Applications of Smartphone Sensors in Agriculture

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Abstract

In this article we discuss the use of smartphone in agriculture, different sensors available on smartphones and their applications. Smartphones have become big part of our daily life and they can be used in agriculture for various application ranging crop and crop disease detection, crop canopy, improving agricultural productivity, irrigation scheduling, monitor pest damage and ripeness of fruits etc. There is different type of sensors available on smartphones like Camera, GPS, Microphone, Accelerometer and Gyroscope which can be harnessed for various applications. There are apps like Plantix which identifies diseases in plants, apps for fertiliser calculations, apps for irrigation water requirement calculation and scheduling and many others.

Introduction

The smartphone can prove to be a highly useful tool due to its features that can be applied to farming applications. For instance, observations for crop and soil conditions can be recorded as pinpoint locations, snapped pictures, water, soil colors, plant leaves and light properties. The specialized applications can play vital role in improving farm productivity by analyzing crop, soil, weed, disease and pest variables as well as offering valuable feedback for agricultural decisions and thus the quality of life of small farmer can noticeably improve. Nowadays smartphones have become highly accessible, and their computing power have also increased this allow for a variety of practical applications to be sued on farms. They equipped with various types sensors which can be used in various farming applications like farm resource management, extension activities, disease and pest detection, fertiliser, pesticide and water application rate calculation etc. They can be very help inefficient management of overall farm resources and increasing efficiency in order to increase profit and productivity in agriculture.

Sensors Available on Smartphones

Camera: A camera can take pictures of plants or soil to provide information about plant health, ripeness level, chlorophyll measurement, etc. It can also be used for measurement of Leaf Area Index (LAI) and organic and carbon composition of soil.

GPS: It provides location of a point with good precision. It can be helpful in locating and mapping crops, disease/pest monitoring and alerts, solar radiation predictions and fertilizing.

Microphone: It gives audio inputs to run apps. It records audio and analysis for predictive maintenance of machinery.

Accelerometer: It is used to detect motion. Used for determining Leaf Angle Index.
**Applications of Smartphone**

**Disease Detection and Diagnosis:** Photos taken of suspect plants can be forwarded to experts for analysis.

**Fertilizer Calculator:** Soil sensors and leaf colour can determine the nutrients requirements of crop.

**Soil Study:** Capturing soil images, as well as pH and chemical data from sensors, allows farmers to monitor and adjust to changing soil conditions.

**Water Study:** Determining Leaf Area Index from photos and brightness logging can help farmers determine water needs.

**Crop Harvest Readiness:** Camera photos with UV and white lights accurately predict ripeness.

**Advantages of Agriculture Sensors**

- They help in maximizing yields with optimal use of resources like water, fertilizers and seeds by conserving resources and field mapping.
- Easy to use and install.
- Cheaper and reduce manual work.
- Can be controlled remotely with the help of wireless chip.
- Provide instant results.
- Reducing chemical use by reducing nutrient depletion by through monitoring and management of soil health.
- Maximize water use efficiency by monitoring moisture in crop root zone and manage crop water requirements.

**Disadvantages of Agriculture Sensors**

- Requires uninterrupted internet connectivity which can be problem in developing countries like India.
- Farmers are rather unenthusiastic in adopting these modern technologies.
- Lack of basic infrastructure to support and augment sensor system.
- High costs of manufacture and purchase.
- No incentives from government to increase adoption of new technologies.

**Conclusion**

Use of agricultural software, sensors and artificial intelligence has potential to change the agricultural industry of today. Agriculture has to grow, as it is important to meet the ever-increasing food demand worldwide by use of modern technologies that can increase production and productivity via relatively less complicated and less expensive ways to collect and apply data in agriculture field to adapt to shifting environmental conditions and efficient utilization of resources. While larger farms under control of government organizations and private companies have been the risk takers to adopt these technologies initially but now even smaller farms can get benefit from them. Agriculture sensors help farmers in efficient and effective crop management. Use of sensors in farming can increase farm efficiency and reduce costs. There are some smartphones-based applications that are easily accessible and provided that target users with access to basic smartphones that gives actionable information to small farmers regarding seeding, weeding, fertilizing, and watering operations.

**Reference**