A SYSTEMATIC REVIEW ON USE OF MODERN TECHNOLOGY IN AUTOMATION OF AGRICULTURE

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ABSTRACT

In order to improve efficiency, productivity, global market, and to reduce human intervention, time, and cost, there is a requirement for the introduction of new technology called the Internet of Things. The internet of things (IoT) is the network of interconnected devices that facilitates information transfer without human involvement. Agriculture and the Internet of Things work together to accomplish smart farming. The current study is a systematic review on the use of IOT and other smart methods in agriculture.

Keywords: IOT, Agriculture, Modern Agriculture, Systematic Review

Introduction

For any sector, it is critical to adapt to the constantly shifting environment. Because of all the ground-breaking technologies in the automation industry, agriculture was forced to adopt all of them. Embedded intelligence emerging as a cutting-edge field by (Diskin & Sreenan, 2000; Hens & Merckx, 2001; McQuiston et al., 2005). Enhancement ideas The embedded intelligence programme includes the use of smart farming, smart crop management, smart irrigation, and smart greenhouses. A nation's agricultural success depends on how well it integrates these new technologies. These researchers revealed a Technology Roadmap (TRM) that follows to knock down the aforementioned doubts that were raised with regard to the agricultural areas (smart farming, smart irrigation etc)(Ampatzidis et al., 2017; Turner et al., 2017).

A new system developed by (Sabri et al., 2014)takes socioeconomic well-being into consideration when determining disease risk for grape crops in India. The anomaly in the vineyard was not discovered until the grape plant had been infected. This impacted the vineyard's results in a very significant way. Temperature, moisture, and humidity sensors were used in the vineyard. The sensor communicates with the database, which is connected to the sensors, on the ZigBee server. Zigbee Alliance has created open global standards called ZIGBEE, which are specifically designed to meet certain requirements when a wireless system network is applied in any location. These specifications specify that Zigbee has four layers: the physical layer, the medium access control layer, the network layer, and the application layer. Three devices are needed: a Coordinator (ZC), a Router (ZR), and an End Device (ZE) (ZED).

(DeJarnette et al., 2009; Diskin & Sreenan, 2000; Hens & Merckx, 2001; McQuiston et al., 2005)utilised the end-to-end approach of ZigBee to talk about farming. Data will remain on the server. The server has loaded the Markov model algorithm, which is hidden. The algorithm's sole function is to help keep sensors and evaluate leaf wetness to help vineyard owners identify whether their grapes are becoming diseased. In advance, the system is programmed to recognise symptoms of grape disease. With this system, the farmer will be encouraged to use pesticides, and will also find that disease detection is less labor-intensive. as seen in (Coulson et al., 1987; Wang & Yates, 1999).

Case studies of use of Modern Agriculture Systems

an extremely sophisticated AI system Prakash et al. founded Prithvi in Rajasthan, India, based on fuzzy logic (2013). Soybeans were planned to be the crop of choice. The participants of the project included agricultural officers, experts on soybean crops, and literature on soybean crops. Fuzzy logic was applied to the system in order to assist the farmer(Abdullah et al., 2013; Levy Jr. et al., 2006; Saimandir et al., 2009), and consulting with him as an expert was also done. The city of Prithvi was broken down into five separate modules. In order to benefit from the system, soybean farmers sought to raise their crop yield. In the system, MATLAB was used as a user interface module.

The apple fruit insect control expert system assisted farmers in finding out when to apply insecticides on the fruit to reduce environmental damage and insect-related injury. Pome was the name of the system . Additionally, it provided farmers with product information, along with the information on how long it would take for the crop to grow. A hypothetical model of POMME was instead constructed instead of the theoretical values from the infection table. The system functioned as expected, and experts who had tried it on a small scale were pleased with the results.

It was reported in 2016 that a crop prediction algorithm was successfully tested on smartphones utilising ANN (artificial neural network). A model for predicting outcomes was created, with a level of accuracy of 100 percent. This system is made possible because of a three-layered model (Ravichandran and Koteshwari, 2016). The number of hidden layers in the model determined the level of the model. The construction and training of the ANN involved applying algorithms like Silva and Almeida's as well as other such tools such as Delta-bar-delta, Rprop, and other devices. Trial and error was used to determine the number of hidden layers. There should be a refined way to evaluate the hidden layers selected, as the prediction system's accuracy is dependent on the number of hidden layers. The better the model's predictions, the greater the number of hidden layers(Afif et al., 1993; Diskin & Sreenan, 2000; Young & Ross, 2001).

Wireless Technologies in Agriculture

Because of wireless technologies, modern communication has been greatly affected, and this has an impact on agriculture automation. This group developed an integrated gateway with sections for sensors, actuators, interfaces, and wireless links that are used to connect gateways. A number of related concepts have also been described, including the estimation for the frequency and bandwidth requirements, which will aid automation(Bannayan et al., 2010; Szenci et al., 1998; Thies et al., 2011).

The different approaches to implementing WSN (Adinarayana et al., 2009; Ampatzidis et al., 2017; Junfeng & Anyuan, 2010; Sabri et al., 2012)in the agriculture sector are described in this paper. Different IEEE standards such as IEEE 802.15.1 PAN/Bluetooth, IEEE 802.15.4 ZigBee etc. are needed in the attempt to use the technology. Another interesting area of discussion was the IPV6 wireless Internet protocol as well as all of the hardware needed to build a WSN. Precision farming with WSN is possible. Moreover, this approach is often used for crop management. The sensors collect different data and store them in the system. Sensors and future actions are taken based both on previous sensor data and on future measures (Shiravale and Bhagat, 2014).

Conclusion

As a result, human intervention is becoming increasingly unnecessary in every field. This early, early in the design process, it is imperative to incorporate both mechanical and electronic layouts to help mitigate these issues. Weed management, combined with computer vision, is a challenge for farmers. Understanding that a weed is different from the crop you're cultivating is critical. CNN will advise us to take out only the unnecessary plants to help us identify various plant types. The immense majority of CNN's algorithms are applicable to locating plants and retrieving plantation data. Möller (2010) said:

Object detection and fruit counting are done with R-CNN for automation. Bargoti and Underwood (2017) trained an input image to the network, which can be any size and of any colour, and a 3-channel colour image of an arbitrary size and colour (BGR). VGG16 NET and a ZF NET with 5 convolutional layers are their models. Data augmentation involves artificially increasing the size of the dataset and changing the variability of the training data. For both the mangoes and the apples, things are looking good. R-CNN outperformed the ZF network in the testing. RCNN is also known as regional convolutional neural network (or R-CNN).

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