Agricultural Robotics and Its Scope in India

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Abstract - **Robotics is the branch of technology that deals with the design, construction, operation, structural depositions, manufacture and application of robots. Robotics brings together several very different engineering areas and skills. Robotics is related to the science of electronics, Engineering, mechanics, mechatronics, and software. There is metalworking for the body and we have mechanics for mounting the wheels on the axles, connecting them to the motors and keeping the body in balance. You need electronics to power the motors and connect the sensors to the controllers. At last you need the software to understand the sensors and drive the robot around. Today Robotics is the rapidly growing field and it is continue in research, design, and build new robots that serve various practical purposes. As it has taken drive in various fields is there any possibility that robot can be introduced in the farming.**

Keywords: Mechatronics, Robotics, mining, fertilizer, yield picker, multipurpose manipulator programmable, artificial intelligence, military, surgery.

INTRODUCTION OF ROBOTICS

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THE FIELDS IN WHICH ROBOTS HAVE BEEN INTRODUCED

Those areas in which dirty, dull, and dangerous missions takes place where human worker have a threat to his life and most difficult jobs where human worker has to apply terrible effort to accomplished it are replaced by the robots. Those fields in which high accuracy is required are also replacing the human workers. Following are the fields in which robots are introduced.

- *In The Field Of Medicine:* Robotically assisted surgery was developed to overcome both the limitation of minimally invasive surgery or to enhance the capabilities of surgeons performing open surgery.
- *Military Applications:* Military robots are now used by the united states Army. They are remote control vehicles of unmanned which are used in military application.
- *Robots In The Mining***:** Robots are now doing jobs like lying explosives , going underground after blasting to stabilize a mine roof or mining in areas where it is impossible for humans to work of even survive.
- *Industrial Robots***:** According to the Robotic Industries Association, an industrial robot is an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes which may be either fixed in place or mobile for use in industrial automation applications. The first industrial robot, manufactured by Unimate, was installed by General Motors in 1961. Thus industrial robots have been used around for over four decades. Foundry robots is an example which are used in the industry to perform works at a very high temperature where human work is unimaginable. We have following types of robots for industry purpose material removal robot, material handling robot, painting/spraying robot, welding robot, assembling robot, dispensing robot, inspection robot.
- *Robots Fishes***:** Robot fish developed by British scientists are to be released into the sea off north Spain to detect pollution. If next year's trial of the first five robotic fish in the northern Spanish port of Gijon is successful, the team hopes they will be used in rivers, lakes and seas across the world. The carp-shaped robots, costing 20,000 pounds ($29,000) apiece, mimic the movement of real fish and are equipped with chemical sensors to sniff out potentially hazardous pollutants, such as leaks from vessels or underwater pipelines. They will transmit the information back to shore using Wi-Fi technology. Unlike earlier robotic fish, which needed remote controls, they will be able to navigate independently without any human interaction. Robotic fishes have intelligence in them and are capable of moving of its own just like fishes it takes another path as natural fishes moves when some obstacle come in the path have kept in the aquarium to examined them. These fishes are capable of finding the images of marine life and give information of the fishes and pollution in the water.

ROBOTS IN GENERAL FIELDS

- *Robots in the Hotels:* To serve the customers in the hotels Robotics engineer have designed REEM H1 Robots which act as member of staff serving at table.

- *Cleaning Robots*: cleaning robots have been designed to clean different things and areas. The designed of cleaning robots depend up on the purpose and area of cleaning. We have different type of robots such as ROM1 as room cleaner, KV8 as intelligent sweeper, vacuum cleaner robot, duct cleaning robot, gutter cleaning robot.

- *Robots in the Classroom:* smart classes were introduced which uses the computer and projectors to show readily the picture as well as the learning get easier. These were the first robots without intelligence in the classes but now Japan has introduced a Robot teacher which is programmed to do all the human teacher activities. These robot teachers is capable of taking attendance, interact with the students and teaches subjects which is programmed them.

- *Robotic Cars:* Robotic car technology being developed at Oxford University that interprets its surroundings and makes decisions about where to go could eliminate the agony and cost of traffic jams. These technologies use Infrared light sources MEMS based IR Light Sources for Gas Detection and Monitoring.

FARMING NEEDS AND BASIC WORKS

Sowing the seeds, Plantation, watering the plants, cutting the weeds spraying fertilizers and chemicals, examining the soil and harvesting the yield, cutting the weeds, killing the pest and insects that harm the crops.

Whether the above mentioned works can be done by the robots are not?

Question is answered by "yes". Farm robots have taken a test drive in the Oklahoma state in the United States.

"Green Seeker" By John Solie- Oklahoma State University:

He introduced the "green seeker sensor" that was developed at Oklahoma state university. This smart machine reads a plant's needs and then applies precisely the amount of fertilizer of herbicides needed. Green Seeker is a machine which uses the sensors to let the plant tell us that what it needs. The green seeker shines light at red and near infrared wavelength on the plants. That light is absorbed by the plant and some of the light is reflected back up into the sensors. The sensor measure the amount of light reflected off the plant, and determines the amount of fertilizer that the plant is needed. By using this we can know how much amount of fertilizer is needed by plant and applicator is the device which takes signals from amount of fertilizer to the plant. The report from the Oklahoma farmer "Tom Denker" has used green seeker in his wheat field he used to spread 80 pounds of nitrogen fertilizer per acre but with the use of Green seeker Tom Denker has used only 20 pounds and hence 75% decrease in the use of fertilizers. "It is great technology and a great savings" by Tom Denker a farmer.

Robot drone tractors:

A new generation of robot drones is revolutionizing the way we farm, with manufacturing of different robots, i.e announcing the first ever robot drone tractor becomes part of the agricultural mainstream. Robot will decide where to plant, when to harvest and how to choose the best route for crisscrossing the farmland. These are used in America now. "We can design Robots to reduce the usage of pesticides, herbicides, fertilizers and water" a robotic scientist says.

Flying Robots To Spread Fertilizer:

A flying robot monitors the growing condition of the crops over farmlands in Ili, a Kazak autonomous prefecture in Northwest China's Xinjiang Uygur autonomous region, July 25, 2011. With camera equipment and an automatic fertilizing system in the front, the robot can fly autonomously and apply fertilizer independently. It is made by the national key laboratory of robotics of Shenyang Institute of Automation of Chinese Academy of Sciences.

Japan's Dream Project to Have Robot in Farms:

The tsunami and earthquake that hit Japan last March saw thousands die, homes destroyed, a nuclear reactor meltdown, and power issues for many months afterwards. But Japan is recovering slowly, and using the disaster as an excuse to try something new in areas of the country affected by those events. One of the most interesting new ideas is called the "Dream Project." It's a new farm being planned for a 600 acre site in Miyagi Prefecture that was flooded with sea water during the tsunami. This farm isn't very typical though, as it will be run entirely by robots. The farm will grow fruit, vegetables, rice, soybeans, and wheat. They will be planted and harvested by robotic tractors, and then boxed up by other robots before being shipped for us humans to enjoy. As well as being unmanned, the farm also aims to minimize the use of chemicals and pollution. With that in mind, the carbon dioxide produced from the robotic tractor engines will be stored and fed back into the crops. Pesticides are out, in their place will be special LED lighting. The company's involved in the farm project include Ajinomoto, Fujitsu, Hitachi, Ito-Yokado Co., NEC, Panasonic, Sharp, and Yammer. Meaning we're sure to see some advanced robotic designs and behavior. Considering the size of the site and technology involved, there is significant investment required to set the farm up. $52 million will be invested over the next 6 years by the Japanese ministry of agriculture, with a further $78 million of investment coming from private companies. If successful, the robotics and techniques used will certainly filter down into machinery for all farms.

Fruit Picking Robots:

The research is still in full progress, especially as the robots need to be carefully designed so that they do not bruise the fruit while picking. One solution is the use of suction grippers, used on automated fruit picking machines manufactured, for example, by ACRO. Citrus fruit robot pickers have thus far been the focus of research and development, but cherry pickers are also being researched. Vision Robotics, in particular, has made several robots that

are already capable of taking over the work. Researchers in the U.K. are working at turning newly developed imaging technology into an intelligent harvesting machine. Using microwave measurement, the system can look beneath the leafy layers of a crop, identify the differing materials, and enable precise size identification. Such a machine could minimize wastage in crops like cauliflower and solve an impending labor shortage for U.K. farmers caused by a fall in the number of migrant workers.

Robot Cattle Grazing and Automatic Milking: Is the milking of dairy animals, especially of dairy cattle, without human labor. Automatic milking systems (AMS), also called voluntary milking systems (VMS), were developed in the late 20th century. They are commercially available since the early 1990s. The core of such systems, that allows complete automation of the milking process, is a type of agricultural robot. Automated milking is also called robotic milking therefore. Common systems rely on the use of computers and special herd management software. Producing fresh food for us to eat every day.

Scope of farm robots in India:

Our farm equipment companies and researchers have developed a lot of small and heavy farm equipment for traditional farming needs but some kind of robotic and pneumatic mechanism are required in precision farming. As robots have entered in the mentioned above fields it is important to think that till, why the robots are not entered in the farming field? If the robots are being used for weed control, that will help to reduce the herbicides usage and the produces will turn into an organic, the same way robots can be used for transplanting the seedlings to avoid intensive labor. We used to read in newspapers on few impressive innovative technologies by rural inventors i.e. electric motors can be operated remotely by cell phones, it's very helpful to farmers in summer time since the power supply is irregular. If we think advanced intelligent machines in farming, Sensors or readers and hand held PDAs are going to be great helpful in computation and accuracy in farming. There are lot of hurdles taken in the agriculture sector in all countries but specially in India. Farmers decreasing in India a daily report from the newspaper. According to Shineveramya a famous writer gave a report mentioning that the "Farmers are eyes of our country. They are great men who provide food for us but now a day's farmers are reducing more in number. Many are leaving the farming profession by telling some repeated common sentences that it is no longer profitable and none want to get losses and it is becoming risky day by day. So many disadvantages. Also the youngsters are not interested in that. So they are ready to work in construction companies and not in farmland.

THE PROBLEMS OF TRADITIONAL FARMING

- *Lack of Knowledge of using fertilizer:* adequate amount of fertilizer will benefit the farmers but surplus quantity damages the crop as well as the yield. The lack of knowledge of the usage is damaging the crops and hence giving the problems to the farmers. Even some farmers mistakenly drinks the water added with fertilizer for the plants and lose their lives.

- *Lack of Man Power:* The farm workers are paid less than the construction labor. So to earn livelihood many of workers are choosing the straight path work in construction and different areas but not farming.

- *Farmers Suicides:* It is a report from a agriculture region Maharashtra, Andhra pradesh and Karnataka states of India that more than 17,000 farmers have suicide and end their lives from 2006-2007.All the above mentioned crisis can be eradicated and Indian farming and agriculture sector can be improved for a very large extent by the use of Robotics with smart intelligence devices and making smart robots that benefit to the agriculture sector and farming and cattle grazing. All the researches are on and we need a good time for the establishment of the technology in the farming.

Advantages

Seeing to the above mention crisis that Robots will make a remarkable perfect entry into the agriculture, following are the advantages of robotics farming.

- Elimination of labor - The farmer is freed from the milking process and associated rigid schedule, and labor is devoted to supervision of animals, feeding, etc.

- It brings us an opportunity of self employment for those who are unemployed and thinks the farming profession as a nightmare.

- It is one time investment then the expenditure of the farming will drastically.

- The use of fertilizer, pesticides, insecticides, herbicides and water consumption can be reduced in very large percentage.

- It brings revolution in the farming, agriculture and cattle grazing.

- Productivity will be increased to a lot extent.

- No more farming will be a difficult occupation it becomes the engineers choice and lot of youngsters will be engaged in the farming.

- Soil testing gives the information of the soil and that information when is taken as the intelligence this report is signaled and given to the artificial intelligence along the Robotics gives us perfect results that perhaps increases the quality.

Disadvantages

- It is costlier to implement.

- Complexity is increased.

- Time management and skill full labor is required.

- Roberts run with power but in india power cut in the farming region is more than 65%.

REFERENCES

[1] Millar, K. M., (2000), "Respect for Animal Autonomy in Bioethical Analysis: The Case of Automatic Milking Systems (AMS)", Journal of Agricultural and Environmental Ethics, Springer, Netherlands, Vol. 12, No. 1, pp. 41–50

[2] Rossing, W. and Hogewerf, P. H., (1997), "State of the art of automatic milking systems", Computers and electronics in agriculture, Vol. 17, pp. 1–17

[3] Farmers journal "Will milking robot work with grazing in Ireland?" - 18-06-2011 by jam kannedy

[4] http://www.agrobot.es

[5] http://www.fieldrobot.dk/pages/casmobot.php

[6] http://www.fieldrobot.nl/

[7] http://www.hortibot.dk/

[8] http://www.roboticharvesting.com

[9] www.kuka-robotics.com India

[10] www.robokisan.co