2019年第32期总199期

农牧业信息化专题

本期导读

前沿资讯

1. 越来越多的应用推动了精细农业软件市场的发展

2. Agrobot制造商将草莓采摘机器人带到了美国

学术文献

1. 用于估算水培溶液中磷酸盐浓度的光谱和钴电化学数据的融合

2. 基于无人机的柑橘高通量表型分析，利用多光谱成像和人工智能技术

3. 无人机遥感在精细农业中的应用前景

中国农业科学院农业信息研究所
联系人：王晶静
联系电话： 010-82106769
邮箱：agri@ckcest.cn
2019年8月12日

更多资讯 尽在农业专业知识服务系统:http://agri.ckcest.cn/

前沿资讯

1. Growing adoption drives precision farming software market（越来越多的应用推动了精细农业软件市场的发展）

简介：The precision farming software market was valued at USD 797 million in 2018 and is expected to reach USD 1,600 million by 2023.

The precision farming software market is currently in the introductory growth phase and is expected to witness substantial growth in the future, owing to the increasing role of technology, according to a recent report by research company MarketsandMarkets.

The precision farming software market was valued at USD 797 million in 2018 and is expected to reach USD 1,600 million by 2023, growing at a compound annual growth rate (CAGR) of 15% during the forecast period.

Increasing need for real-time data management

“Major factors contributing to the growth of the precision farming software market include increasing need for real-time data management through cloud computing, initiatives undertaken by various governments to promote digital farming, increasing adoption of IoT-based smart agriculture, and growing emphasis on increasing farm productivity and profits,” say the reseachers.

Increasing adoption of precision farming software is driving the market, says MarketsandMarkets: “The software in agriculture can play a vital role in increasing productivity of farm on per acre basis through site-specific management of a farm. Increasing adoption of hardware devices such as smart controllers, drones, GPS, and sensors in farms enables farmers or growers to take corrective actions at the right time. Hence, software-based precision farming is the most reliable approach for tracking, monitoring, and predicting crucial variables, such as water quality, ambient temperature and moisture, and soil condition, which impacts the quality of crops, and yield of the farm.”

Cloud computing

Data management in agriculture plays a crucial role as the management decisions are based on the real-time data analysis derived from the observations of the agricultural activities. The real-time data received from cloud computing helps in the management of different farm activities such as farm mapping, planting, crop monitoring, harvesting, inventory management, and marketing.

“Cloud computing is a core technology in the precision farming software practices, which helps in the exchange of data between the software and hardware equipment with minimum human intervention,” states the report.

Americas to dominate precision farming software market

The Americas account for the major chunk of the global precision farming software market in 2018, wherein the US and Canada were the major contributors. The Americas held for a major share of around 47% of the global precision farming software market in 2018, and this trend is expected to continue in the coming years as well.

The early adoption of precision farming software by countries such as the US and Canada are the key factors responsible for the highest market share by the Americas.

Moreover, the Americas has the highest number of IoT devices installed at the agriculture farms.

Growth strategies

Partnerships, agreements, mergers & acquisitions were the key growth strategies adopted by companies from 2016-2018. The prominent players operating in the global precision farming software market have adopted growth strategies, such as mergers & acquisitions, partnerships, and product launches and developments to grow in the market.

For instance, AgJunction partnered Swift Navigation in May 2019 to develop near-autonomous small tractor solutions for agricultural applications. John Deere acquired Blue River Technology, a start-up in the artificial intelligence space, in September 2017. HydroPoint acquired Baseline, Inc. (US), a smart water management technology provider, in 2016. This acquisition strengthened the portfolio of HydroPoint smart water management technology and also helped in expanding its geographic footprint.

来源：FUTURE FARMING

发布日期:2019-07-29

全文链接:

http://agri.ckcest.cn/file1/M00/00/01/Csgk0V1BU7aAN9UQAAXyrh7fhsY307.pdf

2. Agrobot takes strawberry harvesting robots to US(Agrobot制造商将草莓采摘机器人带到了美国)

简介：西班牙农业机器人制造商Agrobot已经进军美国，该公司的机器人正在加利福尼亚州收割草莓。

人工智能

Agrobot SW 6010草莓收获机器人利用人工智能来识别可以采摘的成熟草莓。这台机器配备了30个机械臂，上面安装了摄像头。该摄像机每秒能捕捉10到30张图像，并能分析草莓是否符合采摘的要求，同时考虑到草莓的大小和颜色等参数。

然后，机器人在4秒内切下草莓茎，把草莓放到传送带上。在那之后，草莓被工人们分类并收集在盒子里。Agrobot SW 6010能够在3天内收获100公顷土地上面的草莓。

Agrobot SW 6010相对便宜

据该公司介绍，该机器人的结构简单而坚固，这使得机器相对便宜。例如，由于机械臂是独立工作的，所以当一个或多个机械臂发生故障时，机器仍然可以正常工作。此外，Agrobot表示，各种组件都很容易替换。

来源：FUTURE FARMING

发布日期:2019-07-26

全文链接:

http://agri.ckcest.cn/file1/M00/06/8D/Csgk0F1BVC6AG8hcAA0SQ1tK6Yg806.pdf

学术文献

1. Fusion of Spectroscopy and Cobalt Electrochemistry Data for Estimating Phosphate Concentration in Hydroponic Solution(用于

估算水培溶液中磷酸盐浓度的光谱和钴电化学数据的融合）

简介：Phosphate is a key element affecting plant growth. Therefore, the accurate determination of phosphate concentration in hydroponic nutrient solutions is essential for providing a balanced set of nutrients to plants within a suitable range. This study aimed to develop a data fusion approach for determining phosphate concentrations in a paprika nutrient solution. As a conventional multivariate analysis approach using spectral data, partial least squares regression (PLSR) and principal components regression (PCR) models were developed using 56 samples for calibration and 24 samples for evaluation. The R2 values of estimation models using PCR and PLSR ranged from 0.44 to 0.64. Furthermore, an estimation model using raw electromotive force (EMF) data from cobalt electrodes gave R2 values of 0.58-0.71. To improve the model performance, a data fusion method was developed to estimate phosphate concentration using near infrared (NIR) spectral and cobalt electrochemical data. Raw EMF data from cobalt electrodes and principle component values from the spectral data were combined. Results of calibration and evaluation tests using an artificial neural network estimation model showed that R2 = 0.90 and 0.89 and root mean square error (RMSE) = 96.70 and 119.50 mg/L, respectively. These values are sufficiently high for application to measuring phosphate concentration in hydroponic solutions.

来源：SENSORS

发布日期:2019-06-07

全文链接:

http://agri.ckcest.cn/file1/M00/06/8D/CsgkOF1BUxWAfHPPAHH1nSXfmXo628.pdf

2. UAV-Based High Throughput Phenotyping in Citrus Utilizing Multispectral Imaging and Artificial Intelligence（基于无人机的柑橘高通量表型分析，利用多光谱成像和人工智能技术）

简介：Traditional plant breeding evaluation methods are time-consuming, labor-intensive, and costly. Accurate and rapid phenotypic trait data acquisition and analysis can improve genomic selection and accelerate cultivar development. In this work, a technique for data acquisition and image processing was developed utilizing small unmanned aerial vehicles (UAVs), multispectral imaging, and deep learning convolutional neural networks to evaluate phenotypic characteristics on citrus crops. This low-cost and automated high-throughput phenotyping technique utilizes artificial intelligence (AI) and machine learning (ML) to: (i) detect, count, and geolocate trees and tree gaps; (ii) categorize trees based on their canopy size; (iii) develop individual tree health indices; and (iv) evaluate citrus varieties and rootstocks. The proposed remote sensing technique was able to detect and count citrus trees in a grove of 4,931 trees, with precision and recall of 99.9% and 99.7%, respectively, estimate their canopy size with overall accuracy of 85.5%, and detect, count, and geolocate tree gaps with a precision and recall of 100% and 94.6%, respectively. This UAV-based technique provides a consistent, more direct, cost-effective, and rapid method to evaluate phenotypic characteristics of citrus varieties and rootstocks.

来源：REMOTE SENSING

发布日期:2019-02-17

全文链接:
http://agri.ckcest.cn/file1/M00/06/8D/Csgk0F1BUSSAJJOYAJpcwJ1gytk236.pdf

3. Perspectives for Remote Sensing with Unmanned Aerial Vehicles in Precision Agriculture(无人机遥感在精细农业中的应用前景)

简介：Remote sensing with unmanned aerial vehicles (UAVs) is a game-changer in precision agriculture. It offers unprecedented spectral, spatial, and temporal resolution, but can also provide detailed vegetation height data and multiangular observations. In this article, we review the progress of remote sensing with UAVs in drought stress, in weed and pathogen detection, in nutrient status and growth vigor assessment, and in yield prediction. To transfer this knowledge to everyday practice of precision agriculture, future research should focus on exploiting the complementarity of hyperspectral or multispectral data with thermal data, on integrating observations into robust transfer or growth models rather than linear regression models, and on combining UAV products with other spatially explicit information.

来源：TRENDS IN PLANT SCIENCE
发布日期:2018-12-15
全文链接:
http://agri.ckcest.cn/file1/M00/00/01/Csgk0V1BUe-AE00CACqYtUGc_no068.pdf