Development of a smart mobile farming service system

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ABSTRACT

A smart mobile farming service system is developed based on WSN (Wireless Sensors Network), GPS and GIS technologies. The hardware system includes WSNs based on Zigbee technology, customized farming PDAs and a host PC. The software system comprises the protocol between the Zigbee coordinator and the farming PDA, the embedded GIS system running on the PDA and the remote farming management system running on the host PC. The Farming PDA integrates the Zigbee coordinator module, GPS module and GPRS module. It can monitor and control the WSN via the Zigbee coordinator, collect the farming information from the WSN nodes, acquire GPS information of each sampling site and exchange data with the host PC via GPRS. The host PC can supervise several farming PDA terminals, exchange data with the farming PDAs, visualize the farming information and offer irrigation decision support according to real-time field information and the farmland irrigation model.

1. Introduction

Digital agriculture is used to digitalize, visualize, design, monitor and control the relevant agricultural objects and farming processes according to agricultural needs by using digital technology [1]. It is necessary for precision agriculture to acquire the farmland information and then make farming decision in real time. However, how to acquire the farming information at a high density is a bottleneck in the way of agricultural development until now [2]. Compared with traditional agriculture information collecting systems, the WSN technology provides us with more advantages such as much more convenience and lower cost. Through the WSN base station, the farming information from WSN nodes is collected and transmitted to the internet, so that the ecological environment of the farmland can be remotely monitored. Furthermore, it can enhance the cropland production manageability and improve the intellectualized level [3,4].

Since the first farming WSN was established in the vineyard of Oregon and was successfully used to detect the growth status of each grape [5], more and more studies using WSN technology to serve the farmland production have been conducted. Bao [6], Sun, et al. [7] used a WSN to monitor the crop growth in a greenhouse. Aiming at various farming objectives in farmlands or orchards, Kim et al. [8,9], Pierce et al. [10], André Torre-Neto et al. [11], Cai et al. [12] developed corresponding WSNs to collect the farming information respectively. The above researches used the fixed base station to collect and transfer the data of the WSN nodes. This strategy constrains the mobility and flexibility of the WSN. Therefore, Gomide et al. [13], and Wu et al. [14] tried to gather WSN information by using a self-made PDA based on MCU technology.

By means of the WSN, farming information such as the soil moisture content and soil temperature can be acquired automatically. Therefore remote decisions such as precision irrigation or precision fertilization can be made on the basis

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