

孙道宗,王卫星,姜 晟.基于双传感器数据融合的土壤湿度测量与建模[J].农业工程学报,2012,28(15):60-64

基于双传感器数据融合的土壤湿度测量与建模

**Measurement and modeling of soil moisture based on dual-sensor data fusion**

投稿时间: 2012-03-01 最后修改时间: 2012-07-11

中文关键词: [土壤湿度](#), [硬度](#), [传感器](#), [数据融合](#), [TDR-3](#)

英文关键词: [soil moisture](#) [hardness](#) [sensors](#) [data fusion](#) [TDR-3](#)

基金项目: 2011年广东省科技计划项目(2011B020313019); 2010年广东省科技计划项目(2010B020315021)

作者	单位
<a href="#">孙道宗</a>	<a href="#">华南农业大学南方农业机械与装备关键技术教育部重点实验室, 华南农业大学工程学院, 广州 510642</a>
<a href="#">王卫星</a>	<a href="#">华南农业大学南方农业机械与装备关键技术教育部重点实验室, 华南农业大学工程学院, 广州 510642</a>
<a href="#">姜 晟</a>	<a href="#">华南农业大学南方农业机械与装备关键技术教育部重点实验室, 华南农业大学工程学院, 广州 510642</a>

摘要点击次数: **192**

全文下载次数: **94**

中文摘要:

为了克服TDR-3土壤湿度传感器所测量的土壤湿度数据受土壤硬度的影响,得到客观的水分/土壤的质量百分比,设计并制作基于TDR-3土壤湿度传感器和土壤硬度计的土壤湿度测量装置。装置标定时,通过逆向烘干法精确计算水分与土壤的质量百分比,进行土壤湿度( $c$ )、土壤硬度( $\psi$ )和TDR-3传感器输出电压( $U$ )三因素正交试验,用Matlab软件进行二元曲线拟合,构建三者间的数学关系。试验表明,融合TDR-3传感器的输出电压和土壤硬度计的硬度数据后,装置可直接测量出土壤水分的质量百分比,与理论含水率的最大误差为4.75%。相对于单纯使用TDR-3土壤湿度传感器测量土壤湿度,装置的测量精度显著提高。对同一土样测量的最大重复性误差为0.83%,模型具有一定的可靠性与鲁棒性。该文可为开发更加精确的土壤湿度传感器提供参考。

英文摘要:

In order to overcome soil hardness influence on the measured soil moisture data using TDR-3 soil humidity sensor, and to obtain an objective soil moisture, a soil humidity measurement device was designed and developed based on the TDR-3 soil humidity sensor and a soil hardness tester. The device was calibrated by three-factor orthogonal test with factors as the soil moisture, soil hardness and TDR-3 sensor output voltage was carried out through the reverse drying precise calculation of water and soil mass percentage. The mathematical relationship among the three factors was constructed with Matlab software by dualistic curve fitting. Experimental results indicated that the developed device can directly measure mass percentage of soil moisture after fusing output voltage from the TDR-3 sensor with the hardness data from the soil hardness tester. Test result indicated that, after fusing the TDR-sensor output voltage with the soil hardness data, the soil moisture can be measured directly by the device. The error between measured and theoretical values was less than 4.75% and the measurement accuracy could be significantly improved comparing to that only using the TDR-3 sensor. The maximum repeatability error for the same soil was 0.83%, indicating that the model has a certain reliability and robustness. The research can provide a reference for the development of accurate soil moisture sensors.

[查看全文](#) [下载PDF阅读器](#)

[关闭](#)

您是第**5167377**位访问者

主办单位: 单位地址: 北京朝阳区麦子店街41号

服务热线: 010-65929451 传真: 010-65929451 邮编: 100125 Email: [tcsae@tcsae.org](mailto:tcsae@tcsae.org)

本系统由北京勤云科技发展有限公司设计