Chapter 13
A Neural Network–Based Automatic Crop Monitoring Robot for Agriculture

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ABSTRACT

The economy, being highly based on agriculture, demands innovative and reliable methods of irrigation. In this paper, an idea of automatic irrigation method is proposed. Automatic irrigation is done using a soil moisture sensor. The manual method of irrigation is done by using automated process. In this proposed method, apart from a moisture sensor, other sensors like PIR sensor, ultrasonic sensor, humidity, temperature sensor, and water level sensors are used. This method has additional features like GSM. In wireless systems, electricity will be provided through solar panels. Whenever the moisture content of the soil reaches its maximum threshold value, the system sends a signal to the motor and it turns ON. The robot can do its work automatically through artificial neural network. Every time the motor starts or stops, the user will get the status of the motor's operation through SMS. The robot will continuously monitor the crop field using wireless camera. This provides security for the agriculture land. The main advantages of this system include minimization of water wastage, & error reduction

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INTRODUCTION

In some countries, agriculture is considered as one of the major sources of economic progress. The income of many countries depends directly on agricultural advancement. Moreover, continuous increase in the population of a country demands more innovation in food production technology. The factors affecting agricultural progress must be studied thoroughly to obtain maximum results. The significant building block of agriculture is the irrigation system. In other words, the efficiency of irrigation system may induce ample effects on agriculture (Pathan, & Hate, 2016).

Irrigation process should provide water to soil consistently when it is required and as well stop water flow when the soil has soaked enough water. The excess water in the crop is of no good. It not only leads to wastage of but also destroys crops. In India, the country's economy is mainly based on agriculture. It requires efficient and modern methods for water provision in the crops fields (Bircher et. al., 2012). Problems caused through manual methods of irrigation have let us think about some advance methods which could be relied upon. Any method which is cost effective, reducing manpower and energy saving is considered efficient. Hence, in this proposed system a method which uses very less or no labour (runs on its own) has been recommended, saves electricity and is easy to use.

The proposed system is an automatic irrigation system. Here, automaticity means it turns itself on and off depending on the soil moisture requirement. This automatic irrigation is achieved by using different sensors that sense and notify the user if the soil requires water or not. It also tells the user how much water would be sufficient for the soil, so that water wastage can also be avoided. The errors which may arise when manual irrigation is used would also be rectified to the maximum using this method. The major source of electricity in India is hydroelectric power but this source doesn't pay the country with requisite amount of electrical power. Hence, there is shortage of electricity which is not good for the process of irrigation as motors need uninterrupted supply of electricity (Alsayid et. al., 2013). As deficiency of electricity is a major problem in India, this system is made more feasible by using solar energy. The system is independent of any labour but the status of undergoing process will be received by the user through GPRS (Santhi, 2019) (Nallani, Sandeep, & Hency, 2015). The main objective of this paper is to reduce labour dependency and human effort. Advancement is made by modifying the mechanism in farming, which works automatically, to automate the agro sector. Progressive innovation becomes necessary to meet the raising demands on agro product quality, to reduce the human effort and also to increase crop yield. Solar power is used for operating the robot which is controlled by an obstacle avoidance sensor. This robot is used for monitoring and maintaining crop field using ANN.

SYSTEM DESIGN

The countries where agriculture has a big impact on economy demand a highly efficient way of irrigation. A timely and consistent irrigation is need of the hour in such countries. In places where lack of water is not tolerated by the soil during irrigation, the excess of water provision is also not recommended for crops' flourishment. Hence, a feasible irrigation for any land requires suitable amount of water with minimum amount of delays. Today's world demands improved methods as compared to older ones to carry out processes faster. The world is moving towards automation of every process. In this proposed system, automatic irrigation system has been suggested which detects the soil moisture level and is programmed in a way such that if the water level in soil goes below a particular threshold value,