



DESIGN AND FABRICATION OF PESTICIDES SPRAY ROBOT.

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Abstract— - There are many types of pesticides sprayer are available in India. But mostly used sprayer is backpack type sprayer which is used by farmers because it is cheaper, easy to use but it requires lot of time. Also, the farmer which is spraying pesticides is affected by it as it is harmful to human health and human also affect by the lumbar pain due to weight of equipment. Thus, this project vigorously describes the design and construction of a robot featuring plant spraying mechanism for pesticide with varying spray. To realize this work we provide a compact, portable and a well founded platform that can survey the farmland automatically. This approach will help farmers using fundamental principles of Sensor's 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— pesticides sprayer robot, 3D model, Colour sensor, agricultural robot, technical feasibility, human health, Environmental effect

I. INTRODUCTION

The main business of Indian people is agriculture and the economy of the nation is decided by agriculture. The essential nutrients for plant growth are commonly generated in its surroundings. The plant development process depends on the conditions of the environment, where plant grows. The plant development process depends on the conditions of the environment, where plant grows. The necessary parameters like, humidity, light, moisture, ambient temperature and CO₂ etc. are consists in the environment. Deep understanding of all these factors and their relationships can help the farmer to get much familiar with any of the potential problems that will affect the health of the plants and thereby more appropriate and accurate measures can be taken to get rid of these problems. In conventional methods, manually operated low and high volume hydraulic sprayer and power operated hydraulic sprayer with long boom, long lances or spray gun are used to carry fluid at different targets. In this method, the time and labour required is more. It is difficult to spray the pesticide uniformly and effectively throughout the tree by conventional method of spraying. Though this method gives good pest control, it consumes large volume of liquid per plant, great amount of time and labour are required. Also drip losses are more. Owing to concern towards protecting environment from pollution by excessive use of pesticide and to economies the spraying method suitable alternative should be identified. In India, diverse farm mechanization scenario in country due to varied size of the farm holdings and socio economic disparities. Most of farmer in India are small and marginal land holder. The spraying operation done by Knapsack sprayer which consumes more time and energy. Tractor operated sprayers are difficult for adaption by the farmer due to existing cropping patterns, available field size, field condition during the rainy season. In order to reduce the harm to the environment and people the research and development of plant protecting machine focus on improving the mechanical work efficiency and the effective availability of pesticide.

II. MOTIVATION

There are concerns over the amount of labour the agricultural sector needs. With an aging population, Japan is unable to meet the demands of the agricultural labour market. Similarly, the United State currently depends on a large number of immigrant workers, but between the decrease in seasonal farmworkers and increased efforts to stop immigration by the government, they too are unable to meet the demand.

Businesses are often forced to let crops rot due to an inability to pick them all by the end of the season. Additionally, there are concerns over the growing population that will need to be fed over the next years. Because of this, there is a large desire to improve agricultural machinery to make it more cost efficient and viable for continued use.

III. RELATED WORK

I. STUDY OF CAD

Computer-aided design (CAD) is the use of computer systems (or workstations) to aid in the creation, modification, analysis, or optimization of a design. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing. CAD output is often in the form of electronic files for print, machining, or other manufacturing operations. The term CADD (for Computer Aided Design and Drafting) is also used. Its use in designing electronic systems is known as electronic design automation (EDA). In mechanical design it is known as mechanical design automation (MDA) or computer-aided drafting (CAD), which includes the process of creating a technical drawing with the use of computer software. CAD software for mechanical design uses either vector-based graphics to depict the objects of traditional drafting, or may also produce raster graphics showing the overall appearance of designed objects. However, it involves more than just shapes. As in the manual drafting of technical and engineering drawings, the output of CAD must convey information, such as materials, processes, dimensions, and tolerances, according to application-specific conventions. CAD may be used to design curves and figures in two-dimensional (2D) space; or curves, surfaces, and solids in three-dimensional (3D) space.

2. There are two types of 3D Solid Modelling

Different type of material in powder form or solid form is separated by using two-level screening machines. This machine can be used in different industries like mining, chemical, food & in metallurgical industries to separate component in different sizes. The work can be done by very few people. It requires very less time for completing work. This screening machine is made up of solid material like steel having high strength. It has two opening sides, from which different types of sand are obtained. In that screening machine two screens are placed to separate different size of components. The screens are made up of the wire mesh and come in various grid sizes. Parametric modelling allows the operator to use what is referred to as "design intent". The objects and features created are modifiable. Any future modifications can be made by changing how the original part was created. If a feature was intended to be located from the centre of the part, the operator should locate it from the centre of the model. The feature could be located using any geometric object already available in the part, but this random placement would defeat the design intent. If the operator designs the part as it functions the parametric modeler is able to make changes to the part while maintaining geometric and functional relationships. Direct or Explicit modeling provide the ability to edit geometry without a history tree. With direct modelling, once a sketch is used to create geometry the sketch is incorporated into the new geometry and the designer just modifies the geometry without needing the original sketch. As with parametric modelling, direct modelling has the ability to include relationships between selected geometry (e.g., tangency, concentricity). Top end systems offer the capabilities to incorporate more organic, aesthetics and ergonomic features into designs. Freeform surface modelling is often combined with solids to allow the designer to create products that fit the human form and visual requirements as well as they interface with the machine.

IV. METHODOLOGY

Step 1: - We started the work of this project with literature survey. We gathered many research papers which are relevant to this topic. After going through these papers, we learnt about grass cutter and pesticide spray machine.

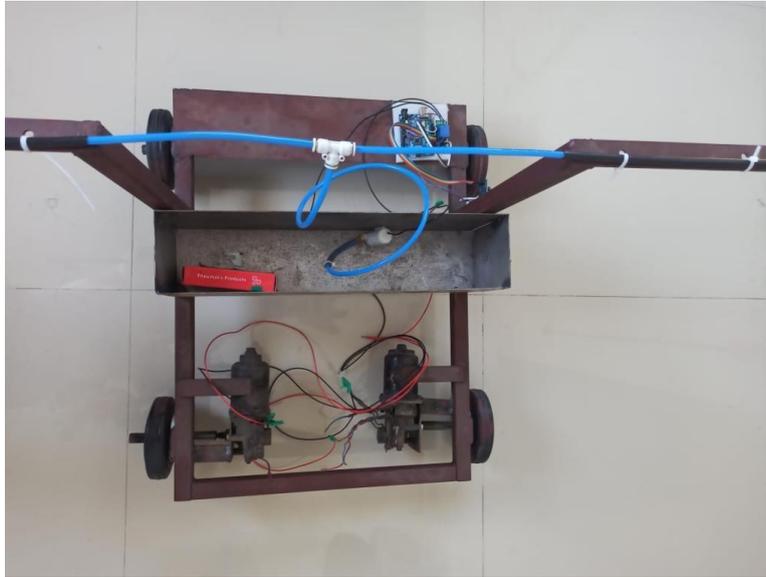
Step 2: - After that the components which are required for my project are decided.

Step 3: - After deciding the components, the 3 D Model and drafting will be done with the help of CATIA software.

Step 4: - The components will be manufactured and then assembled together.

Step 5: - The testing will be carried out and then the result and conclusion will be drawn.

V. EXPERIMENTAL SETUP



VI. MAIN COMPONENTS

NOZZLES:

A nozzle is a device designed to control the direction or characteristics of a fluid flow (especially to increase velocity) as it exits (or enters) an enclosed chamber or pipe. A nozzle is often a pipe or tube of varying cross sectional area and it can be used to direct or modify the flow of a fluid (liquid or gas). Nozzles are frequently used to control the rate of flow, speed, direction, mass, shape, and/or the pressure of the stream that emerges from them. In a nozzle, the velocity of fluid increases at the expense of its pressure energy.

SPRAY:

A spray nozzle is a precision device that facilitates dispersion of liquid into a spray. Nozzles are used for three purposes: to distribute a liquid over an area, to increase liquid surface area, and create impact force on a solid surface. A wide variety of spray nozzle applications use a number of spray characteristics to describe the spray. Spray nozzles can be categorized based on the energy input used to cause atomization, the breakup of the fluid into drops. Spray nozzles can have one more outlets; a multiple outlet nozzle is known as a compound nozzle. Spray nozzles range from heavy duty industrial uses to light duty spray cans or spray bottles.

UNO ARDINO ATMEGA328P:

Nowadays, with Microcontrollers being relatively cheap and readily available in the market, making a purchase decision on a suitable one to pick might be a hard task to handle. However, there's one particular model that's good to start with for users. That model is the ATmega328p, an 8-bit AVR microcontroller. ATmega328P is a high performance yet low power consumption 8-bit AVR microcontroller that's able to achieve the most single clock cycle execution of 131 powerful instructions thanks to its advanced RISC architecture. It can commonly be found as a processor in Arduino boards such as Arduino Fio and Arduino Uno.

WIPER MOTORS:

Wipers have helped in many ways especially when rainy conditions kick in when water drops fall on the window shield. Seeing the wiper blades swipe the window seems simple like simple mechanism but you'd be surprised on how it functions explicitly. These smooth motions are only made possible from the key mover in windshield wiper and these are the wiper motors. Wiper motors are devices in the wiper system that function on a power supply in order to move the wiper blades in a smooth motion. Like other motors, the wiper motor rotates continuously in one direction which is converted into a back and forth motion. Its composition entails a lot of mechanical linkages each playing a role in initiating the movement. The gearhead motor is the type of wiper motor known for its abundance in torque.

XCLUMA Tcs3200 Color Sensor Gy-31 Tcs230 Module

- TCS3200 Color Sensor is a complete color detector, including a TAOS TCS3200 RGB sensor chip and 4 white LEDs. The TCS3200 can detect and measure a nearly limitless range of visible colors. Applications include test strip reading, sorting by color, ambient light sensing and calibration, and color matching, to name just a few.
- The TCS3200 has an array of photodetectors, each with either a red, green, or blue filter, or no filter (clear). The filters of each color are distributed evenly throughout the array to eliminate location bias among the colors. Internal to the device is an oscillator which produces a square-wave output whose frequency is proportional to the intensity of the chosen color.
- Single-Supply Operation (2.7V to 5.5V)
- High-Resolution Conversion of Light Intensity to Frequency
- Programmable Color and Full-Scale Output Frequency
- Power Down Feature
- Communicates Directly to Microcontroller
- S0~S1: Output frequency scaling selection inputs
- S2~S3: Photodiode type selection inputs
- OUT Pin: Output frequency
- OE Pin: Output frequency enable pin (active low), can be impeding when using
- Support LED lamp light supplement control

SUBMERSIBLE MINI WATER PUMP - 3-6V D Micro DC 3-6V

Micro Submersible Pump Mini water pump For Fountain Garden Mini water circulation System DIY project. This is a low cost, small size Submersible Pump Motor which can be operated from a 3 ~ 6V power supply. It can take up to 120 liters per hour with very low current consumption of 220mA. Just connect tube pipe to the motor outlet, submerge it in water and power it. Make sure that the water level is always higher than the motor. Dry run may damage the motor due to heating and it will also produce noise. Specifications:-

- Operating Voltage : 3 ~ 6V
- Operating Current : 130 ~ 220mA
- Flow Rate : 80 ~ 120 L/H
- Maximum Lift : 40 ~ 110 mm
- Continuous Working Life : 500 hours
- Driving Mode : DC, Magnetic Driving
- Material : Engineering Plastic
- Outlet Outside Diameter : 7.5 mm
- Outlet Inside Diameter : 5 mm
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VII. CONCLUSION

Possible conclusions that could be drawn from the use of a pesticide spray robot include increased efficiency and productivity in agriculture, reduced labor costs, and improved environmental outcomes. By using a robot to apply pesticides, farmers can optimize their use of resources and reduce waste, which can help to improve the sustainability of their farming practices. Additionally, by reducing the need for human workers to apply pesticides, farmers can reduce the risk of exposure to harmful chemicals and improve worker safety. Overall, the use of a pesticide spray robot has the potential to revolutionize the way that pesticides are applied in agriculture and to improve the outcomes for farmers, workers, and the environment.

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REFERENCES

1. "Agricultural robots for field operations: Concepts and components" Avital Bechar, Clement Vigneault Institute of Agricultural Engineering, Agricultural Research Organization, The Volcani Center, Bet-Dagan, Israel <https://doi.org/10.1016/j.biosystemseng.2016.06.014> Biosystems Engineering Volume 149, September 2016, Pages 94-111
2. "AGRICULTURAL ROBOT" Kavita Zole, Sanghasevak Gedam, Aditya Dawale, Kiran Nikose, Jayant Hande Research Student, Dept. of ETC, Priyadarshini J L College of Engineering Nagpur, Maharashtra, India International Engineering Research Journal (IERJ), Volume 3 Issue 4 Page 6521-6523, 2020 ISSN 2395-1621
3. "HRI usability evaluation of interaction modes for a teleoperated agricultural robotic sprayer" George Adamidis, Christos Katsanos, Yisrael Parmet, Georgios Christou, Michalis Xeons, Thanasis Hadzilacos, Yael Edan <https://doi.org/10.1016/j.apergo.2017.03.008> Applied Ergonomics Volume 62, July 2017, Pages 237-246
4. "Development of Smart Pesticide Spraying Robot" by Pvr Chaitanya, Dileep Kotte, A. Srinath, K. B. Kalyan International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue-5, January 2020
5. "Application of systematic methods in the electromechanical design of an agricultural mobile robot" Rubens Andre Tabile, Eduardo Paciencia Godoy, Giovana Tripoloni Tangerino, Arthur José Vieira Porto, Ricardo Yassushi. Inamasu, Rafael Vieira de Sousa 10.3182/20130828-2-SF-3019.00052 .
6. "Autonomous Pesticide Spraying Robot for use in a Greenhouse" by Philip J. Sammons, Tomonari Furukawa and Andrew Bulgin Research gate September 9, 2005
7. "Colour sensors and their applications based on real-time colour image segmentation for cyber physical systems" by Neal N. Xiong, Yang Shen, Kangye Yang, Changhoon Lee and Chunxue Wu [https://doi.org/10.1186/s13640-018-](https://doi.org/10.1186/s13640-018-0258-)

