Pest Controlling in Agriculture by Robot

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ABSTRACT

In this research work an engineering solution to the current human health hazards involved in spraying potentially toxic chemicals in the confined space of a hot and steamy glasshouse or agricultural field is achieved by the design and construction of an autonomous mobile robot for use in pest control and disease prevention applications in commercial greenhouses. For this a mechanical robot is designed. The effectiveness of this platform is shown by the platforms ability to successfully navigate itself down rows of a greenhouse, while the pesticide spraying system efficiently covers the plants evenly with spray in the set dosages.

A robot which could spray chemicals under grapevine trellis was developed and experimented. From the experimental results, it was observed that the robot system made precise spraying operation and its precise operation record possible. Based on the precise operations and records, an optimum management of chemicals could be expected, that is, necessary amount of chemicals would be sprayed only at necessary considered that this robot would be able to contribute the minimum input maximum output production system by establishment of trace ability system in grape production.

Such kinds of robots, which are utilized in the farming fields, are called as Agrobots. Here in this module we have planned a robot, which can be constrained by utilizing a distant for showering the pesticides in the field or nursery. By the advancement of these agrobots parcel of physical work will likewise be diminished.

In this regard here is a demo model of such equipment, which performs the operation very effectively. Such types of robots, which are used in the agricultural fields, are called as Agrobots. Here in this module we have designed a robot, which can be controlled by using a remote for spraying the pesticides in the field or greenhouse. By the development of these agrobots lot of manual labor will also be decreased. Here in this project a remote is designed with the help of RF transmitter, which encodes the data to the robot for controlling the movement as well as spraying the pesticide. The robot is equipped with RF receiver, which decodes and controls it. The transmitting and receiving modules are constructed using micro-controllers.

1.INTRODUCTION

The Research work aims on the design, development and fabrication of the demonstration unit of "PEST CONTROLLING IN AGRICULTURE BY ROBOT." More than 42% of the total population in the world has chosen agriculture as their primary occupation. In recent years, the development of autonomous vehicles in agriculture has experienced increased interest. This development has led many researches to start developing more rational and adaptable vehicles. In the field of agriculture autonomous vehicle, a concept is being developed to investigate if multiple small autonomous vehicles, machines would be more efficient than traditional large tractors and human force.

These vehicles should be capable of working 24 hours a day all year round, in most weather conditions. Moreover such a system may have less environmental impact if it can reduce over application of chemicals and high usage of energy, such as diesel and fertilizer, by control that is better matched to stochastic requirements.

2. NECESSITY OF THIS AGROBOT

In agriculture farm, greenhouse, farmers have to suffer many problems while farming like hazards human health, insects eat their crops, breathing problems. Insects are cause of many agriculture problems as they eat and damage the leaves and crops of farm.

Some of disease & their solution:

Fungicides: Robots can be used to combat plant diseases that cause a lot of damage to crops. Fungi are the most common causes of crop loss in the entire world. To kill a fungal disease you need a fungicide, a kind of pesticide. Fungal diseases interfere with the growth and development of a crop. They attack the leaves which are needed for photosynthesis and decrease the productivity of the crop and cause blemishes on the crops which make them worth less on the market. After the crops are harvested fungi can grow and spoil the fruits, vegetables, or seeds. Robots can treat plants that have been infected or destroy them if necessary. They could treat just the plants that need it, instead of covering the entire crop with fungicide.

Fig .1. Leaves Damaged by Insects

Herbicide: Another use for robots is in weeding. Robots can pull weeds from around the plants or just cut the tops off. All of the material can be collected by a robot and brought to a composting site limiting the need for herbicides, chemicals that destroy or inhibit the growth of plants. Herbicides are intended to kill weeds but many times also damage the crops.

Pesticide: Pesticides are used to control insects that can be harmful to crops. They are effective but have many side effects for the environment. Insects also adapt to the toxin in a pesticide and the survivors breed and pass the resistant trait on to the next generation making stronger insects that are harder to kill. Robots could solve this by removing pests from the crops without using chemicals. They might suck them up with a vacuum. A bellow base air system makes a vacuum that doesn't require the large amount of power of regular Vacuum systems. There are ways to kill the insects without chemicals. The robot could submerge them in a container with water or into one closed up to produce extreme heat in the sun. Microbial fuel cells could be used to reduce the insects to electrical power with bacteria. Pesticides kill everything. Robots could be programmed to rid particular pests and not harm anything else.

3.IMPORTANCE OF AGRICULTURE

The written history of agriculture in India dates back to the Rig-Veda, written about 1100 BC. Day, India ranks second worldwide in farm output. Agriculture and allied sectors like forestry and fisheries accounted for 13.7% of the GDP (Gross Domestic Product) in 2013, about 50% of the total workforce. The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. Still, agriculture is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India.

As Per the 2010 FAO world agriculture statistics, India is the world's largest producer of many fresh fruits and vegetables, milk, major spices, select fibrous crops such as jute, several staples such as millets and castor oil seed. India is the second largest producer of wheat and rice, the world's major food staples.

India is also the world's second or third largest producer of several dry fruits, agriculture based textile raw materials, roots and tuber crops, pulses, farmed fish, eggs, coconut, sugarcane and numerous vegetables. India ranked within the world's five largest producers of over 80% of agricultural produce items, including many cash crops such as coffee and cotton, in 2010. India is also one of the world's five largest producers of livestock and poultry meat, with one of the fastest growth rates, as of 2011.

One report from 2008 claimed India's population is growing faster than its ability to produce rice and wheat. Other recent studies claim India can

easily feed its growing population, plus produce wheat and rice for global exports, if it can reduce food staple spoilage, improve its infrastructure and raise its farm productivity to those achieved by other developing countries such as Brazil and China.

3.1 INDIAN AGRICULTURE SINCE 1947

In the years since its independence, India has made immense progress towards food security. Indian population has tripled, but food-grain production more than quadrupled: there has thus been substantial increase in available food- grain per capita.

Prior to the mid-1960s India relied on imports and food aid to meet domestic requirements. However, two years of severe drought in 1965 and 1966 convinced India to reform its agricultural policy, and that India could not rely on foreign aid and foreign imports for food security. India adopted significant policy reforms foc used on the goal of food grain self- sufficiency. The initial increase in production was centre on the irrigated areas of the Indian states of Punjab, Haryana and western Uttar Pradesh. A hectare of Indian wheat farms that produced an average of 0.8 tons in 1948 produced 4.7 tons of wheat in 1975 from the same land. By 2000, Indian farms were adopting wheat varieties capable of yielding 6 tons of wheat per hectare.

3.2 PROBLEM IN AGRICULTURE

"Slow agricultural growth is a concern for policymakers as some two-thirds of India's people depend on rural employment for a living. Current agricultural practices are neither economically nor environmentally sustainable and India's yields for many agricultural commodities are low. Poorly maintained irrigation systems and almost universal lack of good extension services are among the factors responsible. Farmers' access to markets is hampered by poor roads, rudimentary market infrastructure, and excessive regulation."

Although India has attained self-sufficiency in food staples, the productivity of Indian farms is below that of Brazil, the United States, France and other nations. Indian wheat farms, for example, produce about a third of the wheat per hectare per year compared to farms in France. Rice productivity in India was less than half that of China. Other staples productivity in India is similarly low. Indian total factor productivity growth remains below 2% per annum; in contrast, China's total factor productivity growths are about 6% per annum, even though China also has smallholding farmers. Some Indian states produce two to three times more grain per acre than in other Indian states. The table compares the statewide average yields for a few major agricultural crops within India, for 2001-2002.

Crop	Average farm yield in Bihar	Average farm yield in Karnataka	Average farm yield in Punjab
	kilogram per hectare	kilogram per hectare	kilogram per hectare
Wheat	2020	unknown	3830
Rice	1370	2380	3130
Pulses	610	470	820
Oil seeds	620	680	1200
Sugarcane	41510	79560	65300

Table 3.2 Productivity of crop in various states

The low productivity in India is a result of the following factors:

The average size of land holdings is very small (less than 2 hectares) and is subject to fragmentation due to land ceiling acts, and in some cases, family disputes. Such small holdings are often over- manned, resulting in disguised unemployment and low productivity of labor. Some reports claim smallholder farming may not because of poor productivity, since the productivity is higher in China and many developing economies even though China smallholder farmers constitute over 97% of its farming population. Chinese smallholder farmer is able to rent his land to larger farmers, China's organized retail and extensive Chinese highways are able to provide the incentive and infrastructure necessary to its farmers for sharp increases in farm productivity.

Adoption of modern agricultural practices and use of technology is inadequate, hampered by ignorance of such practices, high costs and impracticality in the case of small land holdings.

According to the World Bank, Indian Branch: Priorities for Agriculture and Rural Development", India's large agricultural subsidies are hampering productivity- enhancing investment. Overregulation of agriculture has increased costs, price risks and uncertainty. Government intervenes in labor, land, and credit markets. India has inadequate infrastructure and services. World Bank also says that the allocation of water is inefficient, unsustainable and inequitable. The irrigation infrastructure is deteriorating. The overuse of water is currently being covered by over pumping aquifers, but as these are falling by foot of groundwater each year, this is a limited resource. The Intergovernmental Panel on Climate Change released a report that food security may be a big problem in the region post 2030.

Illiteracy, general socio-economic backwardness, slow progress in implementing land reforms and inadequate or inefficient finance and marketing services for farm produce. Inconsistent government policy. Agricultural subsidies and taxes often changed without notice for short term political ends.

Irrigation facilities are inadequate, as revealed by the fact that only 52.6% of the land was irrigated in 2003–04, which result in farmers still being dependent on rainfall, specifically the Monsoon season. A good monsoon results in a robust growth for the economy as a whole, while a poor monsoon leads to a sluggish growth. A third of all food that is produced rots due to inefficient supply chains and the use of the "Wal-Mart" to improve efficiency is blocked by laws against foreign investment in the retail sector.

3.3 PEST CONTROLLING IN INDIA

India is Agricultural country 70% Percent of Indian Economics is Depend on Agriculture Pest control is mostly required agriculture because The first reason is to minimize germs, disease, Bactria, fecal matter on work surfaces and enter the food product. Next reason is Spoilage of the food. Certain pests eat and leave proteins on food which accelerates some food rotting. Then, there's pests that carry off food stuffs to a location to eat and leaves it. The food rots and stinks which then get into the air systems to cause respiratory problems, and doors. Lastly, the pests affect the profits of the business. Stolen, damaged and partially eaten foods have to be tossed out, which are "Lost Profits" for the business. Pest control refers to the regulation or management of a species defined as a pest, usually because it is perceived to be detrimental to a person's health, the ecology or the economy.

Pest Control (India) Pvt. Ltd., PCI, was established in the year 1954 and is the first and largest pest management company in India. PCI offers a comprehensive range of Professional Pest Management Services and Quality Products and Equipment through a countrywide network of over 150 offices and 3500 employees.

Our own product formulation and manufacturing (liquid and gas) facilities are equipped with state-of-the-art quality control, analysis and research and development (R& D) facilities. Bio-Control Research Laboratories (BCRL) is a modern facility engaged in the propagation and production of various biological control agents and bio-pesticides and spearheads the company's commitment towards environment-friendly pest management techniques.

Over the years, PCI has constantly endeavored to introduce better and more cost-effective pest management technology for both services and products. Vision and foresight coupled with the desire to constantly improve has enabled us to retain our premier

status in the country today. With over 50 years of experience, we reaffirm our commitment: that of providing comprehensive, one-stop solutions in our field of expertise.

3.4 HISTORY OF PEST CONTROLLING

Pest control is at least as old as agriculture, as there has always been a need to keep crops free from pests. In order to maximize food production, it is advantageous to protect crops from competing species of plants, as well as from herbivores competing with humans. The conventional approach was probably the first to be employed, since it is comparatively easy to destroy weeds by burning them or plowing them under, and to kill larger competing herbivores, such as crows and other birds eating seeds. Techniques such as crop rotation, companion planting (also known as intercropping or mixed cropping), and the selective breeding of pest-resistant cultivars have a long history. In the UK, following concern about animal welfare, humane pest control and deterrence is gaining ground through the use of animal psychology rather than destruction. For instance, with the urban Red Fox which territorial behavior is used against the animal, usually in conjunction with non-injurious chemical repellents? In rural areas of Britain, the use of firearms for pest control is quite common. Air guns are particularly popular for control of small pests such as rats, rabbits and grey squirrels, because of their lower power they can be used in more restrictive spaces such as gardens, where using a firearm would be unsafe.

Fig.3.4 Pest controlling by robot

3.5 WORKING OF PEST CONTROLLING

Pest controlling is required in any agriculture field, otherwise it can damage the crops of the fields. Pest controlling is either done manually or recently robot by means of liquid pesticides spraying on the crops. It helpful to protect the crops and leaves from insects and fungies. In most of area it is done manually, but with improvement in technologies about agriculture instruments like robots is used for many works like harvesting of the crops, spraying water to crops, cutting of crops and also providing pesticides to the crops. Many inventers worked on the robots for spraying pesticides and they also gets success, such robots which are helpful to farmers for spraying pesticides called Agrobots.

4.BLOCK DIAGRAM AND DESCRIPTION OF SYSTEM

Working principal of Agrobot: To spray the liquids of pesticide on the crops to protect them against insects while travelling in the field with help of sprayer. Block diagram of pest controlling Agrobot is shown below. The Robot contains components Keyboard, microcontroller, battery, air compressor; sprayer, nozzle, air tank etc. will work as shown in block diagram. The required pressure in the air tank is maintained by air compressor. Key board of remote works as transmitter. The transmitter transmits the signal which is given to it. This signal is captured by robot which works as receiver by microcontroller. As robot senses signal with help of H- bridge circuit D.C motor will actuate and motors get revolution. The working capacity of the battery used in this model is about 2 hour.

Wheels which are connected through D.C motors. So as the motors get revolution the wheels are also rotate. Wheels are rotated as given order reverse, forward, left, right. In this model the diameter of wheel is 4". When voltage is given to circuit as right wheel, motor of right side actuates and wheel takes right turn. When voltage is given to circuit as left wheel, motor if left side actuates and the wheel takes left turn. Same procedure is

done in the forward of reverse motion of the robot. As the carrier of robot travels in the field, the robot sprays the liquid pesticides on the crops with help of sprayer at particular distance.

Working of Remote:

The remote control transmitter is small hand held unit with 4 keys which works on 12V battery to give good range of operation. When a key is pressed, the IC is connected to power supply battery and it starts transmitting packets at 121 MHz frequency consisting of its ID and Data byte which indicates which key was pressed. This information is used in remote control applications. Each transmitter has preprogrammed unique 32 bit ID set during manufacturing and cannot be changed. The receiver board usually stores the transmitter ID in its memory before so receiver only responds to known transmitter IDs for secure applications.The RF part inside remote is SAW based 121 MHz transmitter, which can be received by any 121 MHz type ASK RF Receiver followed by decoder chip.

Nozzle: The nozzle or another hot78 end part could be (partially) blocked by dirt or carbonized material. The impact of vitiated test medium depends upon the partic ular parameter being considered, the operating condition, the test article configuration and the other condition. It is a straight forward analytical task to define the differences in test condition that exits because of testing in a vitiated test medium as opposed to clean air.

Sprayer: Sprayer is the main mechanism in this project without sprayer it is useless because it is main element to pest the pesticide. In this model spraying is controlled by manually. So we work very much to how to control it. After testing it we know that the air pressure in air tank is maintain by pressing the pump about 5-7 times.

Fig.4.Sprayer nozzle

Advantages:

Avoid the farmer being exposed to toxic pesticide vapors produced during spraying. Reduce the workload on the farmer and as it is easier to operate. The farmer need not spry in the hot sun, he can operate the device while standing in a cooler place. By the development of these agrobots lot of manual labor will also be decreased and the farmer life will save from chemicals. It is east to operate and compact in design. It is inexpensive.

5. CONCLUSION

The robot for agricultural purpose an Agrobot is a concept for the near the performance and cost of the product once optimized, will prove to be work through in the agricultural spraying operations.We have been successful in developing a robot whose construction is enough to withstand the challenges of the field. We are sure that once this concept is presented in a manner suitable to Indian market, it will definitely help in bringing down the 15% modality rate found in the Indian formers associated with the agricultural spraying operation.

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