

Customizing Agricultural Practices Using AI Techniques

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Abstract: In terms of human health and in the economic field, agriculture plays a very important role. The need for food and work is also growing due to a growth in the population. Orthodox approaches cannot satisfy these criteria and this is a big problem for automation in the agricultural sector. New automatic approaches have also been implemented. The use of artificial intelligence in the agriculture sector has saved crops from numerous factors such as climate change, food security concerns, unemployment and other issues. The key concern of this paper is to examine numerous current applications in this area, such as irrigation, the use of robotics and the use of drones for spraying in agriculture with the aid of sensors. These technologies save the excess or overuse of water, pesticides, herbicides, boost soil fertility as well as the effective use of manpower and also raise crop yields.

Index Terms: Chatbots, Drones, sensors

I. INTRODUCTION

The world's population is estimated to be nearly 10 billion, enhancing agricultural order – in a circumstance of moderate financial growth someplace in the area of 50 percent relative to 2013. About 37.7% of the total land area is currently used for crop cultivation. It contributes significantly to the economic development of developed nations and also plays an important part in the economies of developing countries. Development in agriculture has resulted in a large rise in the per capita income of the rural population. It will also be rational and appropriate to place greater emphasis on the agricultural sector. In countries such as India, the agricultural sector accounts for 18% of GDP and provides 50 percent of the country's population with livelihoods.

Development in the agricultural sector will boost rural expansion, further contribute to rural transformation and finally lead to structural transformation. AI is focused on vast disciplines such as genetics, linguistics, computer science, mathematics, psychology and engineering a brief description of the existing agricultural automation process. The core idea of AI is to create a technology that works like a human brain.

This technology is carried out by researching how a human brain learns, how humans understand, make choices and work when solving a problem, and on this basis intelligent software and systems are developed. This software are fed with training data and these intelligent devices provide us with the optimal output for any valid input, much like the human brain. Vast realms, including Machine Learning and Deep Learning, are at the heart of AI. AI is a new technology in agriculture. AI-based machinery and computers have brought the new farming method to a different degree.

This technology has enhanced crop production and improved monitoring, harvesting, grinding and sale in real time. The modern technology of automated systems using agricultural robots and drones has made a significant contribution to the agro-based industry. Various high-tech computer-based systems are designed to identify different essential parameters, such as weed recognition, yield detection and crop efficiency, and many other techniques. This paper concerns the technologies used for automated irrigation, weeding and spraying to maximize productivity and reduce the pressure on farmers.

II. DIFFERENT TECHNOLOGIES

Robots

Robots and other autonomous systems were introduced into the large sector industries where the productivity was relatively low, like the agricultural sector. Robotics has played a leading role in rising production and management in the agriculture sector [13]. The researches have been undergoing to design more stable and autonomous conventional farming tools as farming becomes more easy and stable.

Drones

Drones are unmanned aeronautical vehicles (UAVs) or unmanned etheric frames (UAS) often referred to as automatons, defined in mechanical terminology as unmanned aircraft that can be operated remotely [11]. They are being installed on the GPS and other sensors. Drones are used in agriculture to track crop health, irrigation facilities, biodiversity, plant detection and disaster management. Drone (UAV) can also be used for remote sensing for image capture, processing and this has had a significant effect on agriculture [1].

Chatbots

Chatbots are nothing but robotic conversational assistants that simplify conversations with end-users. Artificial intelligence-powered chatbots, along with machine learning methods, have allowed us to understand natural language and communicate with users in a more customized way. They are primarily designed for shopping, transport, media and agriculture, using this facility to help farmers collect answers to their unanswered questions, give advice to them and make different recommendations.

Sensors

AI-driven sensors are very useful for the acquisition and examination of essential agricultural data. Data can be helpful in improving performance. In agriculture, there is a wide potential for these sensors.

Data such as soil condition, the level of weather and groundwater, etc. can be collected from agricultural scientists, which would help to enhance the cultivation process. In order to obtain the data, AI-powered sensors can also be installed in robotic harvesting equipment.

Automated Irrigation Technologies

The agricultural sector consumes nearly 85% of the available water resources around the world. And this percentage will increase because of the increase in population and within the demand of the food. This ends up in things to come back up with additional economical technologies that help in the correct usage of water resources in irrigation [6]. The machine-driven irrigation technologies replaced the manual irrigation which relies on soil water measurements. Whereas implementing automated irrigation technologies and machines many parameters like humidity, wind speed, heat, growth of plant, plant density, soil properties etc are considered [8]. The installation of sensors plays a crucial role in the successful application of irrigation robotics. Various sensors are used for the measurement of various parameters and the information is passed on to the microcontroller and the irrigator pumps run on these details. The template is used to format your paper and style the text. All margins, column widths, line spaces, and text fonts are prescribed; please do not alter them. You may note peculiarities. For example, the head margin in this template measures proportionately more than is customary. This measurement and others are deliberate, using specifications that anticipate your paper as one part of the entire proceedings, and not as an independent document. Please do not revise any of the current designations.

III. DIFFERENT AGRICULTURAL PRACTICES

Robots in Agriculture

The key goal of developing this new technology is to decrease the working rate of farmers and to position robotics in operation, which would also add certain benefits to the productivity of crops. The main change that came in with the introduction of robots is that this increased the productivity immensely [9]. The robots perform various jobs like the farmers perform like the weeding, irrigation and not only that guiding the farmers to get excellent results, by ensuring that no adverse environmental condition has affected the productivity of crops and also increase precision and also manage the crops in a better way. This technology came into practice by the introduction of the machine called Eli Whitney (1765-1825), which marked a revolution in the cotton industry.

With the use of this machine the cotton production was significantly increased. This machine helped to extract seeds from the cotton fibre. This robotic technology can also be used to detect the status or development of plants and that can be recorded. This technology has replaced manual weeding with laser weeding technology, where mobile infrared light disturbs the weed cells and is managed by computers. In farming there is a need for effective usage of water, this problem was also solved by introducing an automated irrigation system [7].

Drones in Agriculture

Drone technology could be an extraordinary innovation that continues to possess extensive effects across today's society, reworking our lives and therefore the means we tend to do business. The agricultural business looks to have embraced drone technology with open arms, victimising these advanced tools to remodel fashionable farming. High-tech drones enable farmers, and the drone pilots that operate them, to extend potency in sure aspects of the farming method from crop observance to planting, placental management, crop spraying, irrigation mapping, and more.

By introducing drone technology, farms and agricultural enterprises are improving their crop yields, saving time and also being able to make decisions that will enable farmers to increase long-term success. There are many factors that a farmer is concerned about that will affect the success of their farms like climate change, wind, soil quality, presence of weeds and insects, variable growing seasons and much more. This agricultural drone technology can access an immense volume of data and this can be used to make better management decisions, improve yield produced by crops and also increase the overall profit of the farmers [2].

Drones can be used to collect knowledge involving crop yields, eutherian health, soil quality, nutrient measurements, weather and precipitation results, and more. This data will then be used to get a more correct map of any existing issues, similarly as produce solutions primarily based upon very reliable data. The agriculture business is not any trespasser to clench ever-changing technological trends to contour business. The use of drones in agriculture is that the next technological waves that'll facilitate agricultural businesses meet the changing and growing demands of the future.

Crop Monitoring Using Sensors

The use of sensors and imaging capability technologies helped the farmers to increase the yields and to reduce the crop damage. For this purpose unmanned aerial vehicles mounted with different sensors are used for inspecting large croplands. And high-tech cameras can also be helpful in the case of inspecting on the ground needed [3].

Satellites have been used for 10 years to inspect large cropland and forestry, but the use of unmanned aerial vehicles has acquired greater accuracy and versatility.

Yield Mapping and Monitoring

Yield mapping allows farmers to consider future practices and historical yield research. It also helps to consider development and digression in agriculture [4]. It proposes geo-referenced information on harvest yields and their consistency.

By analysing the combined information on soil examined data, yield maps empower the arrangement of variable compost maps which considers soil supplement levels just as the supplement which was expelled in the collected harvest.

IV. AI EFFECTS ON AGRICULTURE

AI-based technology aims to increase productivity in all sectors and also helps to manage the problems facing diverse sectors, such as the agriculture industry. Agricultural robots are developed to increase productivity in the agricultural field. With the increase in the population, the agricultural sector is facing some crises, but the implementation of AI delivers a much needed solution. The AI technology in the agricultural sector help the farmers to produce more output with less input and because of this technology the quality of the output has also been improved, and also ensuring availability of yielded crop at the earliest in the market [5].

Artificial intelligence technology is supporting completely different sectors to spice up productivity and potency. AI solutions are aiding to beat the standard challenges in each field. AI in agriculture helps farmers to enhance their efficiency and cut back environmental hostile impacts. The agriculture business powerfully and overtly embraced AI into their follow to alter the outcome. AI is shifting the manner our food is made wherever the agricultural sector's emissions have diminished by 20%. Adapting AI technology is helping to regulate and manage any uninvited natural condition.

Agriculture sector has been facing significant difficulties like absence of irrigation systems, amendment in temperature, density of groundwater, food insufficiency and wastage and well more [10]. The fate of cultivating depends upon a good extent to the reception of assorted psychological feature solutions. When it involves handling realistic challenges long-faced by farmers and using machine-controlled technologies and prophetic solutions to resolve them, farming continues to be at a starting stage. The solutions have to be compelled to become cheaper build sure to confirm that these technologies reach the masses. A platform that's hospitable all would make the solutions a lot of affordable, leading to fast adoption and higher usage among the farmers.

V. CONCLUSION

There are various issues facing the agriculture sector, such as the lack of reliable irrigation facilities, pests, crop height monitoring problems and unfavourable weather conditions. But with the help of technologies, performance can be increased and these issues can also be overcome. Various AI-driven techniques, such as remote soil moisture content detection sensors and automatic irrigation with GPS, can be improved.

The issue faced by farmers was that precision weeding techniques overcome the large amount of crops being lost during the weeding process. These autonomous robots not only increase performance, but also reduce the need for excess pesticides and herbicides. In addition, with the aid of drones, farmers can easily spray pesticides and herbicides on their farms, and plant control is no longer a burden. For example, with the aid of man-made brain power in agricultural business issues, capital shortages, and employment can be understood.

In traditional techniques, enormous quantities of labour were required to obtain crop characteristics such as plant height, soil texture and soil consistency, which were tiresome in this way. With the assistance of various systems tested, quick and non-damaging high-performance phenotyping will take place with the benefit of adaptable and advantageous service, on-demand access to data and spatial objectives.

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