Weed Control Machine Using Iot For The Removal Of Weed In The Agricultural Farm

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Abstract: Weed control in agriculture presents a significant challenge for farmers. Furthermore, present farming techniques make extensive use of herbicides and other chemicals, which might have a negative impact on the environment. These can have an impact on soil fertility as well as water contamination when agricultural runoff enters bodies of water, adversely impacting aquatic ecosystems. It can also have an impact on our health if we consume agricultural goods that are produced using unscientific methods and a high concentration of pesticides. These disadvantages can be avoided by creating a system that can detect and eradicate weeds automatically, either by plucking or spraying herbicides exclusively in the targeted areas.

Index Terms – Weed control, Agriculture, ecosystems.

I INTRODUCTION:

A weed is a plant that is seen undesirable in a specific situation, or "a plant in the wrong location." The presence of these unwanted plants in the field or garden affects crop output and productivity. Weeds absorb the fertilizer, water, and sunlight that reach the field or garden, limiting the amount of these resources accessible to crops. Handpicking is a traditional method of weed control, although it is arduous and time-consuming. Another technique is to spray herbicides across the entire garden or field, which needs a big amount of chemicals and may potentially pose health risks and pollution.

The Internet of Things (IoT) has the potential to transform agricultural weed control by enabling precision weed management through real-time data collecting, analysis, and automated reactions, resulting in more efficient and ecologically friendly practices.

These disadvantages can be avoided by creating a system that can detect and eradicate weeds automatically, either by plucking or spraying herbicides exclusively in the targeted areas. Weed-killing robots can thereby reduce the need for herbicides. It detects and identifies weeds using cameras and image processing algorithms that have no negative impact on crops. The camera's information is sent to the Raspberry pi module, which may be configured to recognize the plant.

Weeds are any undesired plant growth on cultivated ground. Weeds are important in agriculture because not all weeds promote crop growth. Most weeds reduce yield while raising production costs. This paper presents a novel approach to weed detection and categorization in agricultural settings that leverages the combination of Internet of Things (IoT) technologies and powerful Machine Learning algorithms. Weed management is heavily emphasized in modern agriculture in order to maximize crop yields while reducing chemical use. To ensure continuous field surveillance, our suggested system uses a network of IoT sensors equipped with cameras and ambient sensors. Using a network of IoT smart sensors fitted with cameras.

II.LITERATURE REVIEW:

Ganesh Bhogade describe plant disease identification via image processing. According to the paper, the automatic identification of illnesses on plant leaves is an important topic since it may be used to monitor large fields of crops. Various image processing algorithms are utilized to detect illnesses that appear on plant leaves. The provided system is a software solution for the automatic identification and classification of plant leaf diseases. This system comprises of four steps. The first step entails forming the color transformation structure of the input RGB image.

Varsha Sawarkar present an idea for detecting rose plant diseases using image processing. In this research, the diagnosis of rose plant diseases is critical to preventing yield and quantity losses in agricultural products. Diseases impair plant productivity and growth, resulting in decreased plant quality and quantity. Disease detection on plants is crucial for sustainable agriculture. It is quite difficult to monitor plant diseases with the hands. It requires a significant amount of work, specialized understanding of plant diseases, and enough of processing time.

Vignesh Dhandapani describe plant health monitoring by image processing. The study discusses digital image processing approaches for the detection, processing, and identification of plant diseases. Diseases can harm any component of a plant, particularly the leaf. This project only covers methods for identifying illness in leaves. Disease symptoms will be present on the leaves. It is a difficult task to monitor plant diseases manually. A manual plant disease monitoring system requires additional processing time and expertise in the plant disease. As a result, a quick, automated, and precise method for identifying plant diseases is required.

Swati Singh emphasized that plants and crops are the most essential sources of energy since they play an important part in both human existence and all other forms of life on Earth. Plant and crop production in agriculture has recently been employed for purposes other than simply feeding the population. In this regard, the most crucial aspect is the quick and precise diagnosis of the condition. The suggested research examines various strategies for early detection and categorization of sick plants via digital image processing. Agriculturists, like those in agribusiness, detect plant illnesses with their bare eyes. This form of detection necessitates continual supervision, which may be costly and time-consuming on larger farms.

III. PROBLEM DEFINITION:

A weed is a plant that is seen undesirable in a specific situation, or "a plant in the wrong location." The presence of these unwanted plants in the field or garden affects crop output and productivity. Weeds absorb the fertilizer, water, and sunlight that reach the field or garden, limiting the amount of these resources accessible to crops. Handpicking is a traditional method of weed control, although it is arduous and time-consuming. Another technique is to spray herbicides across the entire garden or field, which needs a big amount of chemicals and may potentially pose health risks and pollution. Inability to detect silent heart attacks

The automated weed management methods available now are more advanced and not cheap to small-scale farms. They use advanced programming techniques such as artificial intelligence and machine learning. Because of the complexity needed and the high cost of implementation, most of these solutions are limited to large-scale agriculture. So, if we minimize the cost of implementation, it will be accessible to small-scale farmers and gardeners. The initiative aims to provide a low-cost automated weed control system, specifically for small-scale farmers. The initiative makes it possible by lowering hardware costs and relying solely on image processing and identification techniques to detect weeds to the greatest extent possible.

IV: METHODOLOGY:

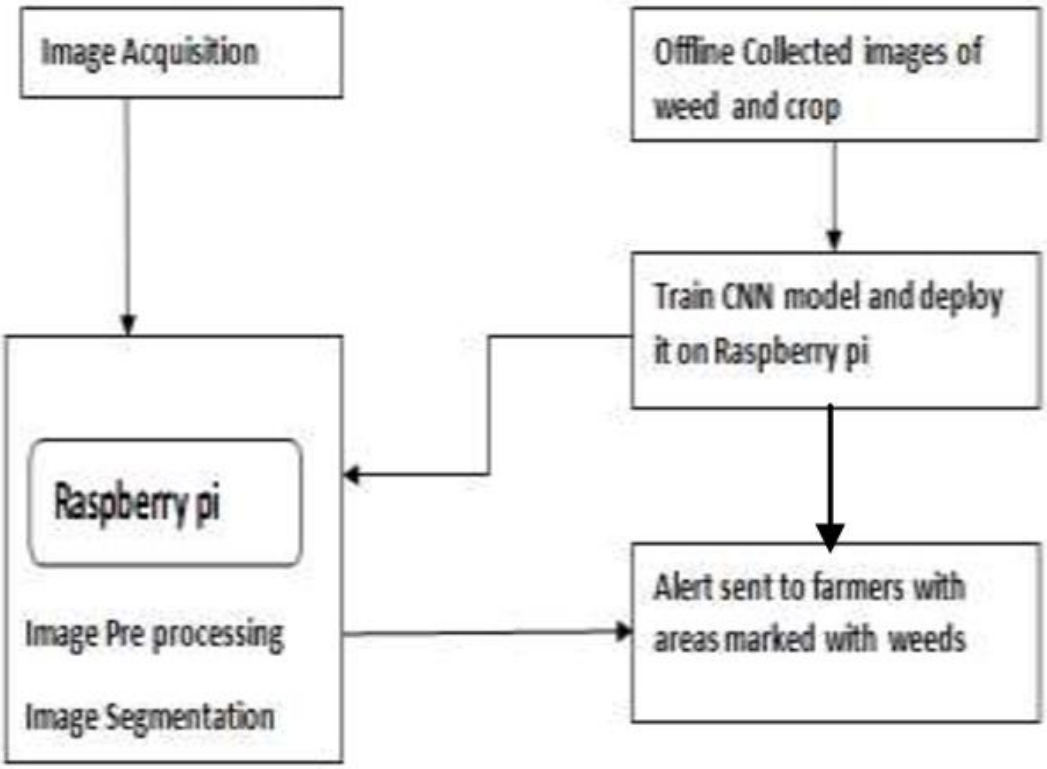

Fig: 1 Block diagram of weed control machine

The proposed system design consists of a Raspberry Pi and camera. Cameras are used to acquire images. The image taken by the camera is forwarded to the Raspberry Pi for processing. Image Preprocessing and Segmentation The suggested methodology includes several stages, beginning with image collection for crops and weeds. The main steps are outlined below.

Data Acquisition and Processing:

IoT sensors, including cameras and environmental sensors, collect real-time data about the field, including images of plants and environmental conditions.

Image Processing and Weed Detection:

Image processing algorithms analyze the captured images to identify and distinguish between crops and weeds.

AI-Powered Weed Identification:

Machine learning models, trained on large datasets of crop and weed images, are used to classify plants and accurately identify weeds.

Targeted Weed Control:

Based on the identified weeds, IoT-controlled robots or systems can be deployed to precisely target and remove or control the weeds, minimizing herbicide usage and environmental impact.

Components used:

Dc Gear Motor: A DC gear motor combines a motor and a gearbox. The addition of this motor lowers the speed while increasing the torque output.A 12v, 100rpm dc motor was employed here. Because it combines a motor with a gear reducer system, it provides a simple and cost-effective solution for high torque, low speed applications. Metal gears provide superior wear and tear qualities. The gearbox is sealed, lubricated with lithium grease, and requires no maintenance. These standard-size dc motors are simple to use.Also, we don't need to invest a lot of money to operate a motor using an Arduino or a related board. By turning on and off coils in sequence, a DC motor may generate a rotation magnetic field. These magnetic fields interact with the magnetic field of the magnet in the secondary component of the motor to generate torque on the armature, causing it to rotate.

Fig :2 DC gear motor

Motor Driver: The L298 is an H-bridge motor driver that controls the speed and direction of two dc motors simultaneously. The module can drive DC motors with a voltage ranging from 5 to 35 volts and a max current. This twin bidirectional motor driver is based on the extremely popular L298 twin H.

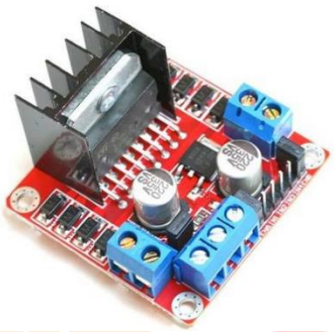

Fig 3: L298 motor driver

Motor Pump:

DC-powered pumps use current flow from a motor, battery, or solar power to move fluid in a variety of ways. This dc motor pump, 3-6v mini micro submersible water pump, is a low-cost, small submersible pump motor that operates on a 2.5-6v power supply.

Fig 4: Motor Pump

Working Principle:

Weed control with IoT uses sensors, image processing, and AI to identify and target weeds, allowing for precise and efficient weed management with little herbicide use and environmental effect.

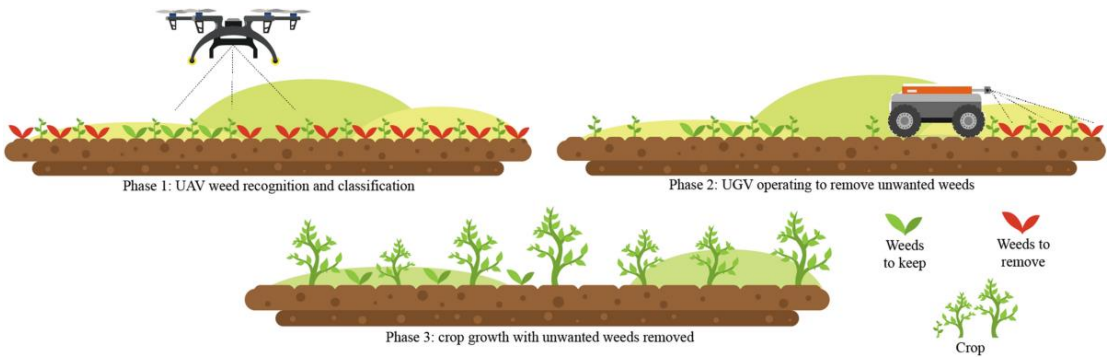

Fig 5: Weed Control Machine

A functional model design for IoT-based weed control typically includes sensors, a microcontroller, and a communication module for monitoring and controlling weed identification and removal, with AI used for picture recognition and automatic spraying or removal.

- **Field:** Representing the agricultural area where weed control is needed.
- **IoT Device:** A box or robot with the sensors, microcontroller, communication module, and actuators.
- **Sensors:** Icons representing cameras, LiDAR, and GPS.
- **Actuators:** Icons representing spray nozzles or weed removal tools.
- **Cloud Platform:** A cloud icon representing data storage and analysis.
- **User Interface:** A screen or dashboard representing monitoring and control.
- **Arrows:** Connecting the components to show the flow of data and control.

Benefits of IoT-Based Weed Control:

- **Precision Weed Control:** Targets weeds accurately, minimizing herbicide use and environmental impact.
- **Reduced Labour Costs:** Automates weed control tasks, reducing the need for manual labour.
- **Improved Crop Yield:** Effective weed control leads to healthier and more productive crops.
- **Real-time Monitoring:** Provides real-time data and insights into weed infestations.
- **Data-Driven Decisions:** Enables data-driven decision-making for optimal weed management.

V.CONCLUSION:

Weed detection in crops can be improved during the herbicide application process; in the case of this application, image processing was critical because obtaining the mask and identifying regions of interest, while keeping in mind that you do not have the same levels of light intensity, was a significant challenge. It is critical that the photographs taken are of crops in their early stages in order to produce a chance of detecting potential weed control.

These disadvantages of traditional weeding techniques are overcome by a system that can automatically detect weeds and eradicate them either by plucking or spraying herbicides exclusively in the required areas. Weed-killing robots can thereby reduce the need for herbicides. It detects and identifies weeds using cameras and image processing algorithms that have no negative impact on crops. The camera's information is sent to the Raspberry pi module, which may be configured to recognize the plant. When a weed is detected, it activates the robotic arm, which has a weed-cutting instrument connected to its gripper.

Reference:

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