Chapter 34
Mobile Vision for Plant Biometric System

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ABSTRACT

In human's life plant plays an important part to balance the nature and supply food-&-medicine. The traditional manual plant species identification method is tedious and time-consuming process and requires expert knowledge. The rapid developments of mobile and ubiquitous computing make automated plant biometric system really feasible and accessible for anyone-anywhere-anytime. More and more research are ongoing to make it a more realistic tool for common man to access the agro-information by just a click. Based on this, the chapter highlights the significant growth of plant identification and leaf disease recognition over past few years. A wide range of research analysis is shown in this chapter in this context. Finally, the chapter showed the future scope and applications of AaaS and similar systems in agro-field.

INTRODUCTION[1]

At the beginning of this century, there was a tremendous technological revolution in the field of wireless communication and mobile technology. Mobile and ubiquitous computers are increasing their magnitude in every small, portable, wireless computing and communication fields. The technological omnipresence of ubiquitous devices invisibly activates the world by providing accessibility *anywhere-anytime* computing. However, this revolution is still slow in the agricultural sphere, despite the advancements in technologies making it possible to build and deploy wireless sensor networks (WSN) in fields that would radically improves the farming efficiencies. This is because the current wireless technologies are too expensive and complicated for farmers to use especially in the developing countries like India. Two-way radios have long been used by farmers in many such developed countries with large farmlands to contact their employees, farm suppliers, equipment dealers, agents, buyers and farm awareness. Today, world-wide availability of smartphones and cellular networks, the use of mobile phones in agricultural sector is popularly, replacing the use of two-way radios (Wang, Li, Zhu, & Xu, 2016). The advantage of using two-way radios and mobile phones is that these wireless tools are relatively cheap and very simple

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to use. Additionally, smartphones have several important advantages such as all the brands of mobile phones are generally compatible for running various types of application software, and are equipped with Wi-Fi, Bluetooth, camera(s) and GPS capabilities.

In Asia-Pacific region, India has outscored the other nations in terms of the number of mobile users. With such rapidly increasing tele-density, mobile penetration in rural areas is also growing strongly. These days, mobile phones are available to people even in rural India, especially among the agrarian community. Motivated by the advancement in mobile technology and the wide-spread use of phones in India, as discussed above, researchers are aiming to help the illiterate agrarian community to improve their agricultural activities through the use of mobile phones. Thus, a new agro-information technology needs to be introduced in order to bridge the gaps between the real and digital objects via mobile computing (MC) and augmented reality (AR).

Agricultural Scenario

In developing countries, agriculture accounts the major role of rural employment and holds the promise for socio-economic growth. In fact, agro-community is roughly five-times more effective in raising the income of poor farmers compared to any other sector. Agricultural improvement also directly impacts on the hunger and malnutrition and thus plays a significant role in decreasing the occurrences of famine. However, the growing global population has heightened the demand for foods. Due to the lack of infrastructure in rural areas, raising the food prices and the climatic change and the real effective and "smart" agriculture is essential. Together with geographic information systems (GIS) and virtual reality (VR) smartphones can play an important role in precision agriculture environment (Bakhsh, Colvin, Jaynes, Kanwar, & Tim, 2000; Jain, Tim, & Jolly, 1995; Tim, 1995). Some of the uses of on-farm wireless network technologies in improving the agricultural productions are discussed in (Vellidis et al. 2007; Izzat, Ismail, Mehat, & Haroon, 2009; Revenaz, Ruggeri, & Martelli, 2010).

Mobile-Based Agriculture

Information and Communication Technology (ICT), particularly mobile technologies, are often seen as the 'game changer' in agro-community. The already existing *m*-Agricultural information system provides a giant leap in agriculture that offers a plethora of services, serving as a tool for information dissemination (Brugger, 2011). Various mobile-based services such as Internet-based, SMS-based information services (Gore, Lobo, & Doke, 2012), voice-based agro-advisory services like mKRISHI -(Shinde et al. 2014), and videos over mobile networks (Pande, Jagyasi, & Choudhuri, 2009) are utilized for transferring general knowledge about the farming techniques and trends, information of the plants and their varieties regarding how to keep them disease free. The general awareness in India by using *m*-Agriculture techniques since last decade are listed in Figure 1. But due to the limited and disconnected services they did not server the real needy.

Specifically, *m*-Agriculture refers to the delivery of agriculture-related services via mobile communication technology (Brugger, 2011). In order to make decisions on agricultural measures, it provides an individual decision support systems and services. These decision are based on the local contextual information, *i.e.*, delivering location-specific information like climatic patterns, soil and water conditions. Here, *m*-Agricultural termed to involve gathering of related information through mobile technologies like automated weather stations or sensors used in mobile. Thus, *m*-Agriculture involves a two-way advisory

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