

# 农业机械学报

## NONGYE JIXIE XUEBAO

2022 年 第 4 期(第 53 卷)

### 目 次

#### 特约专稿

农机装备智能测控技术研究现状与展望 ..... 翟长远 杨 硕 王 秀 张春凤 宋 健( 1 )

#### 农业装备与机械化工程

导种环槽 U 型孔组合型轮式前胡排种器设计与试验 ..... 方梁菲 曹成茂 秦 宽 葛 俊( 21 )

组合式水稻钵苗育秧盘自动分装装置设计与试验

..... 马锃宏 孙泽强 杜小强 李月婵 俞亚新 陈建能( 33 )

马铃薯组培苗移栽吸附式末端执行器设计与试验

..... 段宏兵 姚飞虎 蔡兴奎 姜洪新 谭本芳 陈 欢( 43 )

基于微钻阻力的树木年轮测量方法研究 ..... 姚建峰 赵燕东 符利勇 宋新宇 卢 军 黎沙沙( 52 )

温室叶菜种苗双排移植手稀植部件设计与时序优化试验

..... 马锃宏 饶益成 童俊华 李 恺 徐敏雅 武传宇( 60 )

四杆平移式大豆小区育种排种器设计与试验

..... 顿国强 毛 宁 刘文辉 吴星澎 周 成 纪文义( 70 )

鲜食莲籽剥壳机多通道集成式剥壳机构设计与试验

..... 曾 荣 侯群喜 陈亚欣 王 洋 董 昭 张国忠( 79 )

基于 EDEM - Fluent 的残膜与杂质悬浮分离仿真与试验

..... 斯 伟 张学军 丁幼春 白圣贺 刘伟鹏 周鑫城( 89 )

仿形进阶式天然橡胶自动割胶机设计与试验

..... 张喜瑞 曹 超 张丽娜 邢洁洁 刘俊孝 董学虎( 99 )

板蓝根收获机组合筛面摆动式根土分离装置设计与试验

..... 陶桂香 张紫恒 衣淑娟 夏春龙 马永财( 109 )

免耕播种机侧向清秸覆秸秸秆比例回收装置设计与试验

..... 陈海涛 邹 震 王 星 史乃煜 韩广新 侯守印( 120 )

基于 BP 神经网络的立式离心泵导叶与蜗壳优化设计

..... 张德胜 杨 港 赵旭涛 杨雪琪 高雄发( 130 )

双吸离心泵叶轮内泥沙磨损非定常特性研究 ..... 张自超 李延频 陈德新( 140 )

## 农业信息化工程

- 基于 XGBoost 算法的多云多雾地区多源遥感作物识别 ..... 张超 陈畅 徐海清 薛琳( 149 )  
基于弱监督语义分割的灯盏花无人机遥感种植信息提取  
..... 黄亮 吴春燕 李小祥 杨威 姚皖路( 157 )
- 基于 GF - 1 数据的夏玉米 FPAR 遥感动态估算  
..... 贺佳 郭燕 张彦 杨秀忠 刘婷 王来刚( 164 )
- 基于 U - Net 的葡萄种植区遥感识别方法 ..... 张宏鸣 张国良 朱珊娜 陈欢 梁会 孙志同( 173 )
- 基于日光诱导叶绿素荧光的陆地总初级生产力估算  
..... 袁艳斌 张城芳 黄鹏 董恒 杨敬豪( 183 )
- 基于高光谱图像的叶绿素荧光  $Fv/Fm$  图像预测方法 ..... 王东 沈楷程 范叶满 龙博伟( 192 )
- 荒漠绿洲交错区生态空间网络粒度效应研究  
..... 张启斌 刘冬悦 李倩 于强 宋宏利 李世冉( 199 )
- 国产星载激光雷达森林回波波形模拟仿真 ..... 蔡龙涛 岳春宇 黄缙 贺涛 国爱燕 邢艳秋( 208 )
- 基于适宜性-规划-等级的村庄整治类型划分研究 ..... 唐林楠 刘玉 潘瑜春 郑艳东( 218 )
- 高低频双频激励土壤含水率传感器设计与试验 ..... 盛庆元 张西良 杨越 李萍萍 倪梦瑶( 228 )
- 基于植物介电特性的茎干含冰量检测方法与仪器设计 ..... 田昊 赵燕东 谢涛 于重重( 235 )
- 基于 YOLO v5 - MDC 的重度粘连小麦籽粒检测方法 ..... 宋怀波 王云飞 段援朝 宋磊 韩梦璇( 245 )
- 基于多尺度融合模块和特征增强的杂草检测方法 ..... 亢洁 刘港 郭国法( 254 )
- 基于轻型调控网络的下茧机器视觉实时检测 ..... 张印辉 杨宏宽 朱守业 何自芬( 261 )
- 基于 EfficientDet 的围产期母猪姿态识别 ..... 刘龙申 舒翠霓 李波 沈明霞 太猛 刘康( 271 )
- 基于单目视觉的动态环境同步定位与多地图构建算法 ..... 齐咏生 陈培亮 刘利强 董朝轶( 280 )
- 基于深度学习的大田甘蓝在线识别模型建立与试验  
..... 翟长远 付豪 郑康 郑申玉 吴华瑞 赵学观( 293 )
- 基于 RealSense 深度相机的多特征树干快速识别方法  
..... 沈跃 庄珍珍 刘慧 姜建滨 欧鸣雄( 304 )
- 基于 YOLO v5 的植物叶绿素含量估测与可视化技术  
..... 张慧春 张萌 边黎明 葛玉峰 李小平( 313 )
- 基于 K-medoids 和 LSTM 的冷链运输环境预测方法  
..... 苑严伟 孙国庆 刘阳春 王猛 赵博 汪凤珠( 322 )

## 农业水土工程

- 基于 AquaCrop 模型的冬小麦咸淡轮灌制度模拟与评价  
..... 朱成立 徐雨琳 黄明逸 郑君玉 张帆 曹磊齐( 330 )

## 生物有机肥对马铃薯产量与土壤氮循环作用机制研究

..... 赵健宇 王凤新 孟潮彪 金松 彭敏( 343 )

## 生物炭改良棉花-甜菜间作土壤理化性质与盐分效果分析

..... 王小芳 李毅 姚宁 刘洪光 樊向阳 张选( 352 )

## 耕地生产力隐性退化遥感监测与影响因素分析

..... 李卓 查思含 霍伟 王林林 郭文华 孙丹峰( 363 )

## 农田排水改良盐渍化土壤效果与环境污染研究

..... 窦旭 史海滨 李瑞平 苗庆丰 闫建文 田峰( 372 )

## 农业生物环境与能源工程

低分子量骨胶原肽酶解制备工艺优化和特性分析 ..... 姚玉梅 袁湘汝 韩鲁佳 杨增玲 刘贤( 386 )

## 农产品加工工程

### 超声联合酶处理下 TG 酶交联大豆分离蛋白凝胶特性研究

..... 李杨 马召蕾 郑丽 黄雨洋 金技峰 滕飞( 394 )

### HIF-1 $\alpha$ 作用下宰后成熟初期牛肉糖酵解能力研究

..... 陈骋 郭雨轩 师希雄 郭兆斌 马国源 余群力( 403 )

牛奶中孕酮的金铁复合纳米粒子磁弛豫开关传感检测 ..... 王欣 王琪 孙涵颖 裴凯丽( 412 )

## 车辆与动力工程

拖拉机双向耦合电驱动系统设计与性能分析 ..... 刘孟楠 李书苑 徐立友 赵一荣( 423 )

## 机械设计制造及其自动化

### 基于改进 RRT\*-Connect 算法的机械臂多场景运动规划

..... 王怀震 高明 王建华 房立金 李洪生( 432 )

### 基于多核 CPU 的复杂液压产品快速并行优化方法

..... 宁志强 卫立新 张瑞权 龙化建辉 高有山( 441 )

二维活塞式动态流量计研究 ..... 丁川 陈豪奇 王熙 詹磊 章立超 阮健( 450 )

**Transactions of the Chinese Society  
for Agricultural Machinery**  
**Vol. 53 No. 4 2022**

**Contents**

**Invited Paper**

- Status and Prospect of Intelligent Measurement and Control Technology for Agricultural Equipment  
..... Zhai Changyuan YANG Shuo WANG Xiu ZHANG Chunfeng SONG Jian ( 1 )

**Agricultural Equipment and Mechanization Engineering**

- Design and Experiment of Wheel Seed Metering Device with Guide Ring Groove Combining U -hole for  
*Radix peucedani* ..... FANG Liangfei CAO Chengmao QIN Kuan GE Jun ( 21 )  
Design and Experiment of Automatic Assembly Line for Combined Type Rice Potted -seedling Tray  
..... MA Zenghong SUN Zeqiang DU Xiaoqiang LI Yuechan YU Yaxin CHEN Jianneng ( 33 )  
Design and Experiment of Adsorption End -effector for Potato Tissue Culture Seedling Transplanting  
..... DUAN Hongbing YAO Feihu CAI Xingkui JIANG Hongxin TAN Benfang CHEN Huan ( 43 )  
Tree-rings Measurement Method Based on Micro Drill Resistance  
..... YAO Jianfeng ZHAO Yandong FU Liyong SONG Xinyu LU Jun LI Shasha ( 52 )  
Sparse Transplanting Mechanism Design with Double Row End Effectors and Work Time Sequence  
Optimization for Hydroponics Pot Seedlings in Greenhouse  
..... MA Zenghong RAO Yicheng TONG Junhua LI Kai XU Minya WU Chuanyu ( 60 )  
Design and Experiment of Four-bar Translational Seed Metering Device for Soybean Plot Breeding  
..... DUN Guoqiang MAO Ning LIU Wenhui WU Xingpeng ZHOU Cheng JI Wenyi ( 70 )  
Design and Experiment of Multi -channel Integrated Shelling Mechanism for Fresh Lotus Seed  
..... ZENG Rong HOU Qunxi CHEN Yaxin WANG Yang DONG Zhao ZHANG Guozhong ( 79 )  
Experiment on Suspension Separation of Residual Film and Impurity Based on EDEM - Fluent Coupling  
..... JIN Wei ZHANG Xuejun DING Youchun BAI Shenghe LIU Weipeng ZHOU Xincheng ( 89 )  
Design and Test of Profiling Progressive Natural Rubber Automatic Tapping Machine  
..... ZHANG Xirui CAO Chao ZHANG Li'na XING Jiejie LIU Junxiao DONG Xuehu ( 99 )  
Design and Test of Combined Swing *Radix isatidi* Root-soil Separation Device  
..... TAO Guixiang ZHANG Ziheng YI Shujuan XIA Chunlong MA Yongcai ( 109 )  
Design and Experiment of Straw Proportional Recovery Device for Clearing and Covering Straw of No -tillage  
Planter ..... CHEN Haitao ZOU Zhen WANG Xing SHI Naiyu HAN Guangxin HOU Shouyin ( 120 )  
Optimization Design of Vane Diffuser and Volute in Vertical Centrifugal Pump Based on Back Propagation  
Neural Network ..... ZHANG Desheng YANG Gang ZHAO Xutao YANG Xueqi GAO Xiongfa ( 130 )  
Investigation on Unsteady Erosion Characteristics in Impeller of Double Suction Centrifugal Pump  
..... ZHANG Zichao LI Yanpin CHEN Dexin ( 140 )

**Agricultural Informatization Engineering**

- Multi-source Remote Sensing Crop Identification Based on XGBoost Algorithm in Cloudy and Foggy Area  
..... ZHANG Chao CHEN Chang XU Haiqing XUE Lin ( 149 )

## Extraction of *Erigeron breviscapus* Planting Information by Unmanned Aerial Vehicle Remote Sensing

### Based on Weakly Supervised Semantic Segmentation

..... HUANG Liang WU Chunyan LI Xiaoxiang YANG Wei YAO Wanlu ( 157 )

## Dynamic Estimation FPAR of Summer Maize Based on GF - 1 Satellite Data

..... HE Jia GUO Yan ZHANG Yan YANG Xiuzhong LIU Ting WANG Laigang ( 164 )

## Remote Sensing Recognition Method of Grape Planting Regions Based on U - Net

... ZHANG Hongming ZHANG Guoliang ZHU Shanna CHEN Huan LIANG Hui SUN Zhitong ( 173 )

## Estimation of Global Terrestrial Gross Primary Productivity Based on Solar -induced Chlorophyll Fluorescence

..... YUAN Yanbin ZHANG Chengfang HUANG Peng DONG Heng YANG Jinghao ( 183 )

## Prediction Method of Chlorophyll Fluorescence *Fv/Fm* Image Based on Hyperspectral Image

..... WANG Dong SHEN Kaicheng FAN Yeman LONG Bowei ( 192 )

## Grain-size Effect of Potential Ecological Spatial Network in Desert Oasis Ecotone

..... ZHANG Qibin LIU Dongyue LI Qian YU Qiang SONG Hongli LI Shiran ( 199 )

## Simulation on Forest Echo Waveforms of Domestic Spaceborne LiDAR

..... CAI Longtao YUE Chunyu HUANG Jin HE Tao GUO Aiyan XING Yanqiu ( 208 )

## Classification of Village Remediation Types from Perspective of Suitability - Planning - Grade

..... TANG Linnan LIU Yu PAN Yuchun ZHENG Yandong ( 218 )

## Design and Experiment of Soil Moisture Sensor Based on Dual Frequency Excitation

..... SHENG Qingyuan ZHANG Xiliang YANG Yue LI Pingping NI Mengyao ( 228 )

## Method and Instrument Design for Stem Ice Content Detection Based on Plant Dielectric Properties

..... TIAN Hao ZHAO Yandong XIE Tao YU Chongchong ( 235 )

## Detection Method of Severe Adhesive Wheat Grain Based on YOLO v5 - MDC Model

..... SONG Huabo WANG Yunfei DUAN Yuanchao SONG Lei HAN Mengxuan ( 245 )

## Weed Detection Based on Multi -scale Fusion Module and Feature Enhancement

..... KANG Jie LIU Gang GUO Guofa ( 254 )

## Machine Vision Real Time Detection of Inferior Cocoons Based on Lightweight Manipulation Network

..... ZHANG Yinhui YANG Hongkuan ZHU Shouye HE Zifen ( 261 )

## Recognition of Perinatal Sows ' Posture Based on EfficientDet Algorithm

..... LIU Longshen SHU Cuini LI Bo SHEN Mingxia TAI Meng LIU Kang ( 271 )

## Simultaneous Localization and Multi -mapping Algorithm in Dynamic Environment Based on Monocular

Vision ..... QI Yongsheng CHEN Peiliang LIU Liqiang DONG Chaoyi ( 280 )

## Establishment and Experimental Verification of Deep Learning Model for On -line Recognition of Field

### Cabbage

..... ZHAI Changyuan FU Hao ZHENG Kang ZHENG Shenyu WU Huarui ZHAO Xueguan ( 293 )

## Fast Recognition Method of Multi -feature Trunk Based on RealSense Depth Camera

..... SHEN Yue ZHUANG Zhenzhen LIU Hui JIANG Jianbin OU Mingxiong ( 304 )

## Estimation and Visualization of Chlorophyll Content in Plant Based on YOLO v 5

..... ZHANG Huichun ZHANG Meng BIAN Liming GE Yufeng LI Xiaoping ( 313 )

## Cold Chain Transportation Environment Prediction Method Based on K -medoids and LSTM

..... YUAN Yanwei SUN Guoqing LIU Yangchun WANG Meng ZHAO Bo WANG Fengzhu ( 322 )

## Agricultural Soil and Water Engineering

### Simulation and Evaluation of Cycle Irrigation with Brackish and Fresh Water for Winter Wheat Based on AquaCrop Model

..... ZHU Chengli XU Yulin HUANG Mingyi ZHENG Junyu ZHANG Fan CAO Leiqi ( 330 )

## Mechanism of Bio-organic Fertilizer on Potato Yield and Soil Nitrogen -cycling

..... ZHAO Jianyu WANG Fengxin MENG Chaobiao JIN Song PENG Min ( 343 )

## Effects of Biochar on Soil Physical and Chemical Properties and Salt in Cotton - Sugarbeet Intercropping

Field ..... WANG Xiaofang LI Yi YAO Ning LIU Hongguang FAN Xiangyang ZHANG Xuan ( 352 )

## Remote Sensing Monitoring of Recessive Degradation for Cultivated Land Productivity and Its Influencing

Factors ..... LI Zhuo ZHA Sihan HUO Wei WANG Linlin GUO Wenhua SUN Danfeng ( 363 )

## Effect of Farmland Drainage on Improving Saline Soil and Environmental Pollution

..... DOU Xu SHI Haibin LI Ruiping MIAO Qingfeng YAN Jianwen TIAN Feng ( 372 )

## Agricultural Bio-environment and Energy Engineering

### Optimization of Enzymatic Hydrolysis Process for Ossein Peptide with Low Molecular Weight and Its

Characteristics Analysis ..... YAO Yumei YUAN Xiangru HAN Lujia YANG Zengling LIU Xian ( 386 )

## Agricultural Products Processing

### Effect of Ultrasonic Combined with Enzyme Treatment on Glutamine Transaminase Cross -linked Soybean

Protein Isolate Gels

..... LI Yang MA Zhaolei ZHENG Li HUANG Yuyang KIM Kibong TENG Fei ( 394 )

### Glycolysis Capacity of Bovine Muscle during Early Stage of Postmortem Aging under Action of HIF - 1 $\alpha$

..... CHEN Cheng GUO Yuxuan SHI Xixiong GUO Zhaobin MA Guoyuan YU Qunli ( 403 )

### Magnetic Relaxation Switch Sensor for Rapid Detection of Progesterone in Milk Based on Aptamers

Functionalized Au@ Fe<sub>3</sub>O<sub>4</sub> Nanoparticles ..... WANG Xin WANG Qi SUN Hanying PEI Kaili ( 412 )

## Vehicle and Power Engineering

### Design and Performance Analysis of Tractor Bidirectional Coupling Electric Drive System

..... LIU Mengnan LI Shuyuan XU Liyou ZHAO Yirong ( 423 )

## Mechanical Design & Manufacturing and Automation

### Multi-scene Fast Motion Planning of Manipulator Based on Improved RRT \* - Connect Algorithm

..... WANG Huaizhen GAO Ming WANG Jianhua FANG Lijin LI Hongsheng ( 432 )

### Rapid Parallel Optimization Method of Complex Hydraulic Product Based on Multi -core CPU

..... NING Zhiqiang WEI Lixin ZHANG Rui QUAN Long HUA Jianhui GAO Youshan ( 441 )

### Investigation on Two-dimensional Piston Dynamic Flowmeter

..... DING Chuan CHEN Haoqi WANG Xi ZHAN Lei ZHANG Lichao RUAN Jian ( 450 )