Review Article

ADVANCEMENT IN AGRICULTURE ROBOTS: REVIEW PAPER

Neha Kaushik[1]., Sagarsharma[1]., Shubhamkhandelwal[2]., Manoj kr. Pandey[3] and Tejender Singh Rawat[3]

[1]Department of Electronics and Communication, Student at Amity University Haryana, India
[2]Department of Electrical and Electronics, Student at Amity University Haryana, India
[3]Department of Electronics and Communication, Asst. Prof. at Amity University Haryana, India

DOI: http://dx.doi.org/10.24327/ijrsr.2017.0805.0244

ARTICLE INFO

ABSTRACT

A review is depicted on agriculture robot technologies. Agricultural growth requires innovative technologies to increase efficiency and decrease labor. Worldwide projects have been done keeping in mind the ultimate aim to reduce manpower and increase efficiency. Some projects have come up with robots to harvest crops like wheat and alfalfa while some robots help in ploughing and seeding purpose. Some great technologies like flying robots have also been taken in use in the field of agriculture. Drones are a perfect example for such technologies, which help in spraying pesticides. Autonomous systems in the field of agriculture give us the chance to develop innovative powerful machinery which can serve our purpose efficiently. Such machines are able to perform the required task at the exact place, at the exact period and in the exact mode. The main objective of self-governing cultivate robot is efficient utilization of resources and to reduce labor work.

INTRODUCTION

Agriculture contributes a very large part in the Indian economy. Almost two-third of population is dependent on agriculture directly or indirectly. Agriculture is the basis of life as it provides us with food, fodder and fuel. Agricultural development should be the priority because the Govt. and the nation would both fail to flourish if agriculture could not be successful.

Farming has inflamed rom a physical trade to vastly developed business, exploiting huge gathering of apparatuses and machineries. Now the investigators are concentrating to the obligation of self-governing farming automobiles. Currently many agronomic tasks are computerized and several programmed technologies such as robots are accessible lucratively [1].These types of instructed systems having powerful and attainable model with a number of integrated functionalities is the demand of future in every field of knowledge for the persistence of the association. Excluding them further requirements stand in relations of truthfulness essentially required in the process and that are: tunneling penetration and specific peak distances between rows [1]. Whereas the other mode of operations like ploughing, seeding

and crop cutting relies on planting phase by getting the precise locality of crop, then repeating the similar procedures on it accordingly. The key stage for succeeding the processes is to maintain exactness in seed sowing method [1]. Allowing the physical pose of a robotic system, farmer's existing condition in a specific area shows a major role in manipulating the features. Considering the fact of farming industry of India, the developed system must have the advantages over conformist methods and tractors in terms of cost, speed, accuracy, fuel in taken and physical drive required by mortal for it.

Comparison of Existing Agricultural Technologies

Existing techniques rely on the conduct of human for ploughing, seeding, harvesting, spraying and fruit picking. Humans are accent to perform in perceptive environment while spraying substances and pesticides on the crops for controlling the infection. The tractors truncate the soil, as they are weightier. These techniques cannot recognize the yield and soil in vicinity. In the polemic of automate farming which demonstrates cultivated robot as the solution of above difficulties. Robots nub fake agitatedly in all over circumstances; all you have to do is put a program to achieve the preferred actions. Despite the fact that, elephantine sized

---

Corresponding author: **Tejender Singh Rawat**
Department of Electronics and Communication, Asst. Prof. at Amity University Haryana, India

rolls are essential in muddy soils, robots having small sized rolls enact well. Conditioned scouts are hold to succeed inunmitigated data about the crop such as the uniformity of diseases, weeds, pest adulteration and other stressful situations.

a

B

Fig 1(a) Existing Technique **(b)** Automate Technique

Table 1 Comparison of sowing practices

Serial No.	Parameters	Manual	Tractor	Ploughing, Sowing And Crop Cutting Using Robot
1.	Variable Seed Distance	No	No	Yes
2.	Time required	More	More	Fewer
3.	Ploughing and sowing skill	Manually	Manually	Robotically
4.	Man-Power	More	Moderate	Fewer
5.	Seed expenditure	Moderate	More	Fewer
6.	Pollution	No	More	No

Table1-Depicts the manual sowing techniques that requires more time and man power than sowing with tractor but still it is more in sowing with Agriculture robot. Also using this technique we can change the distance between the two plants and the wastage of seed is less.

Existing technology in agricultural ROBOTS

1. Demeter
2. Weed control Robot
3. Forester robot
4. Fruit picking robot

Demeter

Demeter is a Robot griper. It is principal to agree the labor necessities to grow and to produce the yields through mechanization. The lewd functioning area of robots in cultivation is at the harvesting period. Demeter can harvest crops like wheat and alfalfa. This robot is named after the Roman goddess of husbandry. Demeter is derived by itself respecting no human guidance. This result in tiredness to work continuously, and hence agricultural yield lacks down. With a robotic harvester, on the other hand, it never gets rid of performing the task and can work 24 hours a day.

Fig 2 Demeter [5]

Demeter has cameras fitted in it and perceives the dissimilarity amongst the yield that is being sliced and crop that isn't [2]. This data tells where to drive, where to locate its cutting part, and when it has to get closer to the end of a crop cord so that it can rotate every where. It also has a motor supervisor job. It consist of the structure which offers three stages of mechanization to reapers, and finally to tractors. First one is, "sails control" phase that guides involuntarily, controls and drive the cutter section, and further offered to its operator. Secondly, a "drone" phase that provides, permitting an operator to ambiguously switch numerous reapers [2]. At last, an autonomous mechanism will be urbanized that will permit reapers to totally reap an arena without any manual control.

Weed Controller Robot

Working in farm regularly involves a tough situation like delimited field conditions and soft, unhinged or rough surfaces. The growth of new weeding machineries that can diminish human struggle up to 100% in naturally nurtured sugar plants, vegetable and also use of herbicide from 75% to 100% in high worth yields[2]. They can be utilized in vegetation, which are broadly alienated. This procedure includes use of robots in the farm, to supernumerary operatives on third class weeds. Danish Farm Authority designed a four-roll-drive weed-seeking automaton. The concern of the weed-eliminating machine is to get rid of weed. Crops which are planted in rows can be weeded by operating a weed controller in between the rows [3]. A smart weed customs visualization method to recognize the arrangement of harvests, and direct itself specifically between them, significantly drops the requirement of herbicides.

Fig 3 Weed Controller [5]

Treebot: A courageous portable robot is serving researchers monitor ecological deviations in woods. The hi-tech Tarzan of the robot world, named as Treebot, is the first of its kind to join networked sensors, a wireless net link and a web cam [2].

Fig 4 Forest Robots [5]

It is motorized and can travel down and up by hawsers to take testers and parameters projected for vigorous study. US Center for Embedded Network Sensing, California invented Tree bot. Programmed with open-source computer code Pinpoint, Linux. Treebot is an essential count to researcher's ecological observing equipment. Professor William Kaiser said. "It is very significant in the biology society to appreciate the communication amid the atmosphere and the environment."

Fruit picking robot

Fruit reaping is an intermittent activity that occurs when fruits are ready for harvest in areas being farmed in orchards [6]. The basic ideologies of robots that pick the fruit have been established since the contiguous of 1980′s. These philosophies have begun dissimilar methods to reaping of crops. However, fruit picking is completely robotics equipped; offerings from high-tech occupation, a farm tools producers and agricultural creation must be required [6]. The fruit picking robots initiate need of picking ready fruit without harming the branches or leaves of the tree.


Fig 5 Fruit Picking Robot [5]

Proposed Idea

After studying the existing model on agriculture techniques and robots we listed many disadvantages that we are overcoming with our proposed idea which is AgRo-Bot programmed on single arduino chip with multiple functions**.** The block diagram of proposed system consists of a vehicle controlled by ATMEGA328 microcontroller (Arduino) as master controller, humidity sensor for irrigation, indicators such as LCD etc. and other accessories. The proposed system integrates all the functions such as ploughing, seeding, and crop cutting into a single robot and performs the operations automatically. The whole arrangement with arm is used for ploughing, seeding and crop cutting whenever required. Agro-Bot will also be equipped with solar panels which will help in recharging the batteries by natural source of energy. It will also help in

decreasing the use of non-renewable sources of energy and will not pollute the environment.
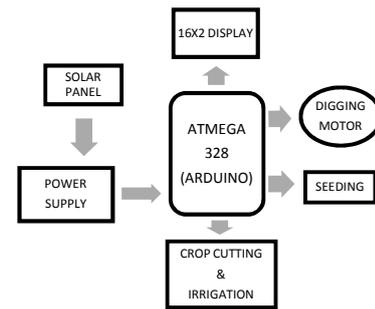
AgRo-Bot's Block Diagram

CONCLUSION

This review paper gives an abbreviated assessment on machineries in farming finished in past 24 years. Though the research expansions are ample, but still there are many shortcomings (e.g. ability to adjust in all directions and insufficiency of multifunction ability) that are suspending the expansions needed for commercialization of the system [7]. The revision insists the matter of double-dealing with autonomous farm outfit apparently be overwhelmed with the help of technology. The idea which we have proposed has significant reasons for thinking that it may not be just changing the human driver with the help of computers. It shows oneself that cultivation might be done correctly and cheaper with a group of small machines than with a few large ones. The jobs in cultivation are managed successfully thus there is requirement of intelligence, quick response and extremely monotonous choices thus machines are good exchanged with human operator.

References

1. Neha S. Naik, Virendra. V. Shete, Shruti. R. Danve. "Precision agriculture robot for seeding function", 2016 International Conference on Inventive Computation Technologies (ICICT), 2016
2. Bak, T. and H. Jacobsen. Agricultural Robotic Platform with Four Wheel Steering for Weed Detection. Biosystems Engineering 87: 2125-136.2003
3. Overview of Agricultural Robots-P. KoteswaraKarthik& P. Ravi Chandra Posted by Yuva Engineers on January 25th, 2014.
4. XUE Jinlin and XU Liming, (2010), Autonomous Agriculture Robot and its row guidance, IEEE, International Conference on Measuring Technology and Mechatronics Automation, 2010.
5. Shwetal Ramesh Gund. July 2015.Agricultural Robot" *International Journal of Advanced Research in Computer Engineering & Technology* (IJARCET).
6. Johan Baeten, Kevin Donnén, Sven Boedrij, Wim Beckers, Eric Claese "Autonomous Fruit Picking Machine: A Robotic Apple Harvester", Field and Service

Robotics Volume 42 of the series Springer Tracts in Advanced Robotics pp 531-539.

7. Yaghoubi, Sajjad; Akbarzadeh, Negar Ali; Bazargani, ShadiSadeghi; Bazargani, SamaSadeghi; Bamizan, Marjan and Asl, Maryam Irani. "Autonomous Robots for Agricultural Tasks and Farm Assignment and Future Trends in Agro Robots", *International Journal of Mechanical & Mechatronics Engineering*, 2013.

****