2019年第40期总207期

农牧业信息化专题

本期导读

前沿资讯

1. Claas和John Deere在精细农业领域开展合作

2.我国首个基于全基因组测序技术的食源性疾病分子溯源网络建成并投入使用

3. SmartAgriHubs创新门户网站上线

学术文献

1. 利用微型传感器连续监测土壤硝酸盐含量，传感器采用聚(3-辛基-噻吩)和二硫化钼纳米复合材料

2. 温室玉米和高粱叶片性状的活体类人机器人表型研究

3. 利用机器学习从三维点云中自动分割大豆植株

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前沿资讯

1. Claas and John Deere team up in precision agriculture(Claas和John Deere在精细农业领域开展合作)

简介： Claas, John Deere and 365FarmNet say they are introducing the first direct, manufacturer independent cloud-to-cloud data connection for the agricultural industry. A major step forward that will be welcomed by many farmers and contractors.

It was quite a big surprise as well as a welcoming revelation at the recent Agritechnica preview event organised by DLG (Agritechnica's organiser) and VDMA (the German Mechanical Engineering Industry Association). Named 'DataConnect', Claas, John Deere and 365FarmNet have teamed up to introduce the first direct, manufacturer independent cloud-to-cloud data connection for the agricultural industry.

Cloud solutions for data storage and evaluation connected

The solution connects the cloud solutions for data storage and evaluation from Claas (Claas Telematics), John Deere (John Deere Operations Center) and 365FarmNet. Owners of a mixed fleet of tractors, combines, forage harvesters and sprayers, can now choose their preferred cloud/data platform from one of the three companies while also being able to transmit data from other machines via the new interface.

This means that the data are still available in JD Operations Centre, Claas Telematics or 365FarmNet, but can be exchanged in real time from one cloud to the other.

Leap forward in data sharing and management

This major and unexpected step is a leap forward in data sharing and management and confirms as well as stresses the importance of big data in agriculture. The companies themselves call DataConnect 'A new era in precision agriculture'.

Exchange of all important machinery data

The solution enables the exchange of all important machinery data, including current and historical machine location, fuel tank level, current working status and forward speed. The key benefit to the users is that all the necessary machine configurations are available in one system. Transmission of agronomic data is also being planned.

The companies involved say that they wish to share their experience with cloud-to-cloud communication with ongoing Agricultural Industry Electronics Foundation (AEF) projects and that the architecture of the interface is designed to support existing industry standards.

Any interested machine manufacturers and software provider as well as association and standardisation committee is welcome to help develop the existing interface.

First insight at Agritechnica

A first insight into the operation of DataConnect will be possible on the Claas, John Deere and 365FarmNet booths at Agritechnica while the official worldwide launch is scheduled for Summer 2020.

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2．我国首个基于全基因组测序技术的食源性疾病分子溯源网络建成并投入使用

简介：食源性疾病是全球范围内重要的食品安全问题，早期发现和查明病因是防控食源性疾病的重要保证。随着新一代基因组测序技术的发展，基于全基因组测序（WGS）的分子分型技术在食源性疾病聚集性病例识别和暴发溯源调查中已显示出极大的应用价值和发展潜力，逐渐成为国际研究热点，欧美相关国家已相继开展研究和布局。在国家重点研发计划“食品安全关键技术研发”重点专项的支持下，国家食品安全风险评估中心与中国农业大学和北京中科助腾科技有限公司合作，以国家食源性疾病分子溯源网络（TraNet）为基础，首次建成了基于WGS分型技术的新型食源性疾病分子溯源网络，是我国首个实现国家、省、市三级实际应用的分子溯源网络。

WGS技术的推广和使用需要解决庞大基因组数据的传输、储存、快速计算和精准比对，需要成熟易用的生物信息学分析流程和标准化解释系统。针对上述问题，研究团队搭建了我国首个全基因组数据计算云引擎，将标准化的WGS数据分析流程转移到云端，大大降低了WGS数据分析、运算及使用门槛。开发了基于阿里云OSS的WGS三级架构WGS原始测序数据交付中心，实现了原始数据的实时、快速上报及安全传输。在此基础上，建立了基于WGS原始及拼接后数据的全基因组特征基因图谱识别算法，通过以上两种分析方式的相互校正，显著提高了全基因组特征基因分析的准确性，同时建立了分辨力高、重复性好的全基因组多位点序列分型（wgMLST）和核心基因组多位点序列分型（cgMLST）标准化方法，结合流行病学信息，构建了溯源分析知识库，实现了不同实验室间WGS数据的快速分析、比对与共享。研究团队还进一步研究并整合NCBI、CARD、ResFinder、VFDB等公共数据库中的特征基因数据，开发了常见食源性致病菌毒力因子、耐药基因、血清分子分型等自动化分析功能模块，有助于各级实验室开展食源性微生物遗传与变异特征、致病和耐药机制及菌株进化等方面的基础研究。目前网络已经在泰国肠炎沙门氏菌暴发病例的跨省溯源、冷冻饮品中单核细胞增生李斯特氏菌的跨省追踪等事件调查中得到成功应用。网络的建成和运行，为我国食源性疾病暴发的快速调查和精准溯源提供了技术支撑。

来源：国家食品安全风险评估中心

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全文链接:

http://agri.ckcest.cn/file1/M00/0E/C9/CsgkOF2IsySAANz6AAW2aVxZc9I924.pdf

3．SmartAgriHubs Innovation Portal launched（SmartAgriHubs创新门户网站上线）

简介：SmartAgriHubs推出了它的创新门户，该门户连接了欧洲各地的农业科技利益相关者。SmartAgriHubs是Horizon 2020仪器下的2,000万欧元的欧盟项目，汇集了欧洲农业食品领域超过164个合作伙伴；该项目旨在实现欧洲农业的“数字化”。

该创新门户的目标是扩展和更好地连接整个欧洲农业技术关键利益相关方网络。为此，SmartAgriHubs表示，该门户网站具有多种用途：搜索引擎、一站式购物市场、图书馆、培训平台、日历、网络、论坛和婚介服务。该创新门户是根据SmartAgriHubs项目的内部和外部利益相关者的需求开发的。只需单击几下和搜索查询，用户就可以在特定的部门或地理区域内找到所需的能力中心、中小企业、数字创新中心、解决特定问题的文档或培训，找到特定的解决方案。例如，正在为自己的农场寻找数字解决方案的农

民，或者正在为市场创建数字解决方案的项目人员，以及正在寻找能够提供技术或商业建议的组织，都可以使用创新门户。这也意味着利益相关者有兴趣学习更多的数字技术并参与讨论。

来源： Future Farming

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全文链接:

http://agri.ckcest.cn/file1/M00/0E/C9/CsgkOF2ItkWAf38JAAYr3fFxszQ891.pdf

学术文献

1. Continuous Monitoring of Soil Nitrate Using a Miniature Sensor with Poly(3-octyl-thiophene) and Molybdenum Disulfide Nanocomposite(利用微型传感器连续监测土壤硝酸盐含量，传感器采用聚(3-辛基-噻吩)和二硫化钼纳米复合材料)

简介： There is an unmet need for improved fertilizer management in agriculture. Continuous monitoring of soil nitrate would address this need. This paper reports an all-solid-state miniature potentiometric soil sensor that works in direct contact with soils to monitor nitrate-nitrogen (NO_3^--N) in soil solution with parts-per-million (ppm) resolution. A working electrode is formed from a novel nanocomposite of poly(3-octyl-thiophene) and molybdenum disulfide (POT-MoS_2) coated on a patterned Au electrode and covered with a nitrate-selective membrane using a robotic dispenser. The POT-MoS_2 layer acts as an ion-to-electron transducing layer with high hydrophobicity and redox properties. The modification of the POT chain with MoS_2 increases both conductivity and anion exchange, while minimizing the formation of a thin water layer at the interface between the Au electrode and the ion-selective membrane, which is notorious for solid-state potentiometric ion sensors. Therefore, the use of POT-MoS_2 results in an improved sensitivity and selectivity of the working electrode. The reference electrode comprises a screen-printed silver/silver chloride (Ag/AgCl) electrode covered by a protonated Nafion layer to prevent chloride (Cl^-) leaching in long-term measurements. This sensor was calibrated using both standard and extracted soil solutions, exhibiting a dynamic range that includes all concentrations relevant for agricultural applications (1-1500 ppm NO_3^--N). With the POT-MoS_2 nanocomposite, the sensor offers a sensitivity of 64 mV/decade for nitrate detection, compared to 48 mV/decade for POT and 38 mV/decade for MoS_2. The sensor was embedded into soil slurries where it accurately monitored nitrate for a duration of 27 days.

来源： ACS APPLIED MATERIALS & INTERFACES

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http://agri.ckcest.cn/file1/M00/0E/C9/CsgkOF2Ism2ASaejAHxmDhy76iE878.pdf

2．In vivo human-like robotic phenotyping of leaf traits in maize and sorghum in greenhouse(温室玉米和高粱叶片性状的活体类人机器人表型研究)

简介：In plant phenotyping, leaf-level physiological and chemical trait measurements are needed to investigate and monitor the condition of plants. The manual measurement of these properties is time consuming, error prone, and laborious. The use of robots is a new approach to accomplish such endeavors, enabling automated monitoring with minimal human intervention. In this paper, a plant phenotyping robotic system was developed to realize automated measurement of plant leaf properties. The robotic system comprised of a four Degree of Freedom (DOF) robotic manipulator and a Time-of-Flight (TOF) camera. A robotic gripper was developed to integrate an optical fiber cable (coupled to a portable spectrometer) for leaf spectral reflectance measurement, and a thermistor for leaf temperature measurement. A MATLAB program along with a Graphical User Interface (GUI) was developed to control the robotic system and its components, and for acquiring and recording data obtained from the sensors. The system was tested in a greenhouse using maize and sorghum plants. The results showed that leaf temperature measurements by the phenotyping robot were significantly correlated with those measured manually by a human researcher (R^2 = 0.58 for maize and 0.63 for sorghum). The leaf spectral measurements by the phenotyping robot predicted leaf chlorophyll, water content and potassium with moderate success (R^2 ranged from 0.52 to 0.61), whereas the prediction for leaf nitrogen and phosphorus were poor. The total execution time to grasp and take measurements from one leaf was 35.5±4.4 s for maize and 38.5±5.7 s for sorghum. Furthermore, the test showed that the grasping success rate was 78% for maize and 48% for sorghum. The phenotyping robot can be useful to complement the traditional image-based high-throughput plant phenotyping in greenhouses by collecting in vivo leaf-level physiological and biochemical trait measurements.

来源：COMPUTERS AND ELECTRONICS IN AGRICULTURE

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http://agri.ckcest.cn/file1/M00/0E/C9/CsgkOF2IsNiALOUoAChwH5Pf3hs878.pdf

3．Automated segmentation of soybean plants from 3D point cloud using machine learning(利用机器学习从三维点云中自动分割大豆植株)

简介：Image-based plant phenotyping has become a promising method for high-throughput measurement of plant traits in breeding programs. Plant geometric features that are essential for understanding plant growth can be obtained from the point cloud built using three-dimensional (3D) reconstruction of plant imagery data. A key task in the data processing pipeline is the automated and accurate segmentation of individual plants. Machine learning is a promising approach due to its strong ability in the extraction of details from images and has been successfully applied in plant leaf segmentation from two-dimensional (2D) images. The aim of this paper was to evaluate the performance of three machine learning methods, i.e. boosting, Support Vector Machine (SVM) and K-means clustering, in

the segmentation of non-overlapped and overlapped soybean plants at early growth stages using 3D point cloud. Images of 75 soybean plants at two growth stages in a greenhouse were collected using an image-based high-throughput phenotyping platform and were used to develop 3D point cloud using the Structure from Motion (SfM) method. Plant features including position (coordinate x, y, and z), and color (Red, Green, Blue, hue, saturation and Triangular Greenness Index) were used for background removal and the separation of non-overlapped plants. A Histogram of Oriented Gradient (*HOG*) descriptor was used for the separation of overlapped plants. The percentage of mismatched points between manual and automated segmentation was calculated and results showed that K-means clustering had the least mean error rates (0.36% and 0.20%) for the background removal and the non-overlapped plant separation. The least mean error rate for the separation of overlapped plants was 2.57% using SVM with labeled *HOG* descriptor. The developed image segmentation pipeline was evaluated in a case study where 69 plants at different growth stages were continuously monitored. Results showed that it took three minutes on average for completing all procedures in the pipeline and the extracted features (i.e. height and shooting area) were able to quantify the plant growth.
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