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《智慧农业发展战略研究》专题快报

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【动态资讯】

1．中英智慧农场1.0科技创新合作正式启动

【科技部】在科技部国际合作司、农村科技司指导下，根据中英农业旗舰挑战计划总体安排，6月10日，中英智慧农场1.0科技创新合作正式在北京小汤山启动。本次活动由农村中心联合英国驻华使馆、国家农业信息化工程技术研究中心、英国创新署精准农业工程中心共同组织实施。农村中心刘作凯副主任、英国驻华使馆科技主管Alasdair Hamilton，以及来自中英两国智慧农业领域的科学家、企业家共计20余人参加活动。中英智慧农场科技创新合作是中英农业旗舰挑战计划的重要组成部分，分为四个阶段（智慧农场1.0-4.0）。本次活动不仅标志着中英智慧农场1.0合作正式启动，也标志着中英智慧农场建设进入实质性推进阶段。启动会上，中英双方开展了小麦联合收割测产、星机地协同作物精准感知及实时诊断、智慧农场管理系统示范和应用等数据采集和监测工作，研讨了未来智慧农场合作重点和合作机制，明确了构建一套可复制、可推广的智慧农场发展新模式的共同目标，为推动中英智慧农场建设奠定了良好基础。

链接:

http://www.most.gov.cn/kjbgz/201907/t20190701_147359.htm

2．河北省多地实现智慧农机全程作业

【农业农村部】6月中旬，在赵县姚家庄村光辉农机合作社麦田里。搭载智能终端的小麦联合收割机、无人驾驶拖拉机、精准变量喷药机、高效节水淋灌机，在全程机械化精准变量作业物联网的监控下，以全新的作业方式逐一亮相，集中展示了京冀联合打造的农作物全程智慧农机作业场景，让人们看到了农业的未来。从无人驾驶的拖拉机高速精量播种，到使用无人机遥感技术测试农作物长势、监测土壤肥力，再到精准变量施肥、精准变量施药、精准水肥一体化，最后实现实时测产的智能化收获，经过3年不懈努力

探索，具有河北特色的农作物全程机械化智能化技术体系基本形成。如今，“物联网+精准农业”的全程机械化架构在河北省已经建立。应用物联网监测平台，河北省的许多农机合作社“智慧农场”实现了“四化”，即农机管理信息化、田间作业智能化、生产过程数字化、经营服务网络化。同时，这一可复制的全程机械化智能化样板也正在全省推广应用。

链接:

http://www.moa.gov.cn/xw/qg/201906/t20190627_6319520.htm

3．ETSI releases new specifications for smart cities, industry 4.0, smart agriculture

【Telecompaper】 The ETSI SmartM2M Technical Committee released three new specifications for smart cities, industry and manufacturing, and smart agriculture and food chain domains following the first three Saref (Smart Applications Reference ontology) specifications for energy, environment and buildings. The Saref4City, Saref4Inma and Saref4Agri standards enable interoperability and therefore contribute to the development of the global digital market. When the European Commission launched the Smart 2013/0077 Standardization Initiative on smart appliances, a survey was conducted. The outcome was to create commonly agreed semantics for smart appliances and build a reference ontology as an interoperability language, and, with the help of TC smartM2M and oneM2M, these standards are now a reality. The Saref4City specification, ETSI TS 103 410-4, was developed with the stakeholders who would need ontology such as other standardization bodies, associations, IoT platforms and European projects and initiatives. Use cases include e-health and smart parking, air quality monitoring, mobility and street lighting. Saref4City provides a common core of general concepts for smart city data for the IoT. The Saref4Inma specification, ETSI TS 103 410-5, was developed to solve the lack of interoperability between various types of production equipment that manufacture items in a factory. The Saref4Agri specification, ETSI TS 103 410-6, addresses the Smart Agriculture and Food Chain domain. Use cases focus on livestock farming and smart irrigation and the integration of multiple data sources for the purpose of providing decision support services located on the local Farm Management System of the farmers or provided by a service over the network. ETSI TC SmartM2M is also working to include more activity sectors and to complete the development of an open portal to gather direct contributions to SAREF by 2020. The stakeholders’ evolving data model inputs can then be directly reflected in the ETSI SAREF and oneM2M specifications.

链接:

https://www.telecompaper.com/news/etsi-releases-new-specifications-for-smart-cities-industry-40-smart-agriculture--1298015

4．二〇一九年移动互联网蓝皮书发布

【人民日报】今日，移动互联网蓝皮书《中国移动互联网发展报告（2019）》发布会在人民日报社图书馆举行。人民日报社副总编辑兼海外版总编辑许正中，中央网信办移动网络管理局副局长苏仁先出席发布会。人民网总编辑、移动互联网蓝皮书主编罗华发布了《中国移动互联网发展报告（2019）》。报告从五个方面梳理了2018年中国移动互联网发展概况，总结了2018年中国移动互联网发展的四大特点。来自中国互联网协会、北京邮电大学、中国传媒大学、吉林大学、中国信通院、Nreal公司和人民网研究院的学者和专家围绕“智能时代的移动互联网”进行主旨发言和圆桌讨论。移动互联网蓝皮书由人民网研究院组织编写，社科文献出版社出版发行，至今已连续出版8年。《中国移动互联网发展报告（2019）》包括总报告和26篇分报告以及2018年移动互联网大事记，由49位作者共同完成。

链接:

http://paper.people.com.cn/rmrb/html/2019-06/25/nw.D110000renmrb_20190625_4-06.htm

5．Centre to use digital technology to transform agriculture, double farmers' income by 2022

【Siasat Daily】New Delhi: In a bid to double farmers' income by the year 2022, the Agriculture and Farmers Welfare" Ministry of Agriculture and Farmers Welfare is set to use digital technology to modernise and organise agricultural activities in rural India. "Digital Technology, like Artificial Intelligence, Big Data Analytics, Blockchain Technology, Internet of Things, etc can play a transformational role in modernizing and organizing how rural India performs its agricultural activities," Union Minister of Agriculture and Farmers' Welfare, Narendra Singh Tomar told the Rajya Sabha in a written statement. The Government has constituted an Inter-Ministerial Committee to examine issues relating to doubling of farmers' income and recommend a strategy to achieve that goal by the year 2022. The committee has appreciated the role of Digital Technology and recommended the development of mobile applications to disseminate valuable information regarding farming, sending crop related advisories through SMS and online portal, launching an online trading

platform, improve/create scientific storage capacity, introduce soil health card scheme and providing subsidies. "The Indian Council of Agriculture Research (ICAR) has compiled more than 100 mobile apps developed by ICAR, state agricultural universities and 'Krishi Vigyan Kendra' and uploaded on its website. These mobile apps developed offer valuable information to the farmers," said the statement. "Use of space technology for various programmes/ areas such as forecasting agricultural output, agro-meteorology and land-based observations, horticulture assessment and management, drought assessment and monitoring system, 'Rashtriya Krishi Vikas Yojana' and crop insurance," it added. The Government has also set up 713 'Krishi Vigyan Kendra' and 684 Agricultural Technology Management Agencies at the district level for the dissemination of technologies among farm community. In addition, farmers are provided information through focused publicity campaigns, Kisan call centres, Agri-Clinics and agri-business centres of entrepreneurs, agri-fairs and exhibitions, Kisan SMS portal, etc.

链接:

https://www.siasat.com/news/centre-use-digital-technology-transform-agriculture-double-farmers-income-2022-1522054/

6．中国•青海智慧农业大数据高峰论坛召开

【青海新闻网】6月21日，由青海省农业农村厅、中国信息协会大数据分会主办的中国•青海智慧农业大数据高峰论坛在西宁召开。来自中国信息协会大数据分会、省农业农村厅相关处(局)及厅属单位负责人，各市(州)、县(区)农业农村主管部门负责同志，以及省内50余家智慧农牧业种养殖基地、涉农企业代表，共计250余名嘉宾参加会议。作为本届中国•青海绿色发展投资贸易洽谈会的主要活动之一，论坛邀请了中国科学院院士及国内大数据行业多位专家学家，聚焦"高原•智慧•特色"主题，共谋青海省农牧业新发展，共商大数据产业合作和智慧农牧业新未来。论坛上，中国科学院院士、数学家、西安交通大学教授徐宗本先生发表题为《大数据与人工智能：创新发展的驱动力与普适技术》的主旨演讲；农业农村部信息中心主任王小兵发表题为《大数据引领驱动乡村振兴》的主题演讲；中国农业科学院农业资源与农业区划研究所研究员钱建平博士发表题为《追溯——促进农产品智慧供应链透明化》的主题演讲；青海宝讯溯源网络科技有限公司的总经理韩艳就青海智慧农牧业建设应用作交流发言。

链接:

http://www.qhnews.com/newscenter/system/2019/06/22/012910305.shtml

7．Smart Agriculture Market is Expected to Reach USD 17.9 Billion by 2025

【Einnews】PUNE, India, June 21, 2019 (GLOBE NEWSWIRE) -- Global Smart Agriculture Industry to reach USD 17.9 billion by 2025. Global Smart Agriculture Industry valued approximately USD 7.1 billion in 2017 is anticipated to grow with a healthy growth rate of more than 12.5% over the forecast period 2017-2025. The demand for smart technologies such as Big Data, cloud-based services, GPS, and the IoT is gaining pace in the agriculture industry. Driven by the rising need for high precision crop analysis, automated farming techniques, and collection of data from the field, the world is likely to witness the agriculture industry get smarter with the implementation of technologies in the coming years. Data thus derived from implementing smart technologies can help farmers yield high quality and larger quantity of crops. Besides rising population, which triggers demand for food, the global smart agriculture Industry is expected to gain from favorable government initiatives. However, the journey is likely to be more difficult in underdeveloped economy where the agriculture sector is reeling under lack of knowledge among farmers. The high cost of smart devices is making the matter worse. Nevertheless, in the coming years the Industry is likely to gain from the rising penetration of high-speed internet even in remote areas. The regional analysis of the Global Smart Agriculture Industry is considered for the key regions such as Asia Pacific, North America, Europe, Latin America and Rest of the World. The dominance was with the smart agriculture Industry in North America, which held over 44.14% of the overall Industry in 2016. Extensive research funded by governments across the region to minimize human involvement and boost crop yield has fueled the demand for smart agriculture technologies in North America. Europe emerged as the second-leading and is expected to continue exhibiting lucrative Industry opportunities. In the U.K. especially the Industry is forecast to witness accelerated pace of gains as the government make huge investments in the research and development of robust technologies. Besides this, the rate of growth in Italy is predicted to remain high through the forecast period. During the same time, the Asia Pacific smart agriculture Industry is forecast to rise at an influential rate. Countries such as Japan, China, and Australia with strong agriculture sectors are expected to emerge at the fore of the regional Industry. China held the leading share in the Asia Pacific smart agriculture Industry. However, in the forthcoming years Japan is expected to showcase more attractive opportunities for the Industry. Major market players in Smart Agriculture Industry are Deere & Company, Trimble, Agco, Agjunction, Raven Industries, Delavai, AG Leader Technology., Teejet Technology, Topcon Positioning System, Geosys, Dairy Master and so on.

链接:

https://agriculture.einnews.com/pr_news/488647157/smart-agriculture-market-is-expected-to-reach-usd-17-9-billion-by-2025-by-major-market-players-deere-company-trimble-agco-agjunction-raven

8．Climate-Smart Agriculture Assistance Available Through UCCE

【Agnetwest】With so many different practices that can be considered climate-smart agriculture, it can be challenging for growers to determine the best course of action when contemplating different approaches. UC Cooperative Extension Community (UCCE) can provide assistance with the selection and implementation of different farming practices. UCCE can also help with the application process for various agricultural programs offered through the California Department of Food and Agriculture (CDFA). "Our role is to provide outreach, education, and technical assistance for different climate-smart practices," said Alli Rowe, UCCE Community Education Specialist working with climate-smart agriculture programs. "So, we will provide consultations with growers, go out to growers' properties and evaluate what practices might work for their operation and their goals." Initiatives such as the Healthy Soils Program, the State Water Efficiency and Energy Program, as well as the Alternative Manure Management Program all offer farmers and ranchers a multitude of different benefits. However, the application process can be fairly technical and also require a substantial amount of time. "Our role is really designed to step in and relieve a lot of that paperwork headache and burden of application so that we're helping growers complete the applications and get the funding that they need to implement these practices," said Rowe. Each of the CDFA programs help to provide opportunities for farmers and ranchers to implement agricultural practices that reduce greenhouse gas emissions, increase carbon storage in soils, and improve water use efficiency. With the adoption of climate-smart approaches, California's agricultural community can help address environmental needs as well as ultimately help to reduce on-farm costs at the same time. "With California being such an important agricultural state and yet also very susceptible to the impacts of climate change, it's very cool to have funding to support practices that help build resiliency and keep our farmers farming," said Rowe.

链接:

http://agnetwest.com/climate-smart-agriculture-assistance-available-ucce/

9．Awards fund innovations in digital agriculture

【Cornell Chronicle】Projects ranging from a soil-swimming robot that can sense conditions in the root zone in real time to computational models that can predict produce spoilage received seed funds from the Cornell Initiative for Digital Agriculture's new Research Innovation Fund. Eight interdisciplinary teams of researchers from the College of Agriculture and Life Sciences, the College of Engineering, Computing and Information Science, Cornell Tech and the College of Veterinary Medicine (CVM) will receive three-year awards of up to $225,000. To apply, teams needed to include Cornell faculty members from at least two colleges, ensuring cross-campus collaboration. "These research projects represent the exciting potential of digital tools, such as computational models, robotic systems, artificial intelligence and the 'internet of things,' to transform agriculture at every step of the food-production process," said Susan McCouch, Ph.D. '90, the Barbara McClintock Professor of Plant Breeding and Genetics and the director of the Cornell Initiative for Digital Agriculture (CIDA). "Interdisciplinary collaborations like these will push the frontiers of science to increase the productivity and sustainability of agriculture, and to foster a pipeline of discovery and practical innovations." A multidisciplinary group of nearly three dozen faculty members, chaired by Renata Ivanek, associate professor in the Department of Population Medicine and Diagnostic Sciences in CVM, selected the eight projects from 31 proposals. Funding for the awards comes from the CIDA Research Innovation Fund and the U.S. Department of Agriculture Hatch Act program.

链接:

http://news.cornell.edu/stories/2019/06/awards-fund-innovations-digital-agriculture

10．Digital Transformation of the Australian Agriculture Sector - Forecast to 2022

【Odessa American】The "Digital Transformation of the Australian Agriculture Sector, Forecast to 2022" report has been added to ResearchAndMarkets.com's offering. Transforming from traditional farming techniques to adopting precision agriculture solutions requires substantial capital investment. This investment decreases on a year-over-year basis and at the same time, the savings per unit of production increases exponentially. Farmers adapting to modern agriculture techniques have been able to carry out farming in a more efficient way, while reducing waste. For example, a GPS-based (Global Positioning Satellite) navigation system for a tractor provides highly accurate plowing, seeding, and harvesting. For long, farmers have used their experience and knowledge to

judge the health of crops. One major drawback of this, is that the accuracy of detection is not high, which leads to losses and sub-standard products being harvested. With the advent of low-cost sensing techniques, farmers can now accurately judge the health of crops and take necessary steps based on readings. Crop sensors measure various parameters that can determine the ripeness and quality of individual plants.

链接:

https://www.oaoa.com/news/business/article_ef274f72-0ec2-5724-8444-91fe6599a7fe.html

【文献速递】

1．A framework for the management of agricultural resources with automated aerial imagery detection

文献源：Computers and Electronics in Agriculture,2019

摘要：The acquisition of data through remote sensing represents a significant advantage in agriculture, as it allows researchers to perform faster and cheaper inspections over large areas. Currently, extensive researches have been done on technical solutions that can benefit simultaneously from both: vast amounts of raw data (big data) extracted from satellite images and Unmanned Aerial Vehicle (UAV) and novel algorithms in Machine Learning for image processing. In this experiment, we provide an approach that fulfills the necessities of rapid food security, assessment, planning, exploitation, and management of agricultural resources by introducing a pipeline for the automatic localization and classification of four types of fruit trees (coconut, banana, mango, and papaya) and the segmentation of roads in the Kingdom of Tonga, using high-resolution aerial imagery (0.04 m). We used two supervised deep convolutional neural network (CNN): the first, to localize and classify trees (localization) and the second, to mask the streets from the aerial imagery for transportation purposes (semantic segmentation). Additionally, we propose auxiliary methods to determine the density of groupings of each of these trees species, based on the detection results from the localization task and render it in Density Maps that allow comprehending the condition of the agriculture site quickly. Ultimately, we introduce a method to optimize the harvesting of fruits, based on specific sceneries, such as maximum time, path length, and location of warehouses and security points.

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0eNZyAKtR4AiXsk4nlPNg002.pdf

2．mySense: A comprehensive data management environment to improve precision agriculture practices

文献源：Computers and Electronics in Agriculture,2019

摘要：Over the last few years, an extensive set of technologies have been systematically included in precision agriculture (PA) and also in precision viticulture (PV) practices, as tools that allow efficient monitoring of nearly any parameter to achieve sustainable crop management practices and to increase both crop yield and quality. However, many technologies and standards are not yet included on those practices. Therefore, potential benefits that may result from putting together agronomic knowledge with electronics and computer technologies are still not fully accomplished. Both emergent and established paradigms, such as the Internet of Everything (IoE), Internet of Things (IoT), cloud and fog computing, together with increasingly cheaper computing technologies with very low power requirements and a diversity of wireless technologies, available to exchange data with increased efficiency and intelligent systems, have evolved to a level where it is virtually possible to expeditiously create and deploy any required monitoring solution. Pushed by all of these technological trends and recent developments, data integration has emerged as the layer between crops and knowledge needed to efficiently manage it. In this paper, the mySense environment is presented, aimed to systematize data acquisition procedures to address common PA/PV issues. mySense builds over a 4-layer technological structure: sensor and sensor nodes, crop field and sensor networks, cloud services and support to front-end applications. It makes available a set of free tools based on the Do-It-Yourself (DIY) concept and enables the use of Arduino® and Raspberry Pi (RPi) low-cost platforms to quickly prototype a complete monitoring application. Field experiments provide compelling evidences that mySense environment represents an important step forward towards Smart Farming, by enabling the use of low-cost, fast deployment, integrated and transparent technologies to increase PA/PV monitoring applications adoption.

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0fBN6AXwhgADZhXudmT1E019.pdf

3．A comprehensive review on automation in agriculture using artificial intelligence

文献源：Artificial Intelligence in Agriculture,2019

摘要：Agriculture automation is the main concern and emerging subject for every country. The world population is increasing at a very fast rate and with increase in population the need for food increases briskly. Traditional methods used by farmers aren't sufficient enough to serve the increasing demand and so they have to hamper the soil by using harmful pesticides in an intensified manner. This affects the agricultural practice a lot and in the end the land remains barren with no fertility. This paper talks about different automation practices like IOT, Wireless Communications, Machine learning and Artificial Intelligence, Deep learning. There are some areas which are causing the problems to agriculture field like crop diseases, lack of storage management, pesticide control, weed management, lack of irrigation and water management and all this problems can be solved by above mentioned different techniques. Today, there is an urgent need to decipher the issues like use of harmful pesticides, controlled irrigation, control on pollution and effects of environment in agricultural practice. Automation of farming practices has proved to increase the gain from the soil and also has strengthened the soil fertility. This paper surveys the work of many researchers to get a brief overview about the current implementation of automation in agriculture. The paper also discusses a proposed system which can be implemented in botanical farm for flower and leaf identification and watering using IOT.

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0fBFSAbA9cABhdQcG6LhI916.pdf

4．智能化无人机植保作业关键技术及研究进展

文献源：智慧农业,2019

摘要:搭载高性能传感器和施药装备的农业植保无人机系统是精准农业领域具有代表性的智能装备之一。本研究首先从前端田间作业环境动态感知技术出发，阐述了无人机光谱成像遥感、多传感器融合的SLAM实时环境建模等技术在无人机植保作业方面的应用情况；然后对精准施药过程建模与优化控制有关的前沿技术进行了分析，包括旋翼下方风场结构演化及雾滴沉积过程仿真建模、多区域全覆盖条件下的智能作业路径规划、精准变量施药控制等；最后论述了作业效果评估与过程监管相关技术的发展现状，包括施药作业质量评价方法、基于云平台数据管理的全过程可视化监管等。在总结现有技术发展现状基础上，对未来智能化无人机植保关键技术发展趋势进行了预测，阐明了光谱图像获取与计算智能的深度学习识别聚类、基于高精度雾滴谱和风场模型预测的精准变量施药作业路径规划、基于传感器实时数据的作业质量评估和作业监管等新技术手段，将

在遥感信息反演、药液飘移抑制、作业效率优化、施药过程管控等方面带来革命性的进步，使植保作业数据化、透明化，全过程可观可控，推动农业生产管理从机械化向智能化和智慧化迈进。

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0fBhqACrB1ABXxbYs5vl8084.pdf

5．Intelligent multi-agent system for water reduction in automotive irrigation processes

文献源：Procedia Computer Science,2019

摘要：This paper deals with a multi-agent system (MAS) to automate the gathering and managing of information from potato crops in order to provide a precision irrigation system. The proposal and development of a novel MAS is presented based on different agent subsystems with specific objectives to meet the main objective of the global MAS. The proposed MAS has been developed on the Cloud Computing paradigm and is able to gather data from wireless sensor networks (WSNs) located in potato crops for knowledge discovery and decision making. According to the collected information as historical data by the MAS, it can make decision on an actuator set that modify the irrigation system by updating the areas of the crop with most irrigation needs. The use of these intelligent technologies in rural areas provides a considerable saving of resources and improves the efficiency and effectiveness of agricultural production systems. The architecture has been tested in an agricultural environment in order to optimize irrigation in a potato crop. The results showed a significant reduction in comparison to traditional automotive irrigation.

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0fBIKAM2HvAAZmOl9-u4s164.pdf

6．基于无人机遥感影像的覆膜农田面积及分布提取方法

文献源：农业工程学报,2019

摘要：针对基于无人机遥感的覆膜农田识别研究甚少的现状,该文以云南省昭通市鲁甸县为研究区,获取了研究区中地表类型复杂程度不同的2幅航空影像(复杂区影像和简单区影像)作为试验数据,利用灰度共生矩阵对原始航片影像进行纹理特征提取并选择纹理特征最佳提取参数;然后基于随机森林算法进行纹理特征重要性评价,优选纹理特征,结合原始数据进行最大似然初步分类;运用众数分析进行分类后处理;最后结合图像形态学算法与面积阈值分割法提取出了最终的覆膜农田面积及分布。通过试验结果发现,依据该文提出的方法,复杂区和简单区覆膜农田识别的总体精度、Kappa系数、产品精度、用

户精度和面积误差分别达到了94.84%、0.89、92.48%、93.39%、0.38%和96.74%、0.93、97.39%、94.63%、1.95%。该文提出的融合监督分类和图像形态学算法的覆膜农田提取方法可以简单、快速的将地膜连成块,形成覆膜农田对象,进而通过面积阈值分割法获取高精度的覆膜农田分布信息。该方法可以为精准覆膜农田识别算法的发展提供参考。

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0fBiiAbr_qABNHv3H94AQ720.pdf

7．基于YOLO深度卷积神经网络的复杂背景下机器人采摘苹果定位

文献源：农业工程学报,2019

摘要：为提高苹果采摘机器人的工作效率和环境适应性,使其能全天候的在不同光线环境下对遮挡、粘连和套袋等多种情况下的果实进行识别定位,该文提出了基于YOLOv3(you only look once)深度卷积神经网络的苹果定位方法。该方法通过单个卷积神经网络(one-stage)遍历整个图像,回归目标的类别和位置,实现了直接端到端的目标检测,在保证效率与准确率兼顾的情况下实现了复杂环境下苹果的检测。经过训练的模型在验证集下的mAP(meanaverageprecision)为87.71%,准确率为97%,召回率为90%,IOU(intersection over union)为83.61%。通过比较YOLOv3与Faster RCNN算法在不同数目、不同拍摄时间、不同生长阶段、不同光线下对苹果的实际检测效果,并以F1为评估值对比分析了4种算法的差异,试验结果表明YOLOv3在密集苹果的F1高于YOLOv2算法4.45个百分点,在其他环境下高于Faster RCNN将近5个百分点,高于HOG+SVM(histogram of oriented gradient+support vector machine)将近10个百分点。并且在不同硬件环境验证了该算法的可行性,一幅图像在GPU下的检测时间为16.69 ms,在CPU下的检测时间为105.21 ms,实际检测视频的帧率达到了60帧/s和15帧/s。该研究可为机器人快速长时间高效率在复杂环境下识别苹果提供理论基础。

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0fBkOAUv0VAB05Kd80Rcs224.pdf

8．Development of a Knowledge Base in the “Smart Farming” System for Agricultural Enterprise Management

文献源：Procedia Computer Science,2019

摘要：Increasing the efficiency of agricultural production is a very important task. To solve this problem, it is proposed to use the “Smart Farming” cloud system for precision farming management. The novelty of the proposed approach lies in using the knowledge base and multi-agent technology to develop coordinated decisions on management of agricultural

enterprises. The paper focuses on development of the knowledge base in the "Smart Farming" system on precision agriculture. Information storage is organized in the form of a semantic network of concepts and relations on the "All about the concept" principle in a single repository, which facilitates the work of farmers with this resource. The paper covers storage, editing, verification, and visualization of knowledge representation about the domain of crop production, production resources, agricultural machinery, equipment and other material resources, as well as peculiarities of the tasks of precision farming. The knowledge base of plant production, built on ontological principles, will be useful to enterprise managers, agronomists, machine operators, planning services and other specialists of large, medium and small farms, as well as to individual farmers.

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0fBKGAVi4vACE_XBVn734519.pdf

9．Agricultural remote sensing big data: Management and applications

文献源: Journal of Integrative Agriculture,2019

摘要: Big data with its vast volume and complexity is increasingly concerned, developed and used for all professions and trades. Remote sensing, as one of the sources for big data, is generating earth-observation data and analysis results daily from the platforms of satellites, manned/unmanned aircrafts, and ground-based structures. Agricultural remote sensing is one of the backbone technologies for precision agriculture, which considers within-field variability for site-specific management instead of uniform management as in traditional agriculture. The key of agricultural remote sensing is, with global positioning data and geographic information, to produce spatially-varied data for subsequent precision agricultural operations. Agricultural remote sensing data, as general remote sensing data, have all characteristics of big data. The acquisition, processing, storage, analysis and visualization of agricultural remote sensing big data are critical to the success of precision agriculture. This paper overviews available remote sensing data resources, recent development of technologies for remote sensing big data management, and remote sensing data processing and management for precision agriculture. A five-layer-fifteen-level (FLFL) satellite remote sensing data management structure is described and adapted to create a more appropriate four-layer-twelve-level (FLTL) remote sensing data management structure for management and applications of agricultural remote sensing big data for precision agriculture where the sensors are typically on high-resolution satellites, manned aircrafts,

unmanned aerial vehicles and ground-based structures. The FLTL structure is the management and application framework of agricultural remote sensing big data for precision agriculture and local farm studies, which outlooks the future coordination of remote sensing big data management and applications at local regional and farm scale.

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0fBPSAFajwACB8CAGpivQ612.pdf

10．数据时代人工智能技术在农业领域的研究进展

文献源：吉林农业大学学报,2019

摘要：随着人工智能和大数据技术的飞速发展及对农业领域的全面普及,作为信息技术与农业领域深度融合的标志性技术——智慧农业,必将为现代农业带来革命性的技术创新。文中分析了人工智能和大数据技术在国内外农业领域应用的研究现状,通过案例重点阐述了大数据时代人工智能技术带来的农业生产方式的新模式、农产品经营状态的新体系、农业领域管理服务的新思维,并通过大数据时代下群体智能、混合—增强智能与自主智能等人工智能技术的发展方向,展望了未来农业的应用前景,为我国智慧农业的发展提供理论基础。

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0fBM6AEORdAAiUQng3Rto664.pdf

【研究报告】

1．USDA Releases Report on Rural Broadband and Benefits of Next Generation Precision Agriculture

发布源：USDA

发布时间：2019-05-30

摘要：WASHINGTON, April 30, 2019　Agriculture Secretary Sonny Perdue today unveiled a groundbreaking report, A Case for Rural Broadband: Insights on Rural Broadband Infrastructure and Next Generation Precision Agriculture Technologies. The report finds that deployment of both broadband e-Connectivity and Next Generation Precision Agriculture Technology on farms and ranches throughout the U.S. could result in at least $47 billion in national economic benefits every year. “Broadband and Next Generation Precision Agriculture are critical components for creating vital access to world-class resources, tools and opportunity for America’s farmers, ranchers, foresters and producers,” Secretary Perdue said. “Under the leadership of President Trump, USDA is committed to doing our

part to clear the way for nationwide broadband connectivity that will allow the next generation of precision agriculture technologies to thrive and expand." The report also finds that if broadband infrastructure and digital technologies at scale were available at a level that meets estimated producer demand, the U.S. economy could realize benefits equivalent to nearly 18 percent of total agriculture production. Of that 18 percent, more than one-third is dependent on broadband e-Connectivity, equivalent to at least $18 billion in annual economic benefits that only high-speed, reliable internet can provide. For many years, USDA and the American agriculture industry have been actively researching the feasibility, usage and potential upside of Next Generation Precision Agriculture technologies. Until now though, the interdependency of these technologies and broadband e-Connectivity has not been evaluated. The report released today explores this symbiotic relationship and quantifies the potential economic benefit of broadband buildout and the complementary adoption of connected agriculture technologies. Going forward, the U.S. Department of Agriculture (USDA) will be engaged in multiple facets of infrastructure and technology deployment, including financing rural capital investments and supporting producers who are exploring which Next Generation Precision Agriculture Technologies are best suited to improve their operations and serve their customers.

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0fBf-AT-gYACg7BDfzIPA875.pdf

2．Smart agriculture（report）

发布源：STATISTA

发布时间：2018-01-01

摘要：This dossier presents information regarding smart agriculture. It presents a broad overview on global smart agriculture and the precision farming market. It also follows up with smart farming applications such as Internet of Thing (IoT) and Global Navigation Satellite System (GNSS), and furthermore includes data on smart agriculture in North America.

链接:

http://agri.ckcest.cn/file1/M00/06/88/Csgk0F0fBECAMAD8AAF-lTmEX_A716.png

主编：赵瑞雪　　本期编辑：陈亚东
地址：北京市海淀区中关村南大街12号　　邮编：100081
电话：010-82106649　　邮件地址：agri@ckcest.cn