

## 集成GPS和GIS技术的变量灌溉控制系统(英)

### Variable rate irrigation control system integrated with GPS and GIS

投稿时间: 2005-4-21 最后修改时间: 2005-11-25

稿件编号: 20061029

中文关键词: 变量灌溉; 控制系统; 处方图; GPS OEM; GIS

英文关键词: variable rate irrigation; control system; prescription map; GPS OEM; GIS

基金项目: Supported by 863 Program of Chinese Science & Technology Ministry (2004AA2Z4120) and. by Scientific Research Foundation for Doctoral Discipline of Chinese Ministry (20040712018)

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中文摘要:

结合中国现实国情,应用先进的单片机、GIS、GPS以及变量控制技术,设计了一种经济实用、先进的变量灌溉控制系统。系统设计采用AT89C51单片机作为系统微处理器, Jupiter GPS OEM二次开发作为GPS接收机, IC卡作为GIS数据传递媒体,并根据矢量法提出一种简单快速的田间定位和数据查询算法。灌溉机在田间工作时,系统可从GPS OEM得到位置信息,进行地块识别和位置判断;然后根据位置信息从IC卡的GIS信息中查询土壤属性数据或处方数据,结合机械行走速度、施水幅宽等进行运算,得出某一时刻的灌水量;最后向控制器发出指令,实现变量节水灌溉。田间和实验室模拟试验结果表明,自行研制的低成本GPS OEM接收机,可获得与Ag GPS132相当的定位精度,控制系统能根据处方图的不同需水量,通过电磁阀驱动电路得到变化的输出,实现自动变量施水,系统也能根据需水量进行手动灌溉。

英文摘要:

The objective of this study is to use advanced electronic and computer technology to design a practical and economic variable rate irrigation control system according to the actual conditions in rural areas of China. The control system integrates single-chip microcontroller (SCM) technology, Global Positioning System (GPS) and Geographic Information System (GIS). The main hardware and software components of the system include an AT89C51 single-chip unit as the microprocessor, an IC (Integrated Circuit) card used to transfer GIS information in the unit, and a GPS receiver based on Jupiter GPS OEM developed independently. Meanwhile, a simple and quick data-querying algorithm based on the vector method was put forward and used in the system. The control system received position information from the GPS OEM, recognized the site and determined the vehicle position in the field. Then, the amount of water to be applied was found from a water prescription map on the IC card based on the position data, and the water flow rate was calculated based on vehicle speed and the spray width. Finally, the flow information was converted to an electronic signal to drive a water-regulating valve on an irrigation machine to accomplish variable rate irrigation. The experiment results in field and laboratory showed that there was approximate accuracy for the low cost GPS OEM receiver self-developed compared with Trambler AgGPS132, and the control system was able to fulfill variable rate irrigation automatically based on a prescription map or to apply a specified amount of water through manual control.

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