Implementation of Modern Technology in Agriculture

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***Abstract*— This Agribot is a robot designed for agricultural purposes. As one of the trends of development on automation and intelligence of agricultural machinery in the 21st century, all kinds of agricultural robots have been researched and developed to implement a number of agricultural productions in many countries. This Bot can perform basic elementary functions like picking, harvesting, weeding, pruning, planting, grafting. Agricultural robots or Agribot is a robot deployed for agricultural purposes. The main area of application of robots in agriculture today is at the harvesting stage. Emerging applications of robots or drones in agriculture include weed control, cloud seeding, planting seeds, harvesting, environmental monitoring and soil analysis. Some Examples of Computer Vision Guided Farm Robots Include: Drones which can be fitted with the latest multi spectral, network-connected sensors in order to image crops or the environment, survey the landscape, and even analyze the fertility of certain areas of soil then send this data across the network to be analyzed and processed. Harvesting Robots which are not only able to pick the fruit but using their computer vision programs, can sort the produce based on size and ripeness. Weeding and Spraying Robots with computer based vision systems are being deployed on tractors to automate spraying for weed control. With the use of artificial intelligence and machine learning techniques to enhance the precision of processes such as weeding. The motivation for this project came from the countries where economy is based on agriculture. Our idea presents a system with high speed of operation for an advanced agriculture process which includes grass cutter, Seed sowing, Sprinkler, Ploughing and solar panel for battery charging. The robotic system is an electromechanical (conveys a sense that it has agency of its own) and artificial agent which is steered by DC motor which has four wheels. Generally in farm lots of time consumes for grass cutting, seed sowing and spraying work, here is an approach to reduce farmer time for cultivation and increase farm efficiency by using multipurpose agricultural robot. The key objectives of this research work are to design and evaluate a novel and effectual Agribot for the agriculture and cultivation applications to assist the farmers. The work is based on the evaluation of projected design on assorted parameters to analyze the overall integrity.**

***Keywords*— Agribot, Grass cutter, Seed sowing, Sprinkler, Ploughing and solar panel.**

INTRODUCTION

Now a day's most of the countries do not have sufficient human factor in agricultural sector and it affects the growth of developing countries so it's time to automate the sector to overcome this problem. In India, 70% people depend on agriculture. So we need to study the agriculture. Innovative idea of our Project is to automate the process of sowing crops such as groundnut, baby corn, and sunflower and so on. The farming system like plugging, cultivating, weeding, harvesting, etc. is the different process. All the processes are advance to modifying the mechanism in farming which works automatically without the man power requirement. Manually seed plantation method suffers from various problems. The tendency of manual work is going on reducing. The man power shortage is one of the biggest problems faced continuously to all farmers. Due to labor shortage the plantation cost should be increased. So it is not economically beneficial for all farmers. Now a day's instrumentation and control system plays an important role. So we develop a system for "seed plantation robot" using microcontroller which is very economical and beneficial. Due to automation the work become easiest, errorless and it saves money also. Our system is nothing but the four tyre vehicle which is driven by geared DC motor. According to microcontroller program, after some distance or some time instant the seed should be

dropped through the nozzle, which is operated by relay. Nozzle size is depends on the diameter of the seed. Same operation is repeated after some time delay. So there is no more labor work. It gives information about weather conditions for seed plantation. Hence all the problems of conventional method are overcome by using this system.

Agriculture is the need of most of the Indians livelihood and it is one of the main sources of livelihood. It also has a major impact on economy of the country. We know there is day by day increase in population. Due to this tremendous growth in population there is huge demand or food. Agriculture is the main source for food production. So, we need to develop the methodologies which are currently uses in agriculture application to increase the efficiency of application. Due to this reason we are going to prepare "multipurpose agriculture Robot" which present four applications are like Grass cutter, Ploughing, Seed sower, Sprinkler. These applications make sure that the time required for it is less than conventional methods.

We prefer robot for carried out these applications because robot is a mechanical, artificial agent and is usually an electromechanical (Mechatronics) system. By using controller we operate whole robot by wireless remote. In that remote we have four buttons for forward reverse motion and one switch for operating sprinkler and grass cutter mechanism. For ploughing mechanism we are going to use hydraulic jack and for sprinkler high pressure liquid is provided with the help of pump. If we use this robot in real time application it save money and time consumption. With this help of robot we can achieve human safety at the night time and we easily perform task which is in complicated location.

Design Perspectives

Fruit picking robots, driverless tractor / sprayer, and sheep shearing robots are designed to replace human labour. In most cases, a lot of factors have to be considered (e.g., the size and colour of the fruit to be picked) before the commencement of a task. Robots can be used for other horticultural tasks such as pruning, weeding, spraying and monitoring. Robots can also be used in livestock applications (livestock robotics) such as automatic milking, washing and castrating. Robots like these have many benefits for the agricultural industry, including a higher quality of fresh produce, lower production costs, and a smaller need for manual labour. They can also be used to automate manual tasks, such as weed or bracken spraying, where the use of tractors and other manned vehicles is too dangerous for the operators. The mechanical design consists of an end effector, manipulator, and gripper. Several factors must be considered in the design of the manipulator, including the task, economic efficiency, and required motions. The end effector influences the market value of the fruit and the gripper's design is based on the crop that is being harvested.

1.End effectors

An end effector in an agricultural robot is the device found at the end of the robotic arm, used for various agricultural operations. Several different kinds of end effectors have been developed. In an agricultural operation involving grapes in Japan, end effectors are used for harvesting, berry-thinning, spraying, and bagging. Each was designed according to the nature of the task and the shape and size of the target fruit. For instance, the end effectors used for harvesting were designed to grasp, cut, and push the bunches of grapes.

Berry thinning is another operation performed on the grapes, and is used to enhance the market value of the grapes, increase the grapes' size, and facilitate the bunching process. For berry thinning, an end effector consists of an upper, middle, and lower part. The upper part has two plates and a rubber that can open and close. The two plates compress the grapes to cut off the rachis branches and extract the bunch of grapes. The middle part contains a plate of needles, a compression spring, and another plate which has holes spread across its surface. When the two plates compress, the needles punch holes through the grapes. Next, the lower part has a cutting device which can cut the bunch to standardize its length.

For spraying, the end effector consists of a spray nozzle that is attached to a manipulator. In practice, producers want to ensure that the chemical liquid is evenly distributed across the bunch. Thus, the design allows for an even distribution of the chemical by making the nozzle to move at a constant speed while keeping distance from the target.

The final step in grape production is the bagging process. The bagging end effector is designed with a bag feeder and two mechanical fingers. In the bagging process, the bag feeder is composed of slits which continuously supply bags to the fingers in an up and down motion. While the bag is being fed to the fingers, two leaf springs that are located on the upper end of the bag hold the bag open. The bags are produced to contain the grapes in bunches. Once the bagging process is complete, the fingers open and release the bag. This shuts the leaf springs, which seals the bag and prevents it from opening again.

2.Gripper

The gripper is a grasping device that is used for harvesting the target crop. Design of the gripper is based on simplicity, low cost, and effectiveness. Thus, the design usually consists of two mechanical fingers that are able to move in synchrony when performing their task. Specifics of the design depend on the task that is being performed. For example, in a procedure that required plants to be cut for harvesting, the gripper was equipped with a sharp blade.

3.Manipulator

The manipulator allows the gripper and end effector to navigate through their environment. The manipulator consists of four-bar parallel links that maintain the gripper's position and height. The manipulator also can utilize one, two, or three pneumatic
actuators. Pneumatic actuators are motors which
produce linear and rotary motion by converting compressed air into energy. The pneumatic actuator is the most effective actuator for agricultural robots because of its high power-weight ratio. The most cost efficient design for the manipulator is the single actuator configuration, yet this is the least flexible option.

Application Domains

Robots have many fields of application in agriculture. Some examples and prototypes of robots include the Merlin Robot Milker, Rosphere, Harvest Automation, Orange Harvester, lettuce bot, and weeder. One case of a large scale use of robots in farming is the milk bot. It is widespread among British dairy farms because of its efficiency and no requirement to move. According to David Gardner (chief executive of the Royal Agricultural Society of England), a robot can complete a complicated task if it's repetitive and the robot is allowed to sit in a single place. Furthermore, robots that work on repetitive tasks (e.g. milking) fulfil their role to a consistent and particular standard.

Another field of application is horticulture. One horticultural application is the development of RV100 by Harvest Automation Inc. RV 100 is designed to transport potted plants in a greenhouse or outdoor setting. The functions of RV100 in handling and organizing potted plants include spacing capabilities, collection, and consolidation. The benefits of using RV100 for this task include high placement accuracy, autonomous outdoor and indoor function, and reduced production costs.

Agriculture Robotics at the Australian Centre for Field Robotics (ACFR), the University of Sydney. Application areas include autonomous mapping, phenotyping and weeding for crops and livestock monitoring.

If farming is done manually then a lot of human efforts are required and then also the required quality work is not possible. Also there is wastage of seeds and fertilizers due to improper use of it. Also the harvesting part is very difficult manually because it may happen that the fruits are cut before

their maturity level of it because grading of fruit is done manually. Manual harvesting method is slow and also very costly.

Agribot Design Challenges

Today agricultural robots can be classified into several groups: harvesting or picking, planting, weeding, pest control, or maintenance. The goal is of creating "robot farms" where all of the work will be done by machines. The main obstacle to this kind of robot farm is that farms are a part of nature and nature is not uniform. It is not like the robots that work in factories building cars. Factories are built around the job at hand, whereas, farms are not. Robots on farms have to operate in harmony with nature. Robots in factories don't have to deal with uneven terrain or changing conditions. So following are some challenges in designing Agribot.

1. It is difficult to drop only one seed at a time, so control the flow of seed tank is difficult task to plant only one seed.
2. Difficult to design seeding mechanisms with plough in the farm and cover it with soil again.
3. Difficult to design spraying mechanisms, while spraying the pesticides it is necessary to control otherwise only the air or pesticides will be out from the nozzle and proper spraying is not done.
4. While harvesting the fruit on tree, the fruit will be detected by using 2D camera we get only XY direction but it is difficult to get Z direction which is distance of fruit on tree from robot.

Comparison between Present sowing techniques and sowing with Agribot System

Table 1: Comparison of sowing techniques.

Sr. No.	Parameters	Manual	Tractor	Digging and sowing using Agribot
1.	Man Power	More	Moderate	Less
2.	Time Required	More	More	Less
3.	Digging and sowing technique	Manually	Manually	Automatically
4.	Adjustable seed distance	No	No	Yes
5.	Seed Wastage	Moderate	More	Less
6.	Energy needed	High	Very High	Less
7.	Pollution	No	More	No
8.	Alarm and display	No	No	Yes

Research Objectives

1. To design an effectual approach with the design and evaluation of Agribot.
2. To analyse the cavernous literature on the assorted perspectives of Agribot technology.
3. To evaluate the performance of proposed Agribot on assorted parameters
4. The area of work is specially for the following purposes which consists of following perspectives
    - Grass cutter
    - Sprinkler
    - Seed Sowing.
    - Plough

Research paradigm

Brown (2004) defines research paradigm is the design and the handling of the study by the investigator in developing the study results. Research is trans-disciplinary in nature. Research paradigm is the standard procedure by the investigator and it follows the scientific method of action in

acquiring the results. Research always direct towards the finding answers for the problem framed and develops the theory and principles. Research paradigm is the first attempt by the investigator and the person chooses the method of handling the complete study from the two main categories as positivism and Interpretivism. The study followed the mixed paradigm. The study followed the positivism and the Interpretivism technique. The study needs to reveal the answer by means of the numerical and the content manner. Positivism will be the purposive study and the Interpretivism is the other type that will make use of open-ended questionnaire to depict the views and opinions of the respondents in clear manner. The study employs the positivism method since it deals with the numerical secondary information of the research based Internet resources.

Research Approach

Huberman & Miles (2002) elaborates that the research approach is the way in which the study is taken. Approach is the choosing of the method in which the data collection is handled. The research approach is of two types. They are quantitative and qualitative approaches. The quantitative approach will be in terms of numbers and the qualitative approach will in the textual manner. Qualitative approach will be biased. The study followed a mixed approach. The study aims at collecting the information from the students of agriculture research institutes by means of open-ended questionnaires and the secondary data source is gathered from the government databases. The study also collect the information regarding the research based resources and its impact on the students as well as practitioners.

Research Design

Maxwell (2004) says that a research design is the group of progressed decisions that makes up the main plan articulating the methods and actions for assorting and evaluating the needed data. Research drawing is a rational structure that gives the coherent structure that directs the researcher to speak to the research issues and respond to the research questions. Research design is the main component in any research methodology. Research design is widely divided into two types. They are exploratory and conclusive research designs. The conclusive research design is sub divided into descriptive and causal research designs. The study followed the methods of descriptive data. The study links both the qualitative and the quantitative approaches. The descriptive method of design will assist both the approaches and hence, the study includes the principles of the descriptive design. The descriptive study tries to explain systematically a condition, difficulty, occurrence, service or programme, offers data regarding the living circumstances of a group, or explains attitudes towards a subject.

Agricultural is one of our most important industry for providing food, feed and fuel necessary for our survival. Certainly, robots are playing an important role in the field of agriculture for farming process autonomously. Normally, farming process include planting, irrigation, fertilisation, monitoring and harvesting of a crop of any kind. Agriculture is the backbone of India. The robotics plays a major role in various fields such as industrial, medical, military applications etc., the robotics field are gradually increasing its productivity in agriculture field. Some of the major problems in the Indian agricultural are rising of input costs, availability of skilled labours, lack of water resources and crop monitoring. To overcome these problems, the automation technologies were used in agriculture. The automation in the agriculture could help farmers to reduce their efforts. The robots are being developed for the processes such as fruit picking, monitoring, irrigation, etc., all of these functions have not yet performed using a single robot. In this the robots are developed to concentrate in an efficient manner and also it is expected to perform the operations autonomously. The proposed idea implements the robot to perform the functions such as planting, irrigation, fertilization, monitoring, and harvesting of an onion crop. These functions can be integrated into a single robot and then performed. The robot is expected to perform the functions such as planting, irrigation, fertilization,

monitoring, and harvesting autonomously in the field of onion. All these processes are not being done by using a single robot. In the proposed research work, a new design of Agribot is to be developed and evaluated on multiple parameters.

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