Possible Use of an Agricultural Service with Artificial Intelligence to Monitor Crops

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Abstract. Today, AI technology is a promising field for the development and automation of many processes in various fields. Therefore, the use of AI in the field of agriculture will have a positive impact on many problems that used to take a lot of time and effort, both for individuals and large companies. This work is aimed at suggesting new approaches in agriculture. The suggested approach is to create fully autonomy service that will automatically identify and monitor diseases of crops at an early stage and their further treatment.

1 Introduction

Automation in any industry is the most preferred way to put systems as a whole a new pedestal of fortune. New ways and technologies are transforming our significant sectors almost to the point where human interactions becomes negligible. The autonomy that is given to the machinery is immense. Therefore, the question arises as to how much autonomy is acceptable to us and whether we can fully yield and rely on it. Right now, things are not so vague and the application of autonomy technologies is still in the range of human grip. Modern technologies may claim to be completely autonomous, but what they really mean is that technology can operate with the help of a human as part of the industry 4.0 is called smart agriculture [1-2].

The need for complete autonomy comes from the human desire to accompany one's life with ease. It can be noted that the trend towards comfort increases every year, as well as standards. Only new approaches and technologies as big data, internet of things (IoT), and artificial intelligence (AI) can give the desired results if used correctly for the smart agriculture [3]. Although there is another side, like the medal. The same technology used for good can be used or lead to more serious consequences. These consequences can cause a well-known climate change, which can have catastrophic consequences for humanity in present and in the future, if proper and timely measures are not taken. Some manifestations of climate change appear in different forms and most often not in a positive spectrum. Henceforth, if autonomy is desired, the judicious use of technology must be considered. A

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clear example of the necessity of smart agriculture in coffee is the application of IoT sensors for climate change forecasting [4].

These technologies, in the presence of autonomy, reflect their usefulness in different areas. Most of the time they are controlled using AI. Machine vision in some machines is the main component, allowing it to function for a certain period of time without human interaction. Of course, there must be other components, such as: digital sensors, clever mechanics, well written overall algorithm and others.

This work will look into the possibilities of using AN almost completely autonomous complex for monitoring and identifying crops diseases and taking appropriate measures. Some of the methods proposed by the project are widely used, but not at the level (of autonomy) presented in this work. The mentioned project is supposed to be used in the agricultural sector, as it is more in line with the general idea. This service is not actually used anywhere in the agricultural sector or anywhere else. This is a theoretical work on how the proposed service would work if applied in the agricultural sector.

2 The Agricultural Sector and the Use of AI

The agricultural sector is an important part of humanity in order to survive and hence the prosperity of the sector will positively affect them. Although it functions to fulfil the needs of the planet's population, there are some issues that have yet to be addressed. The first and most important influencer is population growth that pushes agricultural sector to the verse of changes. And the second one is a by-product of agriculture. Agriculture plays an important role in climate change and accounts for almost a third of the total impact on the planet. Therefore, modern methods and technologies should become an integral part of the agro-industrial complex to reduce environmental damage and increase the quality of the crop. Automation in the field of agricultural industry in the form of through technologies, namely, in this case, the use of mostly artificial intelligence, for the timely detection of diseases in crops, will positively affect the general description of the selected type of activity [5-6]. Timely detection of diseases and their prevention can save the crop from the spread of diseases. And also, the technology can be used to identify other parameters, for example: water lack of water, the presence of pests, a lack of fertilizers. Today, AI technology is a promising field for the development and automation of many processes in different fields. Consequently, the use of AI in the field of agro-industry will positively affect many problems that previously took a lot of time and effort, both in individuals and large companies. There are other elements that enhance the AI to maximize it potential, and these will be discussed lately in this work. Therefore, the suggested work must easy the impact on global warming and increase production rate too.

3 Aim of the Work

Consider the benefits of an autonomous service for early detection and monitoring of crop diseases and their further treatment.

4 Agroservice

This section describes the basics of the proposed project and the steps to be taken to achieve autonomy. These steps summarize the general idea of the project, but not the full picture.

Area set up

The very thing to do at the beginning is to select and equip the area for analysis and monitoring of crop diseases. For high-quality analysis and data collection, one need to

determine the area where different types of diseases in crop can be observed (occur). In most cases, this may be an area where crops are grown. The selected area should be equipped with technical devices (cameras, drones, sensors, etc.) for data collection. IoT should be used to improve the organization of value cycles of crop, the communications between machines and data acquisition [7]. For small areas (for example, greenhouse), stationary chambers or a mechanism with an attached camera that can view all plants around the perimeter can be used. And for large areas (sown fields), drones with a camera can be used.

Algorithms

The next step is creating an algorithm (neural networks) to analyze the necessary data collected from the selected area (previously mentioned). The main part of the project is to create AI, which will be capable to detect diseases in a wide range. The neural network should identify and classify different diseases, analyzing the information passed through it, in the form of photos or videos (as well as location). To do this, the system must be trained using a database [5-6].

Replenishment of the library date by sets (date of set of various diseases in plants) and training of neural networks. In the beginning, the data can be collected manually from the selected places, and the available date can be used. The collected data is unloaded into a cloud storage. The next process is the training of neural networks using the selected data. If necessary, the collected data is processed using software. Consequently, the training of neural networks will go until the error decreases to acceptable values.

Mini station with UAVs

Creating a mini station where unmanned aerial vehicles (UAVs) will be located. To grow vegetation inside small areas (greenhouse) there is no need to use drones, since stationary cameras and various sensors are able to work using the created algorithm. To automate the departure of drones, one need mini stations, where drones with the desired modules will be located. It will be necessary to simulate a mini station where drones can be located, which will be remotely (automatically) fly out, analyze the area and return back with the collected data. First of all, the Drone observer will go out and collect information and can be used in all agriculture sectors [8]. Then, depending on the results, drones will fly out with the desired modules (sprayers against diseases or pests). Therefore, the function of the station is the ability to host drones (as well as charge them for further flights) and send the collected information from drones to the general service.

Output results

Obtaining the output data and their validation. The output will be given after passing the collected data through a neural network. Namely, the text with the names of diseases and their location. Depending on the output, the service may respond appropriately.

Service

Creating a full -fledged automated service is the end result of the project. All of the above tasks must be combined into one service that is able to work automatically without the participation of people, except for maintenance. This service should work as a complex that is able to identify problem areas and respond correctly to the problem that has appeared.

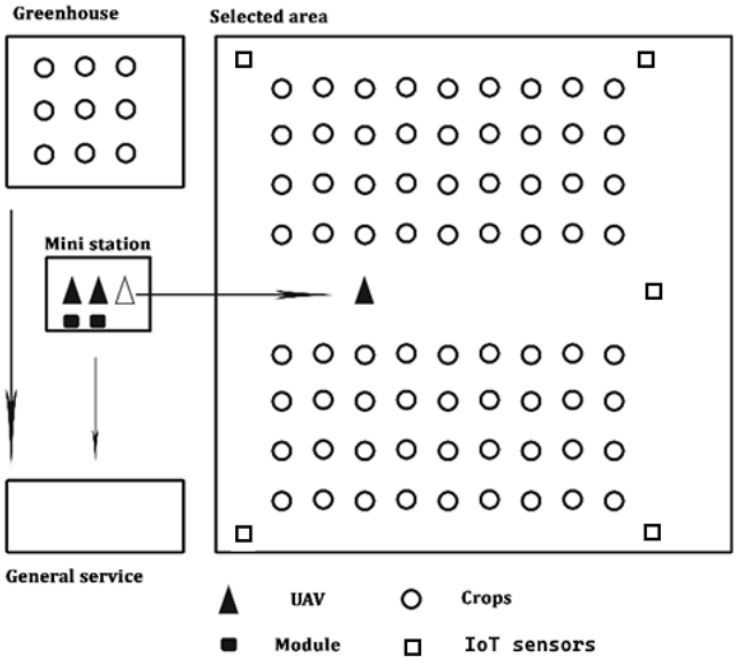

Fig. 1. A possible diagram of agroservice

5 Advantages of the Proposed Approach

At the final stage of the project, it is assumed that a fully automated system or a set of services will be created to prevent various kinds of problems associated with the well -being of the crop. The first is the ability to remotely monitor the selected areas (both greenhouses and fields) by using IoT sensors to understand environmental and geographical conditions for the crops [9]. The ability to identify diseases at an early stage in plants (the method of examining external features using through technologies). Determine the location of the problem area (location of the plant), therefore, eliminate the problem found. This approach will allow you to quickly and accurately identify the problem and eliminate it. The advantages of this technique are: automation of processes, coverage of hard-to-reach places, the correct distribution of resource waste, a point solution to problems (for example, usually if any diseases appear, the solution is spraying the entire area. This method is not effective (economical) and environmentally harmful both for soils, and for the atmosphere). The second is data collection. The data in our time are considered a valuable resource, as powerful computing computers have appeared capable of processing a large number of non -classified information in a short time. What does this give within this project? Neural networks will become better and better with each data collection, therefore, this will positively affect the sphere used. The collected data can be used as a preventive tool to identify the cause of the investigative connection. Also, the collected data can be scientifically investigated to identify the most suitable ways of automation of processes, where costs, waste, working personnel, and impact on the climate are minimized, and the quality, speed and accuracy of this technique is also increased [10].

6 Conclusion

The proposed work was carried out to show the use of an agroservice for the detection and monitoring of crop diseases at an early stage and their further treatment. The proposed work is not fully used in any area, but has a lot of advantages when applied in agriculture. today's agriculture lacks the introduction of new approaches to keep up with needs and threats. Thus, the proposed method can solve some problems and bring the industry to a new level.

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