

Multipurpose Agricultural Robot

Dudhat G.S.¹ Deokar A.A.² More A.D.³ Shedge R.B.⁴ Prof. Dhage S.K.⁵

^{1,2,3,4}Student ⁵Assistant Professor

^{1,2,3,4,5}Department of Mechanical Engineering

^{1,2,3,4,5}S.C.S.C.O.E, Shrishivajinagar, Rahuri, Maharashtra, India

Abstract— Automation was the rage of the engineering world. Developed agriculture needs to find new way to increase efficiency. One approach is to utilize available information technologies in the form of more intelligent machines to decrease and target energy inputs in extra effective way then in the past. The precision farming has shown benefits of this approach but we can now move towards the new generation of equipment. The advent of autonomous system gives us the opportunity to develop a complete new range of agriculture equipment based on small smart machines that can do the right thing, at the right place, the right time in the right way. The investigation on the existing spraying, grass cutting machine reviews the following drawbacks such as high investment cost, the impurity, extra manpower and time consumption caused by manual processing. The setup has simple arrangement.

Key words: Cutting Blades, Small blower, Storage tank, Infrared Sensors, pipes, Solar Plate, Battery

I. INTRODUCTION

The idea of robotic agriculture (agricultural environments serviced by smart machines) is not a new one. Many engineers have developed grass cutters, sprayer in the past but they have not been successful as they did not have the ability to embrace the complexity of the real world. Most of them assumed an industrial style of farming where all was known earlier hand and the machines could work entirely in predefined ways much like a production line. The approach is now to develop smarter machines that are intelligent sufficient to work in an unchanged or semi natural environment. These machines do not have to be intelligent in the way we see people as intelligent but must display sensible behavior in known contexts. In this way they should have sufficient intelligence embedded within them to behave sensibly for long periods of time, unattended, in a semi-natural environment, whilst carrying out a suitable task. One way of considerate the complexity has been to identify what people do in certain situations and decompose the actions into machine control. This is called behavioral robotics and a draft method for applying this approach to agriculture. The approach of cutting crop and soil mixing selectively according to their needs by minor independent machines is the natural next step in the progress of Precision Farming (PF) as it reduces the field scale right down to the individual plant or Photo-technology. One simple meaning of PF is doing the correct object in the correct place at the correct time with the right amount. This definition not only applies to robotic agriculture (RA) and Photo-technology but it also denotes a level of automation characteristic in the machines. Automatic sensing and control for each task is also important and many research papers have shown that these systems are feasible but maximum are too unhurried, and hence not economically possible, to be operated on a worked sprayer & cutters. Once these systems are mounted

on an autonomous vehicle, they may well suddenly become commercially possible. To do this we must stop defining plant care in terms of the current mechanization but in terms of what the plant needs. Actually how many amount of fertilizers are required to plant is most important design a better way of dealing with them. By using this system we can save the costly fertilizers waste. The environmental implications would seem good. Minimized inputs to reduce waste and pollution. Modern agriculture uses a lot of energy. It comes in many forms from fertilizers and chemicals to plants. The multi-tasking agriculture robot approach tries to target the introduced energy to improve efficacy. Energy saving can be made in cultivation energy by moving from traditional trafficked systems to a non-trafficked system. Manual sprayers cannot work in high winds this problem can avoid by using sensor operated sprayers but increasing pressure. Perhaps it will be probable to develop lesser, less disturbing machinery that can allow additional tasks to be carried out in marginal conditions. An example might be an autonomous cutter, sprayer, blower that could work properly well. Most of the current machinery is very weather dependent. Safety is another important factor. Any autonomous vehicle is going to go wrong at some time and the chance of catastrophic failure should be minimized within the design process. A small light vehicle is inherently safer than a large one. Redundant, self-checking systems should be constructed into the system architecture to allow elegant degradation. The vehicle should be in continual communication with the base station, giving data about current conditions and contexts.

II. LITERATURE SURVEY

D.D. Tekale: - Experiments were conducted in laboratory to study the performance of centrifugal flow mist blowers based on air velocity, air discharge, efficiency and power requirement.

Nitish Das: - By mechanization in spraying devices fertilizers and pesticides are distributed equally on the farm and reduce the quantity of waste, which results in avoidance of losses and wastage of input applied to farm. It will decrease the cost of production. It will reduce the cost of production.

A.P. Magar: - it was found necessary to have a grass cutter which can be operated by electricity (motor) with lowest primary cost and can be operated by unskilled labor. The newly developed grass cutter was able to operate at an average speed of 2km/hr. without disturbance in operation.

S.P. Singh: - Measurement using ultrasonic sensors is one of the cheapest among various options. In this paper distance measurement of an obstacle by using distinct ultrasonic transmitter, receiver and a microcontroller is presented.

III. METHODS

A. Conventional method

In the conventional method the equipment use for agriculture purpose was a distinct unit like spraying machine, dusting machine, cutting machine as shown in below figure.

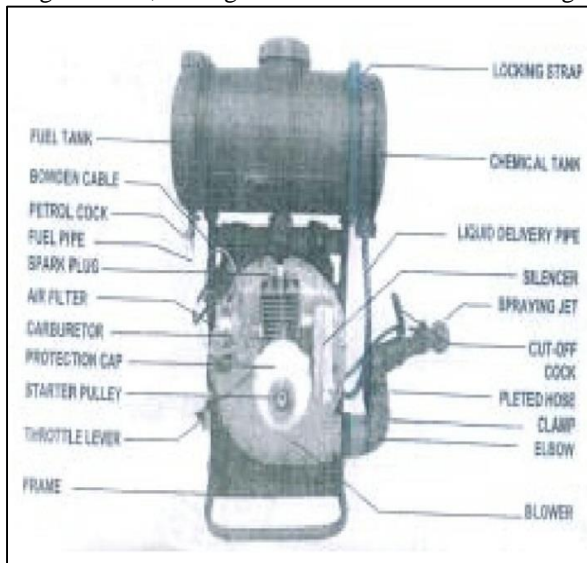


Fig. 1: Spraying Machine

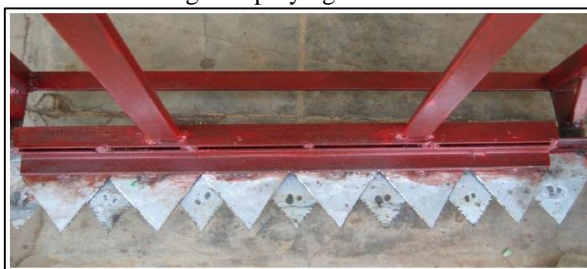


Fig. 2: Cutting Machine

B. Advanced Method

Below Figure Shows Three Mechanism mounted on the single foundation which is different from the conventional method in which all the three equipment's where working as single unit.



Fig. 3: Three in one machine

IV. PROBLEMS IN AGRICULTURAL FIELD EQUIPMENTS

The main problem we observed was that the cost of equipment's likes spraying machine, dusting machine and cutting machine. Also the accessibility of such machine in the single unit. Also the convectional equipment's used, required the fuel for their working this increase the

maintenance of the equipment. Also the problem like pollution is caused by the convectional equipment's. If the equipment's are working on the electricity then the work is stationary during the time when the electricity is not existing this cause delay in the working, which can growth the disease in the plant if electricity is not present for the several days. Also the cutting the grass in the farm ground requires number of labors which is fairly hard now a day, also the charges to be pay are increasing day by day which cannot be affordable for the poor farmer. And also the work is not complete in time. Also the convectional blower machine is very expensive and it works on the tractor machine. The cost of tractor machine in very high. This tractor machine and blower machine is out of cause of poor farmer. The cutting machine value is also very high and cutting of grass in the farm field has to be done continuously this requires lot of labors means extra rise in the cost while doing the farming. The spraying machine is the most significant now days due to which the price is increasing, also it is operated with the help of electricity of diesel machine means it will not be capable to operate without the electricity or the diesel machine. The diesel machine will cause pollution. The drenching is also the main function to be performed in case of tomato farm field in the Rainy season. The maintenance apparatus is very costly of all this instruments. The breakdown of a single part will cost too much to the farmer.

A. Need

The main intention after this is to construct the equipment which are important for the farm field with the suitable cost which will be affordable for the poor farmer and also the efficiency of the apparatus should be high, so that all farmer can select it first relatively going to the convectional equipment's. The other need is the labor availability, now a day the labor is not being simply accessible. Also if they are accessible the working cost of them is very high and the efficiency of the labor is very low. This can cause the working time to be rise. Therefore the work will not be finished in the given time. When we use the convectional machine like the diesel machine the main problem caused by this machine is the pollution. The pollution is the main difficulty now a day. Because of the contamination, the human life is getting disturbed and also the temperature of the environment is increasing this disturbed the human comfort. Also there are very far nonconventional energy source existing in our surrounding which can be used rather than the convectional source of energy. We are using the solar energy as the main source for finishing the changed operation. If we don't use the solar energy it will be wasted. Also it has no harmful effect like polluting the surrounding environment. And also the solar energy is freely available, we has to not pay for it. The tricking of solar energy is very easy and also conversion of it into the electricity is very easy. The equipment's required for the conversion of solar energy is easily available in the market with the suitable low cost.

V. CONSTRUCTION & WORKING

A. Construction of spraying machine

It consist of solar plate, battery, on off switch, centrifugal pump fluid caring pipe or tube, nozzle, fluid containing tank, a 12 volt dc motor, power conducting wire.

B. Working of spraying machine

The solar energy is trapped with the help of solar plate this energy is stored in the battery. The power is provided to the centrifugal pump when the on off switch is on, the pump gets operated it pumps the fluid from the fluid tank this fluid is passed through the tube towards the nozzle where the nozzle will spray the liquid consistently over the plant. We can use this machine as a drenching machine by removing the nozzle, as per requirement in the farm field. The 12 volt dc motor is used to regulate the angle of spraying machine as per process to be completed.

C. Construction of Blower Machine

Blower machine consist of rotary fan, gearing arrangement, blower pipe, solar plate, battery, motor, powder container, switch, adjusting rod.



Fig. 4: Blower

D. Working of blower machine

The solar plate trappers, traps the solar energy and the power is kept in the battery. This power is used to initiate the system. The switch is on and the power is given to drive system which operates the rotary fan. The powder to be spray falls in front of the rotary fan by mean of air pressure the powder is compulsory out of the pipe. The adjusting rod is used to adjust the powder falling from the powder container according to necessity.

E. Construction of Cutting Machine

It contains motor, cutting blades, switch, solar plate, battery, adjusting stand.

F. Working of Cutting Machine

The solar energy stuck in the solar plate is kept in the battery. This energy is given to the motor due to this motor start running. The cutting machine is attached to the motor, when the supply is given to motor, motor starts running simultaneously cutting machine starts. The grass is trapped in the cutting blades because of this the grass is being cut.

G. Ultrasonic Sensors Principle

Ultrasonic transducer uses the physical characteristics and different other effects of ultrasonic sound of a specific frequency. It may transmit or receive the ultrasonic signal of a particular strength. These are available in piezoelectric or electromagnetic versions. The piezo-electric type is usually desired due to its lower cost and simplicity to use [5]. The Ultrasonic wave propagation velocity in the air is approximately 340 m/s at 15°C of air or atmospheric temperature, the same as sonic velocity.

Distance measurement of an object in the path of a person, equipment, or a vehicle, stationary or moving is used in a number of applications such as robotic movement control, blind man's walking stick, medical applications, vehicle control etc. Measurement using ultrasonic sensors is one of the inexpensive among different options. In this paper distance measurement of an obstacle by using separate ultrasonic transmitter, receiver and a microcontroller is presented. The experimental setup and results are described and explained.



Fig. 5: ultrasonic sensor

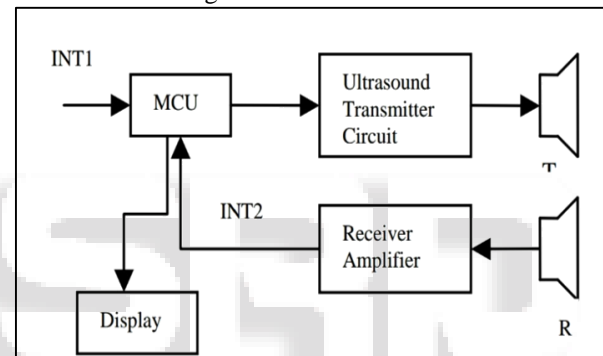


Fig. 6: Block Diagram of the System

VI. ADVANTAGES

- It is contamination free.
- It is cost effective.
- It is simple in operation.
- Various operations can be performed at a time.
- It easily portable.
- It has less maintenance cost.
- It has high efficiency.
- It has assembly is easy.
- Skilled operator not required.
- It has Smooth operation.
- Controlling of operation easy.

VII. DISADVANTAGES

- It has Initial cost is high.
- Power supply problem.
- It has Wear & tear Problem.

VIII. APPLICATION

- Agriculture
- Garden
- Forest
- Small nurseries

IX. CONCLUSION

This paper has set out a vision of how aspects of crop saving & increase production could be automated in the future. Although existing manned operations can be effective over big areas there is a potential for decreasing the scale of treatments with autonomous machines that may result in greater efficiencies. The development method may be incremental but the overall concept requires a paradigm shift in the way we think about mechanization for Fertilizers saving. Farmer needs to use modified techniques.

ACKNOWLEDGEMENT

We would like to recognize the contributions to these concepts by various people around the world that are too numerous to mention here. Particular acknowledgement should go to the Agro Technology group for their innovative thinking.

REFERENCE

- [1] Nitish Das, Namit Maske, Vinayak Khawas, Dr.S.K. Chuadhary, April 2015 Agricultural Fertilizers and Pesticides Sprayers, ISSN (online): 2349-6010
- [2] A.P. MAGAR, M.D. ABUJ, T.B. BASTEWAD AND P.V. ADAGALE , Performance evaluation of grass cutter Vol. 3 No. 1 (April, 2010) : 153-155
- [3] K. Shrivastava, A. Verma, and S. P. Singh, Distance measurement of an object or obstacle by ultrasound sensors using P89C51RD2 Vol. 2, No. 1 February, 2010 1793-8201
- [4] D.D. TEKALE, A.R. MANTRI AND S.C. KAWADE, Performance evaluation of centrifugal flow mist blowers in laboratory, Vol. 2 No. 2 (October 2009 to March 2010) : 197-201.