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DESIGN & DEVELOPMENT OF COLOUR DECODING AGRI-ROBOT

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***Abstract*—In India, there are numerous varieties of pesticide sprayers. However, farmers prefer backpack sprayers since they are more affordable and simpler to operate, but they take a lot of time to use. Additionally, the farmer who uses pesticides is impacted because they are dangerous to human health and cause lumbar pain in humans owing to the weight of the equipment. The design and building of a robot with a plant spraying mechanism for pesticide with variable spray is so strongly described in this project. We offer a small, lightweight, and stable platform that can autonomously survey the farms in order to carry out this operation. Farmers will benefit from this strategy by utilizing the basic ideas behind sensor technology. The main aim of our project is to design and develop pesticide spray with varying the timing machine. The 3 D model is drawn. All the parts are manufactured and then assembled together and then the testing of model is carried out.**

Keywords—component; formatting; style; styling; insert (key words)

I. INTRODUCTION (*Heading 1*)

Agriculture is the main source of income for Indians, and it also determines the country's economic situation. The vital nutrients for plant growth are frequently produced in the environment. The environmental conditions in which a plant grows determine how it develops. The environmental conditions in which a plant grows determine how it develops. The environment contains the necessary elements, such as CO2, light, moisture, humidity, and ambient temperature. The farmer can become much more familiar with any potential issues that may influence the health of the plants by having a thorough grasp of all these aspects and how they interact. As a result, more appropriate and accurate steps can be implemented to address these issues.

II. DEMAND & NECESSITY OF THE PROJECT

A. Demand

The amount of labour required by the agriculture sector is a source of concern. Japan's population is ageing, making it impossible to fill open positions in the agricultural sector. Similar to the United States, which also rely heavily on immigrants for labour, the country is currently unable to meet demand due to a decline in seasonal farmworkers and intensified government measures to halt immigration. Due of the difficulty to gather all of the crops by the end of the season, businesses are frequently compelled to let them decay. Concerns about the expanding population that will need to be fed in the upcoming years are another issue. As a result, there is a strong desire to enhance agricultural machinery to make it more affordable and practical viable for continued.

B. Necessity of the project

Agribusiness growers, nurseries, and ranchers must deal with a variety of problems while farming, including as risks to human health, pesky crawlies that eat their crops, and respiratory problems. Some horticulture problems are caused by creepy crawlies because they consume and harm ranch goods and foliage. a few cases of illness and its response:

Fungicides: Robots can be used to combat plant diseases that severely impair harvests. The most frequently acknowledged causes of product failure worldwide are parasites. A fungicide, a type of pesticide, is necessary to eradicate a parasite disease. A harvest's growth and development are hampered by parasitic diseases. They damage the leaves, which are necessary for photosynthesis, lowering the profitability of the harvest, and they introduce flaws into the harvests, lowering their value. After the harvest, organisms may develop and contaminate the natural goods, such as vegetables or seeds. Infected plants can be treated by robots, or if necessary, they can be destroyed.

Fig 1. leaves damaged by insects.

C. Objective

- To design and fabricate automatic spray pesticide which spray pesticide According to color.
- The purpose is to reduce the human efforts, operating cost and maintenance cost.
- Spray Pesticide on plant with appropriate quantity.
- Also, this machine keeps the environment clean and healthy.

D. PROBLEM STATEMENT

The past technology of pesticides spray is manually operated these results into more human effort and more time required accomplishing the work. Also, they are spray with the same rate so, some plant which required more or less spray which can't be done by old pesticides spray. In our project we design and fabricate pesticides spray robot which is spray pesticide according to color of plant.

III. LITERATURE REVIEW

[1] "Agricultural robots for field operations: Concepts and components" by Avital Bechar, Clement Vigneault

This magazine offers the innovations and improvements in agricultural robots for field work, together with the related concepts, guiding principles, constraints, and gaps. Robots are extremely complicated, made up of various subsystems that must be linked and properly synchronized in order for them to successfully complete jobs and communicate the necessary information. The use of robots and automation in a range of field operations has been thoroughly studied, and technical viability has been amply proved. Agricultural robots for field work must be able to perform with the same level of efficiency as is already possible in agriculturally unstructured areas. Technology must be designed to overcome constantly changing situations, variability in produce, and settings in order to absorb robotic systems.

[2] "Agricultural Robot" by Kavita Zole, Sanghasevak Gedam, Aditya Dawale, Kiran Nikose, Jayant Hande.

This article presents a design for an advanced agricultural robot that is based on a mechanical and electronic (Mechatronics) platform. The goal of this study is to create a robot that can automatically plough fields and distribute seeds. We have created an electromechanical car with wheels driven by a DC motor for steering. The farm is cultivated by an automated system based on the crop, taking precise rows and columns into account. The solar panel used to charge the DC battery in this project is regulated remotely.

In this journal author tried to present related work of agricultural robot as labor problem can be reduced as compared to the manual and tractor based sowing time, energy required for this robot machine is less. At the same time by using solar energy environment pollution can also be reduced. Development and Automation of Robot with Spraying Mechanism for Agricultural Applications. This is achieved by the design and construction of an autonomous mobile robot for use in pest control and disease prevention applications in commercial Farm.

[3] "HRI usability evaluation of interaction modes for a teleoperated agricultural robotic sprayer" by George Adamides, Christos Katsanos, Yisrael Parmet, Georgios Christou, Michalis Xenos , Thanasis Hadzilacos, Yael Edan

This body of literature demonstrates that effective and efficient human-robot interaction is necessary for teleoperation of an agricultural robotic system. The usability of several interface mechanisms for agricultural robot teleoperation is examined in this research. With regard to a teleoperated agricultural sprayer, we specifically looked at the overall effects of two types of output devices (PC screen, head mounted display), two types of peripheral vision support mechanisms (single view, multiple views), and two types of control input devices (PC keyboard, PS3 gamepad). Construction and field testing of a modular user interface for teleoperating an agricultural robot sprayer. Eight interaction modes—differing combinations of the three factors—were evaluated. Thirty representative participants used each interaction mode to navigate the robot along a vineyard and spray grape clusters based on a 2 2 2 repeated measures experimental design.

[4] "Development of Smart Pesticide Spraying Robot" by Pvr Chaitanya, Dileep Kotte, A. Srinath, K. B. Kalyan

This page describes how to manage food crops, which involves very close monitoring, especially when it comes to the treatment of illnesses that will have negative repercussions after harvest. In crops, disease is defined as a change in or absence of a plant's normal physiological processes, which will result in certain symptoms. The pathogens of any agent are generally considered to be the illness that causes agents in plants. The majority of these pathogenic agents' symptoms are found on the crops' leaves, stems, and branches. Therefore, for efficient and fruitful plant cultivation, the diagnosis of disease and the percentage of disease produced in crops is essential. This can be accomplished by employing a camera to capture the input photos and a machine learning technique to analyses them.

IV. PROPOSED SYSTEM

- This project is a combination of Electronics & Mechatronics called mechatronics. It has a Arduino controller which works as a brain to this project.
- Color sensor is used to identify the color of a leaf predicting up on its colors like green, yellow & brown.
- A storage containing pesticide fluid with water motors and supplies like pipe and nozzle.
- Battery for power supply.
- Dc motors and drivers for the motion of the Agri-Bot, can be controlled with Arduino programing.
- Fertilizer Agri-Robot consist of color sensor & ARDUINO MEGA as main controller,

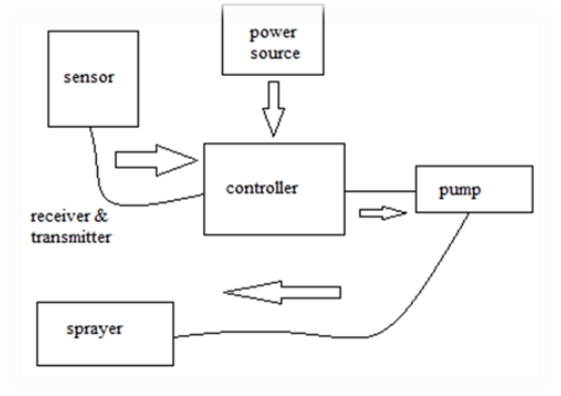

Fig 2. Working Schematic

Color sensor recognizes the color of a sapling and sends the signal to the Arduino mega (which acts as a main controller) through relay. As the Arduino mega receives the signal, it drives the water motor in the tank & pumps water through the pipe from which the fluid is sprayed to the sapling with the help of nozzle. Here, time taken for water fertilization is controlled depending upon the color of a sapling. The delay is given in the water motor upon sensing particular color of plant as mentioned below. For an example

A. Green color = Less water = 5 sec

B. Yellow color = Medium water = 10 sec

C. Brown color = More water = 15 sec

A. Designs

Design Procedure

- Take tracing of 2D drawing of any Suspension model with standard dimensions available, and download.
- Open CATIA software, select sketch tracer from shape designing, select the downloaded 2D drawing and extract all the views on required plane, using create an immersive sketch.
- Now the importation part is over, after importation trace the sketch using free style section using desired plane. (Tracing involves creating of spline on a 2D drawing).
- Create nodes and join nodes using curvature.
- Extract the area to surface,
- Add material Offset thick surface to the required value.
- Convert to IGS or STP file for ANSYS import.

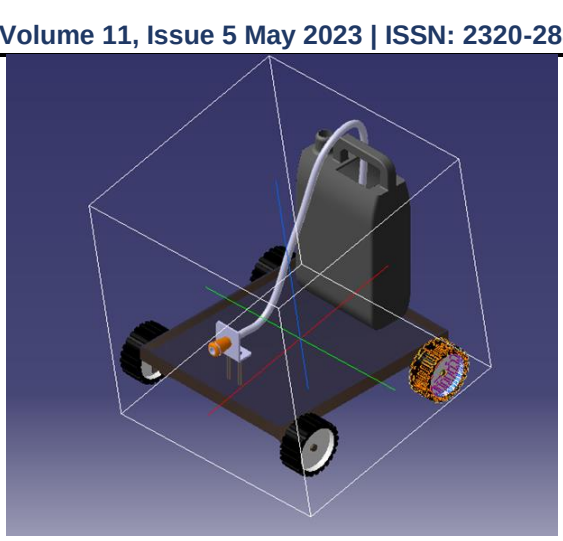

Fig. 3 ISO view of the proposed System.

B. Analytical Calculations

Frame

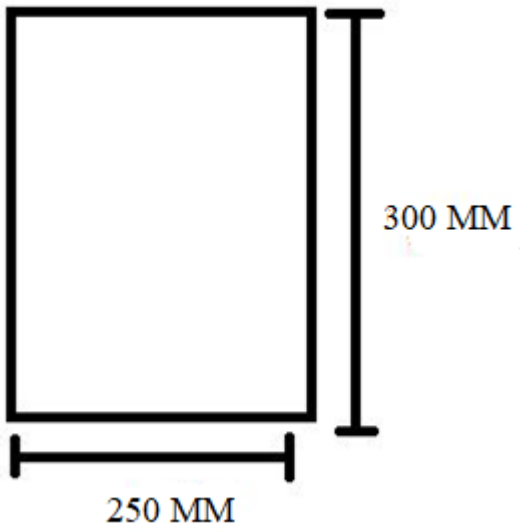

Fig 4. Frame calculation

$$M/I = \sigma b/Y \quad \ldots\ldots s. (1)$$

Area of rectangular

Thickness = 4 MM

W = 300 MM

L = 250 MM

The total surface area of the rectangular prism is given by:

A = 2(lb + bh + lh)

= 2((300 x 200) + (250 x 4) + (300 x 4))

= 154400MM2.

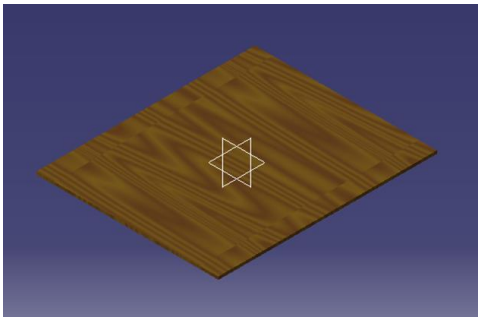

Fig .5 Ply wood design In Catia v5

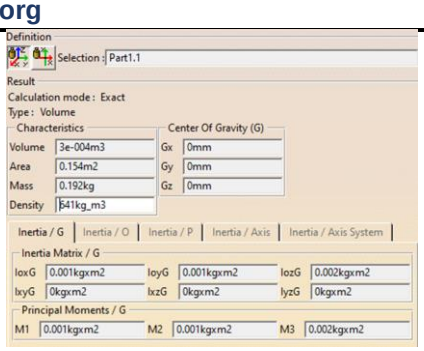

Fig. 6 Material Mass Properties of the Ply Wood From Catia v5 Software

Mass= 0.192 Kg = 0.192 x 9.81 = 1.88352 N

From CATIA v5 software @ Area = 154400mm2 = 0.154mm2

Moment of Inertia ICM = 1/12 x M (w2 +l2)

= 1/12 x 1.88352 (3002 x 2502)

= 23936.4 Nmm2

(Formulas are taken from khurmi gupta-reference book.)

M/I=σb/y …… (1)

Bending moment (M) = force *perpendicular distance

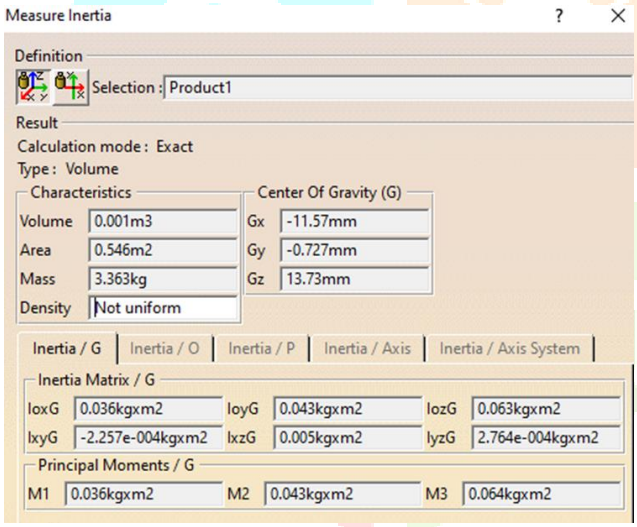

Fig .7 Total mass Properties of the system

Force = total load from CATIA = 3.363 X 9.81 = 32.99103 N

FOS = 1.5 = 32.99103 X 1.5 = 49.48 N = 50 N

Perpendicular distance = 300/ 2 = 150 mm

M = 50X 150 = 7500 Nmm2

M = 7500 Nmm2

I = 23936.4 mm2

Y = Distance of the layer at which the bending stress is consider = 4

4/2 = 2 mm

Sigma b = M X Y / (I)

= 7500 X 2 / (23936.4)

= 0.626N/mm2

Wood Plywood13.8 Ultimate Yield strength

=0.626N/mm2< 13.8 N/mm2

Hence Design is safe.

SELECTION MOTOR

50 N Total Load But Load Is Divided Into 4 Wheels Which Is + 2.5 lter waters =2.5kg=2.5*9.81=28.449=30N

= 50+30/4 = 20 N

Torque = ½ Force X Diameter

= ½ X20*70 mm

= 700Nmm

= 7.13Kg/Cm

Diameter = diameter of wheel (d= 70 mm) standard available in market.

Force = total force including all components(45 N)

HYDRAULIC PUMP OR MOTOR

Assumption

W = 2Kg = of water to be transferred from reservoir to the panel. = 2000grm

T = For a time of 1min = 60 Sec

Delta (h) = 1m

P=W/T

W = Fd

W = mg*Delta (h)

P=m/T*g*Delta (h)

2Kg/min X 1min/60sec

= 0.0334 Kg/sec

P = 0.0334 X 9.81 X 1

= 0.327 Kw required

Power of water pump

According to this we will select water motor required as per the availability in Market.

C. Components Required

1. Arduino Mega
2. Color sensor
3. Receiver & transmitter
4. Relay
5. Water motor
6. Dc motor
7. Motor drives
8. Pipe
9. Nozzle
10. Storage tank
11. Wheels
12. Clamps
13. Frame
14. Battery

a. Color Sensor

- The TCS3200-based Color Sensor is a comprehensive color detector that can recognize static color.
- A square wave with frequency directly proportionates to incident light intensity is the sensor's output. Additionally, fill light from onboard LEDs is supported.
- It has 4 white LEDs and a TAOS TCS3200 RGB sensor chip.
- Applications include test strip reading, sorting by color, ambient light sensing and calibration, and color matching, to mention a few. • The TCS3200 can detect and measure a virtually infinite spectrum of visible colors.

Specifications

High-resolution conversion of light intensity to frequency; single-supply operation (2.7V to 5.5V); programmable colour and full-scale output frequency; power-down feature; communicates directly to 5V Microcontroller OUT Pin: Output frequency OE Pin: Output frequency enable pin (active low), can be impending when utilising Support LED lamp light supplement control S0S1: Output frequency scaling selection inputs S2S3: Photodiode type selection inputs.

Fig .8 TAOS TCS3200 RGB sensor

b. Arduino UNO

Arduino Board are able to read inputs Like- light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

Uses In our Project

In This project Arduino is used as a external controller where it propagates all the activity inheriting of Battery, like Receiving and transmitting the data of system from Internal color sensor.

Fig. 9 Arduino UNO

V. CONCLUSION

The proposed system deals by preventing Human resources required for fertilizing the plants with pesticide fluid. This system is fully autonomous with Arduino Controller Monitoring of Fertilizing water of fluid on to the plant saplings, it also comes with a TCS Colour Sensor which propagates the sprayer if the Plant sapling has a particular color of its determination like green, yellow & Red or Brown Leaves. Another automation is Wireless connection for the developed. Finally, all the thesis part has been completed Problem definition, Literature, Design, calculation & components required all segments have been sated & also programming & testing Frame also has been developed successfully.

- Until now we have studied several literatures surveys & estimated the components & other software requirement for this project.
- Further in we have analytically calculated the components sizes and requirement of dimensions according to the cost reduction procedure.
- Created a 3D model upon CATIA v5 Software.
- We also had developed the model according to the created Feasibility of model.
- Code And connect the components.
- Finally test and observe.

A. Estimation & Costing

Sl No	Components	Specs	Price
1.	Arduino	1x	950/-
2.	Nozzle	1 X	75/-
3.	DC Motors	2 X	945/-
4.	Pipe	1 m	125/-
5.	L29 3D motor Driver	2X	675/-
6.	Water Motor	1 X	275/-
7.	Water Storage	1 X	165/-
8.	Clamps, frame and wheels	-	1750
9.	Color sensor	1X	650/-
10.	Battery	1X	975/-
11.	Other Components like door teak wood resistor & buzzer etc.	-	500/-
12.	Fabrication	-	**2000/-**
	Total	-	**9,085/-**

Fig. 10 Cost Estimation

B. Possible Outcome

1. Fully Autonomous
2. Require less work-force.
3. Less wages.
4. Easy to operate

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