Chapter 5
Internet of Things for Automation in Smart Agriculture: A Technical Review

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ABSTRACT

By combining the different monitoring and automation techniques available today, we can develop cutting-edge internet of things (IoT) systems that can support sustainable development through smart agriculture. Systems are able to monitor the farming areas and react to the parameters being monitored on their own without the presence of human beings. This automation can result in a more precise way of maintaining the aspects that affect the growth of plants, leading to an increase in the food production on farmlands. This chapter focuses on IOT for automation in smart agriculture and provides a pathway to develop automation system in the smart environment.

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INTRODUCTION

Internet of Things is the interconnection of physical objects like home appliances, vehicles, and other devices that can be embedded with electronics. This interconnection enables these devices to exchange data with each other as well as other networked devices. IoT devices use sensors to sense the physical world and transmit this sensing in form of an electrical signal. IoT has been applied in many sectors, including agriculture. Applying IoT to agriculture can enable farmers to grow crops or raise animals using the precision of today's modern technology, which results in high outputs of food production. This is achieved by enabling the farmer to monitor aspects that affect production on a farm, these include moisture, humidity, soil nutrients, weather. The monitored data can be analyzed and used to counter the negative effects of these aspects. If used effectively, IoT can simulate an ideal environment for agriculture that is prone to negative effects of parameters that affect the food production in agriculture.

The use of IoT in agriculture has been done using different approaches in the past. Krishna, Silver, Malende & Anuradha (2017) designed and implemented a novel wireless mobile robot equipped with various sensors to monitor different environmental parameters that are suitable for crop yield. In this design, a Raspberry Pi 2 Model B is the main controller. All the sensors such as thermo hygro sensor, soil moisture, humidity, ultraviolet, CO2, ultrasonic and pH sensor are interfaced to Raspberry Pi 2 Model B which is located on the wireless mobile robot. A Camera is also interfaced to the Raspberry Pi 2 Model B to capture the crop field and to observe the live events occurring on crop fields. The novel wireless robot is remotely controlled using necessary commands from the PC section in the receiver side.

Patil and Kale (2016) propose a three modules system for crop monitoring on a farm. The modules are farm side, server side, and client side. The system consists of six methods namely, sensing local agricultural parameters; identification of the location of sensor and data collection; transferring data from crop fields for decision making; decision support and early warming based on data analysis, domain knowledge and history generated; actuation and control based on the decision; crop monitoring via camera module. The paper, further suggests using Ubi-Sense motes for monitoring crop fields. Where data from Ubi-Sense mote will be transferred to Ubi-mote Server side module. And implementing a Decision support system for alerts and crop monitoring. Client-side module will consist of a web application as well as mobile application on Android OS.

Jiber, Harroud, and Karmouch (2011) propose an iFarm Architecture Framework for a more precise way of Agriculture monitoring using Wireless Sensor Networks (WSN). Chang, Zhou, Zhao, Cao, Tan, & Zhang (2014) also proposes an agriculture