《智慧农业发展战略研究》专题快报

2019年第3期（总第3期）

【动态资讯】

1．从化：AI赋能农业，助力乡村振兴

【新华网】季夏时节，稻谷渐黄。16日，从化艾米稻香小镇正式启动，并举办乡村振兴－艾米稻香小镇产业签约大会。大会以"助力乡村振兴，打造中国农智谷"为主题，提出艾米稻香小镇要走科技赋能农业、产业振兴乡村之路，打造成为粤港澳人工智能农业科技小镇。在现场，包括村社环境工程、艾米会议中心、生态湿地保育工程、5G智能建设工程在内的十三个产业项目正式动工，第一期工程预计今年10月完工。与此同时，电信－华为－艾米稻香小镇5G智能农业平台、中山大学国家重点实验室速品艾米稻田民宿等产业也完成签约。与此同时，艾米稻香小镇联合中国电信从化分公司、华为共同签订《5G生态智能农业共建协议》，建设从化首个5G全域覆盖小镇项目，共同打造全国领先的5G智能农业示范园区和5G生态智能农业科技实验室。华南理工大学前校长、俄罗斯工程院外籍院士刘焕彬认为，通过人工智能科技的赋能，农业的经验变成了机器可识别的数据，结合卫星遥感、无人机等技术，让农田实现数据化、智能化。"未来，农民将有知识、有分量。"从化区相关负责人表示，艾米稻香小镇高度融合一二三产业，实行规模化、产业化、集约化的发展路径，鼓励村民入股、带动更多农民走上创业致富的道路，以打造"国字号"现代农业产业园为发展目标，成为从化建设全省乃至全国乡村振兴示范区中的标杆小镇，实现乡村产业、生态、人才、文化、组织振兴。

链接:

http://www.xinhuanet.com/info/2019-07/17/c_138233191.htm

2．雷沃重工：推动智慧农业 担当社会责任

【中国工业新闻网】今年以来，面对行业下行压力，雷沃重工旗下雷沃阿波斯农业装备通过内、外部调整和能力提升，产品和服务继续深获用户认可，2019年上半年，雷沃阿

波斯国内业务实现了稳步竞争性增长，其中，雷沃谷神轮式谷物收割机、自走式玉米收割机业务竞争力再次提升，市场占有率稳步增长；水稻机产品竞争力、市场竞争力提升，尤其是专业跨区作业群体同比上升；雷沃农机具业务也实现了产销量、占有率与竞争位次的全面快速提升，雷沃阿波斯智能科技整体解决方案竞争优势更加明显。近年来，雷沃重工集团每年都会拿出销售收入的3%~5%作为专项研发经费，为企业研发创新提供资金保障，保证科技创新成果的转化。从2010年开始，坚持"全球研发、全球制造与分销"的特色发展模式，积极构筑和完善全球创新研发体系。 雷沃重工集团在有序推进研发、制造、营销、服务全价值链能力升级的同时，还积极围绕产业链创新服务链，先后与IBM、拓普康、百度、中化农业等多家行业巨头达成合作，共同推进智能装备、精准农业和智能农业在国内的发展，建设现代农业生态圈。

链接:

http://www.cinn.cn/zbgy/201907/t20190717_215649.html

3．Smart irrigation model predicts rainfall to conserve water

【**Cornell Chronicle**】Fresh water isn't unlimited. Rainfall isn't predictable. And plants aren't always thirsty. Just 3 percent of the world's water is drinkable, and more than 70 percent of that fresh water is used for agriculture. Unnecessary irrigation wastes huge amounts of water—some crops are watered twice as much as they need—and contributes to the pollution of aquifers, lakes and oceans.A predictive model combining information about plant physiology, real-time soil conditions and weather forecasts can help make more informed decisions about when and how much to irrigate. This could save 40 percent of the water consumed by more traditional methods, according to new Cornell research."If you have a framework to connect all these excellent sources of big data and machine learning, we can make agriculture smart," said Fengqi You, the Roxanne E. and Michael J. Zak Professor in Energy Systems Engineering in the Smith School of Chemical and Biomolecular Engineering.

链接:

http://news.cornell.edu/stories/2019/07/smart-irrigation-model-predicts-rainfall-conserve-water

4．Botswana's Food Security: Climate Smart Agriculture to the Rescue

【**Sunday Standard**】Botswana, just like other countries, has finally developed its Climate-Smart Agriculture (CSA) manual book, thanks largely to the Botswana Institute for

Technology Research and Innovation BITRIThe state owned research entity BITRI recently handed the blue-print document to the Ministry of Agricultural development and food security which was also attended by officials of the United Nations Development Fund.The Botswana CSA manual encompasses a bundle of production techniques and inputs that could help local farmers adapt to changing weather conditions across the country according to BITRI.Amongst the recommendations made by the BITRI authored CSA manual is the establishment of a fund that would support nurturing and dissemination of smallholder farmers' innovations. It has also recommended that the Agriculture ministry consider undertaking a country wide soil fertility investigations and come up with soil fertility status maps/atlases and fertilizer type recommendations, to compliment climate smart agriculture interventions across the country."We are worried about the effect of climate change it is one of the things Government is concerned about it affects Botswana`s ability to attain food security as all over the world food security has become a challenge because of climate change. If we fail to respond to climate change we will fail to produce food for our people." said Associate researcher climate change and Society at BITRI - Kgomotsego Motlopi. The project which took three and a half years to complete is regarded as a tool to attainment of food security for Botswana.Deputy Director of Crops Production Department - Barutwa Thebenala says agriculture in Botswana is currently grappling with drought due to the effects of climate change such as high temperatures resulting in prolonged heat wave, erratic and unreliable rainfall.Amongst others things, Botswana's CSA manual determines risk factors to the attainment of food security by smallholder dry land arable farmers and subsequently co-develop with farmers the use of climate smart technologies to increase productivity and farmers resilience.Climate change has over the past decades had direct impact on food security and livelihoods of people in Africa including in Botswana. It is manifested by shifting seasons, erratic rainfall, recurrent droughts, torrential rainfall when it rains, disappearance of rivers, appearance of diseases where they never thrived and so forth.

链接:

http://www.sundaystandard.info/botswana%E2%80%99s-food-security-climate-smart-agriculture-rescue

5．《智慧农业》顾问罗锡文院士：对加快发展农业人工智能的思考

【智慧农业】《智慧农业》顾问罗锡文院士在"2019中国农业展望大会"上做了关于《对

加快发展农业人工智能的思考》的报告，介绍了人工智能的基本定义与内涵、基础理论、关键技术和在农机领域的应用.

链接:

http://www.smartag.net.cn/CN/news/news187.shtml

6．腾讯智慧农业新进展：让AI种番茄，国际智慧温室种植大赛启动

【Donews】近日，腾讯宣布与欧洲顶级农业大学 WUR（荷兰瓦赫宁根大学）合办第二届"国际智慧温室种植大赛"，邀请全世界农业及技术专家组队，跨学科探索智慧农业的未来方案。除了与欧洲顶级农业大学WUR举办国际性智慧温室种植大赛，腾讯 AI Lab 还在今年与中国农科院信息所成立智慧农业联合实验室，探索农业与AI、IoT、大数据、云计算与机器人等结合的跨学科前沿研究，打造中国智慧方案。

链接:

http://www.donews.com/news/detail/4/3052427.html

7．特写：智慧农业让农民"在手机上种田"

【新华社】7日的内蒙古自治区锡林郭勒盟正蓝旗，一场小雨来得突然。这种天气对正在打农药的作物影响很大——刚打完的药让雨一浇就都冲掉了，但中化农业正蓝旗技术服务中心的农艺师对此却早有准备。"我们的天气预报是订制的。天气预报说锡林郭勒盟有雨，但可能精准到正蓝旗这边并没有下。我们的农业服务能精准到每个地块的天气情况。如果预测到这场雨，我们会提前告知给客户。"中化农业MAP特种作物事业部总经理汤可攀介绍道。如今，随着物联网、大数据、移动互联网、智能控制、卫星定位等技术的发展，手机成为"新农具"。在手机软件"MAP智农"上，农艺师可以看到1平方公里精度的精准农业气象服务，包括天气预报、气象灾害预警、农事作业适宜指数等。MAP（Modern Agriculture Platform）是中化农业推出的一个现代农业技术服务平台，可为农户提供线上线下结合的农业托管服务：精准选种、测土与全自动配肥施肥、智能配药、粮食品质与土壤养分等检测服务、农机服务、农民培训、智慧农业系统。业内人士认为，以卫星、无人机和地面监测为手段的农业多尺度数据获取体系已逐步建立，物联网、云计算、大数据以及人工智能等新一代信息技术正全面向农业渗透，高强度的人类劳动将被智能化的农业设备取代。

链接:

http://www.xinhuanet.com/2019-07/08/c_1124725414.htm

8．Victoria opens interest in AU$12 million IoT agriculture test

【ZDNet】Victorian farmers interested in grabbing some Internet of Things (IoT) technology to help run their land have until 2 August to claim a grant. The government said on Friday that over the next two years, Agriculture Victoria would partner with "hundreds of farms" across four regions and sectors: Dairy in Maffra, grains in Birchip, sheep in Serpentine, and horticulture in Tatura. As part of the AU$12 million program, farms are able to land AU$30,000 to cover two-thirds of the cost of purchasing IoT equipment from a list put together by the state government. "We've been working with Victorian farmers to understand how digital technology can revolutionise their businesses -- and we're excited to invite farmers to trial new Internet of Things tech on their own farms," Minister for Agriculture Jaclyn Symes said. "Our Internet of Things trial is an ambitious program supporting Victorian farmers to be at the forefront of modern agriculture, to improve farm productivity, efficiency and safety. "Expressions of interest for the first round close on 2 August. The funding for the trials is from the state's Connecting Victoria Program, which includes its Connecting Regional Communities Program. In October, the state announced a AU$1.7 million investment in symmetrical gigabit fixed-wireless broadband in Horsham through a partnership with Spirit Telecom. Earlier that year, Victoria set aside AU$1.2 million to expand the free public Wi-Fi network in Shepparton. In its latest state Budget, Victoria dedicated AU$53 million towards digital service delivery and citizen engagement.

链接:

https://www.zdnet.com/article/victoria-opens-interest-in-au12-million-iot-agriculture-test/

9．中国移动5G商用，农业物联网进入发展快车道

【北国网】随着万物互联和人工智能时代的到来，据权威机构预测，到2020年，全球将有接近300亿台联网设备，蜂窝物联网连接数将超过30亿。《智慧农业市场评估报告》指出"物联网有望成为促进农业提产、实现供需平衡的关键使能技术。 智慧农业采用了基于IoT的先进技术和解决方案，通过实时收集并分析现场数据及部署指挥机制的方式，达到提升运营效率、扩大收益、降低损耗的目的。可变速率、精准农业、智能灌溉、智能温室等多种基于物联网的应用将推动农业流程改进。物联网科技可用于解决农业领域特有问题，打造基于物联网的智慧农场，实现作物质量和产量双丰收。到 2020 年，智慧农业的潜在市场规模有望由2015年的137亿美元增长至268亿美元，年复合增长率达14.3%"。2019年6月6日，工信部正式向中国移动、中国联通、中国电信、中国广电四家运营商发放了5G牌照，中国正式迈入5G时代。业界对于5G如何"改变社会""改变产业"

也成为热门话题。在智慧农业物联网领域，5G+IoT会擦出怎样的火花？

链接:

【文献速递】

1．Architecting User-Centric Internet of Things for Smart Agriculture

文献源：Sustainable Computing: Informatics and Systems,2019

摘要：Recent advancement in the technology has paved the way for the optimization of traditional industrial practices. Agriculture sector continues to serve as the backbone of the global economy and as such it is required to keep up with the increased demand of food products due to rapid growth of global population. This urges for the modernization of traditional agricultural methodologies. Internet of Things (IoT) has the potential to become the key enabler for realizing the vision of Smart Agriculture. This paper proposes a user-centric IoT architecture for addressing the various issues faced in the agricultural domain. The proposed system allows the farmers to monitor their agricultural fields in real time and also suggests them with methods to adopt for producing good quality crops. The proposed architecture also optimizes the food supply chain in a manner that allows the farmers to maximize their overall profit on the sold goods. The applicability of the proposed architecture is evaluated using multiple uses cases encompassing the different aspects of the agriculture. The paper also proposes a novel framework for a mobile based application that would facilitate the application engineers to develop the applications required for implementing the various functionality of the proposed system.

链接:

http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0wumqAZnqIABH2q3FxiIQ390.pdf

2．基于系统基模的"互联网+"驱动传统农业创新发展路径研究

文献源：农业工程学报,2019

摘要：本研究通过文献研究法,以"互联网+"为研究切入点,构建了驱动传统农业创新发展的内在静态机制路径。同时,以系统动力学为具体研究手段,构建了驱动传统农业创新发展的外在动态反馈机制。通过打通传统农业生产、交易、服务三个环节,形成"三位一体"的农业智慧云平台。此外,通过打造产业大数据中心,加快传统农业"接二连三"进程,从而达到驱动传统农业创新发展的目的。

链接:

http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0wtwCAUvQwAArkKF93bNc905.pdf

3．设施农业喷雾机器人的组合视觉导航方法

文献源：江苏大学学报(自然科学版),2019

摘要：温室环境下，针对喷雾机器人在直线路径行驶时会存在偏差，在转弯路径处又需迅速获得导航信息的情况，设计一种导航线和QR码组合的视觉导航算法。在直线行驶路径贴上红色导航线，对采集到的图像处理后获得偏差、偏角进行方向修正，实现直线行驶精准导航。但导航线导航在转弯行驶时存在转弯效率低、偏差大等问题，因此设计QR码导航方法，通过识别贴在转弯处的存储有导航和决策信息的QR码，完成转弯处的迅速精准导航的要求。采集各种工况下导航线和QR码图像各120幅进行算法验证，导航线的平均纠正率为93.33%，QR码平均识别率为92.50%。导航试验结果表明:行驶速度在2.0 m·s⁻¹时，导航线和QR码的最大导航偏差分别为2.0和3.5 cm，满足喷雾机器人导航的实时性和准确性要求。

链接:

http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0xOIqASrRfAB3LpATRhFY076.pdf

4．基于移动sink的农田无线传感器网络数据收集策略

文献源：计算机科学,2019

摘要：为解决农田无线传感器网络可扩展性较差及节点能量消耗不均匀的问题，针对农田传感器网络节点众多、网络面积大和移动sink网络对节点密度要求较低的特点，提出了适合农田应用的无线传感器网络的移动sink节点移动策略和抗干扰路由策略。算法通过划分可变子网，并利用跳数限制的汇聚树集路由算法选择路由；同时，针对sink节点附近数据传输量大而容易发生碰撞的问题,对节点的稀疏化处理和区域分时的路由能有效减少数据传输中的相互干扰。仿真结果表明,算法在抗干扰传输的同时能够延长网络的生存期。

链接:

http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0xN2uAc6qyAAxYApx-FB8776.pdf

5．Nano-based smart pesticide formulations: Emerging opportunities for agriculture

文献源：Journal of Controlled Release,2019

摘要：The incorporation of nanotechnology as a means for nanopesticides is in the early stage of development. The main idea behind this incorporation is to lower the indiscriminate use of conventional pesticides to be in line with safe environmental applications. Nanoencapsulated pesticides can provide controlled release kinetics, while

efficiently enhancing permeability, stability, and solubility. Nanoencapsulation can enhance the pest-control efficiency over extended durations by preventing the premature degradation of active ingredients (AIs) under harsh environmental conditions. This review is thus organized to critically assess the significant role of nanotechnology for encapsulation of AIs for pesticides. The smart delivery of pesticides is essential to reduce the dosage of AIs with enhanced efficacy and to overcome pesticide loss (e.g., due to leaching and evaporation). The future trends of pesticide nanoformulations including nanomaterials as AIs and nanoemulsions of biopesticides are also explored. This review should thus offer a valuable guide for establishing regulatory frameworks related to field applications of these nano-based pesticides in the near future.

链接:

http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0wvceAYjjPACQv5WD6XIs604.pdf

6．An automated low cost IoT based Fertilizer Intimation System for smart agriculture

文献源：Sustainable Computing: Informatics and Systems,2019

摘要：This paper presents an Internet of Things (IoT) based system by designing a novel Nitrogen-Phosphorus-Potassium (NPK) sensor with Light Dependent Resistor (LDR) and Light Emitting Diodes (LED). The principle of colorimetric is used to monitor and analyze the nutrients present in the soil. The data sensed by the designed NPK sensor from the selected agricultural fields are sent to Google cloud database to support fast retrieval of data. The concept of fuzzy logic is applied to detect the deficiency of nutrients from the sensed data. The crisp value of each sensed data is discriminated into five fuzzy values namely very low, low, medium, high and very high during fuzzification. A set of If-then rules are framed based on individual chemical solutions of Nitrogen (N), Phosphorous (P) and Potassium (K). Mamdani inference procedure is used to derive the conclusion about the deficiency of N, P and K available in soil chosen for testing and accordingly an alert message is sent to the farmer about the quantity of fertilizer to be used at regular intervals. The proposed hardware prototype and the software embedded in the microcontroller are developed in Raspberry pi 3 using Python. The developed model is tested in three different soil samples like red soil, mountain soil and desert soil. It is observed that the developed system results in linear variation with respect to the concentration of the soil solution. A sensor network scenario is created using Qualnet simulator to analyze the performance of designed NPK sensor in terms of throughput, end to end delay and jitter. From the different variety of

experiments conducted, it is noticed that the developed IoT system is found to be helpful to the farmers for high yielding of crops.

链接:

7．Development of an open sensorized platform in a smart agriculture context: A vineyard support system for monitoring mildew disease

文献源：Sustainable Computing: Informatics and Systems,2019

摘要：In recent years, some official reports, to produce best products regarding quality, quantity and economic conditions, recommend that the farming sector should benefit with new tools and techniques coming from Information and Communications Technology (ICT) realm. In this way, during last decade the deployment of sensing devices has increased considerably in the field of agriculture. This fact has led to a new concept called smart agriculture, and it contemplates activities such as field monitoring, which offer support to make decisions or perform actions, such as irrigation or fertilization. Apart from sensing devices, which use the Internet protocol to transfer data (Internet of Things), there are the so-called crop models, which are able to provide added value over the data provided by the sensors, with the aim of providing recommendations to farmers in decision-making and thus, increase the quality and quantity of their production. In this scenario, the current work uses a low-cost sensorized platform, capable of monitoring meteorological phenomena following the Internet of Things paradigm, with the goal to apply an alert disease model on the cultivation of the vine. The edge computing paradigm is used to achieve this objective; also our work follows some advances from GIScience to increase interoperability. An example of this platform has been deployed in a vineyard parcel located in the municipality of of Vilafamés (Castelló, Spain).

链接:

8．基于NoSQL数据库的农田物联网云存储系统设计与实现

文献源：农业工程学报,2019

摘要：为了解决农田物联网大量图像、视频和传感器等结构化和非结构化数据实时处理与写入问题，该文基于分布式存储与NoSQL(NotOnlySQL)技术，结合农田物联网数据特征，利用HDFS(HadoopDistributedFileSystem)和HBase(Hadoop Database)存储非结构化和

结构化数据，基于Redis缓存服务，设计了三层物联网数据云存储框架，实现了海量农田物联网数据存储中的业务处理、事务处理、图片打包与索引、负载均衡等关键技术。面对复杂业务下的事务数据一致性，该文采用基于HLock的乐观锁机制，实现了HBase对强事务性的支持，经过与传统MySQL集群事务对比测试，当数据量级在500万时，数据读取效率提升达35.75%。为了提高农田物联网中大量的小图片和小文件处理效率，基于图片打包合并策略，利用SequenceFile技术实现物联图片的快速索引读写技术，与原生HDFS存储效率相比，读写效率提升30%以上。该研究可以为海量农业物联网数据的存储和管理提供技术参考和理论支撑。

链接:

http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0xN_yABYkjABP5pk2tvRQ638.pdf

9．农业机器人路径识别自主导航系统——基于STM32与物联网

文献源：农机化研究 ,2019

摘要：我国人口众多，粮食需求量高，因此有必要提高农业生产效率以提高粮食产量。为此，开发了一套基于STM32及物联网的农业机器人定位及路径导航行走系统，跟踪端GSM芯片在STM32的控制下通过GPRS网络发送GPS定位数据信息，农业机器人视觉系统根据所在环境拍摄图像分析获得行走路径，完成导航任务。以农田垄沟环境为研究对象并进行仿真，将机器人视觉系统采集的图像进行优化，通过MatLab仿真处理，将机器人导航行走路线通过阈值分割和边缘检测提取出来，满足其定位导航的精度。该系统能够大量应用在农业生产技术中，包括种植管理、喷洒农药及果实采摘等，极大地减轻了我国农业生产人员的劳动强度，对于推动农业的现代化具有重要意义。

链接:

http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0xNqaASl5vABitmb-4Jnc997.pdf

10．国外智慧农业的发展经验及其对中国的启示

文献源：世界农业,2019

摘要：智慧农业是大农业发展的重要体现,是现代农业发展到高级阶段的重要标志。本文通过分析国外智慧农业的发展情况,总结其发展经验,并提出促进中国智慧农业发展的启示,为中国智慧农业的发展提供参考。

链接:

http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0wtoSAPxgOAAXV2q54l6I185.pdf

11．Scaling up agricultural interventions: Case studies of climate-smart agriculture

文献源：Agricultural Systems,2019

摘要：If climate-smart agriculture (CSA) is meaningfully to address the development challenges posed by climate change, effective approaches will be needed to scale up research findings. Here, eleven case studies are used to exemplify scaling-up strategies based on (1) value chains and private sector involvement, (2) information and communication technologies and agro-advisory services, and (3) policy engagement. We evaluated these case studies and the scaling strategies they exemplify, using a simple conceptual framework from the field of scaling up nutrition interventions. Results showed that these different strategies exhibit different characteristics; all offer considerable potential for taking CSA interventions to scale, but there still may be unavoidable trade-offs to consider when choosing one strategy over another, particularly between reaching large numbers of farmers and addressing farmers' specific contexts. The case studies highlighted several challenges: estimating the costs and benefits of different scaling activities, integrating knowledge across multiple levels, and addressing equity issues in scaling up. The case studies outlined here will continue to be monitored and evaluated, thus strengthening the evidence base around effective scaling-up strategies that can contribute to achieving food and nutrition security under climate change in the coming decades.

链接:

http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0wvEqAHgR1AAToPXnVWg8336.pdf

12 .Multi-objective land use allocation modelling for prioritizing climate-smart agricultural interventions

文献源：Ecological Modelling,2019

摘要：Climate-smart interventions in agriculture have varying costs and environmental and economic impacts. Their implementation requires appropriate investment decisions by policy makers that are relevant for current as well as future scenarios of agro-ecology, climate and economic development. Decision support tools are therefore needed to assist different stakeholders to prioritize and hence implement appropriate strategic interventions. These interventions transform agriculture ecosystems to climate-resilient, adaptive and efficient. This paper outlines the mathematical modelling framework of one such, the Climate Smart Agricultural Prioritization (CSAP) toolkit. This toolkit employs a dynamic, spatially-explicit multi-objective optimization model to explore a range of agricultural growth pathways coupled with climate-adaptation strategies to meet agricultural

development and environmental goals. The toolkit consists of three major components: (i) land evaluation including assessment of resource availability, land suitability, yield and input-output estimation for all promising crop production practices and technologies for key agro-ecological units; (ii) formulation of scenarios based on policy views and development plans; and (iii) land-use optimization in the form of linear programming models. Climate change and socio-economic drivers condition the land evaluation, technological input-output relations, and specification of optimization objectives that define modelled scenarios. By integrating detailed bottom-up biophysical, climate impact and agricultural-emissions models, CSAP is capable of supporting multi-objective analysis of agricultural production goals in relation to food self-sufficiency, incomes, employment and mitigation targets, thus supporting a wide range of analyses ranging from food security assessment to environmental impact assessment to preparation of climate smart development plans.

链接:

http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0wu6GAQU5wACBeZB2fAIk108.pdf

13．Using SmartMesh IP in Smart Agriculture and Smart Building applications

文献源：Computer Communications,2019

摘要：We deploy two low-power wireless networks, one in a Smart Agriculture setting (a peach orchard), one in a Smart Building. Both networks use out-of-the-box SmartMesh IP technology to gather sensor values, as well as extensive network statistics. This article presents an in-depth analysis of the performance of both networks, and compares them. Nodes in both exhibit end-to-end reliability of 100%, with an expected lifetime between 4 and 8 years. We show how contrary to popular belief wireless links are symmetrical. Thanks to the use of Time Slotted Channel Hopping (TSCH), the network topology is stable, with at most 15 link changes on average per day in the network. We conclude that TSCH as implemented by SmartMesh IP is a perfectly suitable IoT solution for Smart Agriculture and Smart Building applications.

链接:

http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0wuy2AIGNxABtTQ3KWOZM380.pdf