in horticulture cultivation. We designed the cloud-awareness terminal with universal sensor port which could measure air temperature, air humidity, light intensity, carbon dioxide concentration, soil temperature and soil humidity, optional transmission module from GSM/GPRS, Zigbee, Sub-GHz, and WiFi, multi-angle mounted micro-power solar panels, and integrated encapsulation with active ventilation radiation shield and waterproof box had the protection level of IP68. It could monitor greenhouse environment parameters as user need in high temperature and humidity circumstance. The optimized structure of solar panels could prolong the charging time more than 2 hours under the covered greenhouse. And star or mesh networks for greenhouse group and distribute greenhouse access network easily. Kinds of energy saving methods for hardware and software design made the terminal had lower power consumption (44uA in sleeping model) which could continuous working over one month with sole 6Ah Li-on battery. For solving the multi-tenants of software as a service (SaaS), big data storage and concurrent access, visualization technology on web, and sensory data access, Mongo DB non relational database integrated with MapReduce structure model was used for greenhouse production cloud service platform. It was built base on the measure terminal, data cloud storage, pool of application resources and service customization, analysis in DSS and smart control technology. It could provide many pluralistic, real time and personalized services like remote greenhouse climate monitor, production assistant management, and market guidance. And operation modes were explored by application. The design had lower cost, better practicability, and information centralizing characteristics than conventional scheme.

P–04. Covering Materials

P-04-01

Mapping Greenhouse Plastic Wastes in The West Region of Portugal

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Plastic materials are used in many applications in agriculture, such as greenhouse and tunnel covering films, direct coverings, shading and protective nets and others. In Mediterranean countries, plastic film is the most common greenhouse covering material. Due to the direct exposure to sun and wind, greenhouse plastic cover needs to be replaced every 6 to 45 months, depending on the material. This means that huge quantities of plastic waste are produced and they need a proper management in order to avoid environmental and economic impacts. The plastic waste is usually recycled by special companies that collect and treat this waste material. The aim of this study was to apply GIS and photointerpretation techniques to determine the amount of plastic waste produced in one of the most important regions of greenhouse production in Portugal, the West Region specifically the Torres Vedras municipality. The methodology integrated the characterization of the type of plastic covering material and the cartography of the greenhouses land units. It was used the Land Use Map 2007 (DGT), Bing Map images and administrative boundaries to determine the geographic position and the types of greenhouses. For each administrative unit it was calculated the frequency and total greenhouses area. The identification of the type of plastic material was made by photointerpretation and direct interviews in one Company that sells material for greenhouses in Torres Vedras. The database created allowed to determine the amount of plastic used as greenhouse cover materials