic models over conventional methods including manual removal or chemical pesticide. Authors speculate future research in the practical domain for the effective weed removing without affecting the growth of the desired crop

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