

# 目次

# CONTENTS

《制造技术与机床》2022年第11期(总第725期) No.11.2022 Total Issue No.725

## 1 | 国内外动态 / Information at Home and Abroad

### 专题专访 / Special Topics & Interview

- 5 | 七年磨剑终成锋 奋楫扬帆新征程| 特约记者 / 吴怡然  
——首个中国主导的机床数控系统系列国际标准 ISO 23218 正式发布
- 7 | 驭“数字孪生”之力，行“机床转型”之路| 本刊记者 / 谭弘颖  
——西门子机床行业媒体沙龙在京举办

### 故障诊断 / Fault Diagnosis

- 9 | 阶次跟踪与改进小波阈值降噪的 RV 减速器故障诊断/蔺梦雄 王爽 韦克吉  
张向慧 曹洪鑫 张敬彩  
RV reducer fault diagnosis based on order tracking and improved wavelet threshold noise reduction/LIN Mengxiong, WANG Shuang, WEI Keji, ZHANG Xianghui, CAO Hongxin, ZHANG Jingcai
- 15 | 基于 FCMMWPE-BSASVM 组合算法的调心球轴承故障诊断研究/张昭晗  
齐俊平 李峰 崔金巍  
Research on fault diagnosis of self-aligning ball bearing based on FCMMWPE-BSASVM combined algorithm/ZHANG Zhaohan, QI Junping, LI Feng, CUI Jinwei

### 工业机器人 / Industrial Robot

- 20 | 并联机器人工作空间分析与结构优化/郭建烨 刘军  
Workspace analysis and structure optimization of parallel robot/GUO Jianye, LIU Jun
- 27 | 基于 MATLAB 的 6R 机械臂运动学的仿真研究/胡宇航 张尚盈 张晓艳  
Kinematics simulation of 6R mechanical arm based on MATLAB/HU Yuhang, ZHANG Shangying, ZHANG Xiaoyan
- 33 | 基于两种建模方法的冗余并联机器人的动力学对比研究/郝亮亮 刘小娟  
杜婷 闫献国  
Comparative study on dynamics of redundant parallel robot based on two modeling methods/HAO Liangliang, LIU Xiaojuan, DU Ting, YAN Xianguo
- 40 | 面向工业机器人配合使用的变位机设计开发与实验研究/才磊 郭建飞  
李斌 张晋  
Design development and experimental research of positioner for industrial robot/CAI Lei, GUO Jianfei, LI Bin, ZHANG Jin

### 特种加工 / Non-traditional Machining

- 45 | 基于 ANSYS 的镍钛合金心血管支架光纤激光切割温度场仿真/刘旭东  
李志永 刘育辰 柴明霞 王永琪 高存福  
Temperature field simulation of fiber laser cutting Nitinol stent based on ANSYS/  
LIU Xudong, LI Zhiyong, LIU Yuchen, CHAI Mingxia, WANG Yongqi, GAO Cunfu

- 52** | SiCp/Al 复合材料电火花加工材料去除率及电极损耗研究/刘宇 曲嘉伟  
李小明 阎长罡 张生芳 王紫光  
Study on material removal rate and tool wear in EDM of SiCp/Al composite/LIU Yu,  
QU Jiawei, LI Xiaoming, YAN Changgang, ZHANG Shengfang, WANG Ziguang
- 59** | 壳体结构对激光器输出功率的仿真及实验研究/冀小刚 张志新 王端 陈燕  
鲁飞 付世斌  
The simulation and experimental study of the shell structure on laser output power/  
JI Xiaogang, ZHANG Zhixin, WANG Duan, CHEN Yan, LU Fei, FU Shibin
- 65** | 激光切割机横梁多工况多目标动力学拓扑优化/张宇 林毓培 舒雷 董俊红  
Multi-conditions and multi-objective dynamic topology optimization of laser cutting machine  
beam/ZHANG Yu, LIN Yupei, SHU Lei, DONG Junhong

## 切削加工 / Cutting Processing

- 71** | 镍基合金微钻削加工现状与分析/张好强 张傲 吴昱鑫 王鑫阁 侯锁霞  
Present situation and analysis of micro drilling of nickel base alloy/ZHANG Haoqiang,  
ZHANG Ao, WU Yuxin, WANG Xingge, HOU Suoxia
- 78** | 方肩铣刀铣削钛合金腹板崩刃识别算法研究/毛一砚 姜振喜 朱绍维 刘宽  
赵中刚  
Research on the algorithm for recognizing chipping of square shoulder milling cutter machining  
the webs of titanium alloy/MAO Yiyuan, JIANG Zhenxi, ZHU Shaowei, LIU Kuan,  
ZHAO Zhonggang
- 84** | 不同刀具高速干切削 2219 铝合金性能研究/王利利 刘雪峰 崔鑫 赵尔华  
王星然 李士鹏 秦旭达  
Study on the performance of different tools in high-speed dry cutting of 2219 aluminium alloy/  
WANG Lili, LIU Xuefeng, CUI Xin, ZHAO Erhua, WANG Xingran, LI Shipeng, QIN Xuda
- 92** | 基于知识工程的滚刀设计系统开发/杨晨 张巧丽 徐敏 李西宁 刘育志  
Development of hob design system based on knowledge engineering/YANG Chen, ZHANG Qiaoli,  
XU Min, LI Xining, LIU Yuzhi

## 设计与研究 / Design and Research

- 97** | 半结构装配数据的知识抽取及机床装配知识图谱构建方法研究/尹昱东 王保健  
Research on knowledge extraction of semi-structured assembly data and construction method of  
machine tool assembly knowledge graph/YIN Yudong, WANG Baojian
- 102** | 面向细长面特征的自动数控编程方法研究/柳大坤 方喜峰 王楠 张胜文  
王沾 徐精英  
Research on automatic NC programming method for slender plane features/LIU Dakun,  
FANG Xifeng, WANG Nan, ZHANG Shengwen, WANG Zhan, XU Jingying
- 109** | 考虑温度影响的机床螺栓结构接触特性分析/雷声 毛宽民 李明 赵飞宇  
Contact characteristic analysis of bolted joint on machine tools considering temperature effect/  
LEI Sheng, MAO Kuanmin, LI Ming, ZHAO Feiyu
- 116** | 插件机龙门横梁的热态特性分析/胡意波 高自成 李立君 邹洋 乔志东  
Thermal characteristic analysis of cross beam in gantry machining center of moving beam/  
HU Yibo, GAO Zicheng, LI Lijun, ZOU Yang, QIAO Zhidong
- 123** | CFRP 连接孔几何误差对螺栓连接结构拉伸强度的影响规律研究/高学敏  
石大鹏 许彦伟 殷银银 张钦莹  
Study on the effect of geometric errors of CFRP connection holes on the tensile strength of  
bolted structures/GAO Xuemin, SHI Dapeng, XU Yanwei, YIN Yinyin, ZHANG Qinying

## 工艺与制造 / Technology and Manufacture

- 131** | 异形偏心零件的动平衡调节工装的设计及应用/高源 张小飞 杨培辉 崔涛 李杰 吴伟宏 张鹏 王永国  
Design and application of dynamic balance adjustment fixture for special-shaped eccentric part/  
GAO Yuan, ZHANG Xiaofei, YANG Peihui, CUI Tao, LI Jie, WU Weihong, ZHANG Peng, WANG Yongguo
- 137** | 基于BP-PSO的电驱质量预测模型及工艺参数敏感性分析/王峰 万冶 陶小亮 赵世金 赵鑫  
Quality prediction model and sensitivity analysis of process parameters based on BP-PSO/  
WANG Feng, WAN Ye, TAO Xiaoliang, ZHAO Shijin, ZHAO Xin
- 144** | 涡轮盘榫槽加工工艺及变形控制方法研究/于建华 李勋 丁志纯  
Research on deformation control method during the machining of turbine disk fir-tree slot/  
YU Jianhua, LI Xun, DING Zhichun

## 检测与质量 / Test and Quality

- 150** | 刚齿加工几何位姿误差补偿系统的开发/薛凤 林晓川 洪荣晶 胡敏  
Development of geometric location errors compensation system for power skiving/  
XUE Feng, LIN Xiaochuan, HONG Rongjing, HU Min
- 156** | 基于数字孪生的滚动轴承健康状态预测/拓云天 崔洁 王津沓 杨泞宁 韩飞 李富国  
Health prediction of rolling bearing based on digital twin/TA Yuntian, CUI Jie, WANG Jinta, YANG Ningning, HAN Fei, LI Fuguo
- 163** | 正交法/响应面法四点接触桃形沟球轴承参数优化/高福生 贾瑞超 姜淑凤 闫朝竣 王俊峰  
The parameters of four-point contact peach groove ball bearing are simulated and redesigned by orthogonal experiment method and response surface method/GAO Fusheng, JIA Ruichao, JIANG Shufeng, YAN Chaojun, WANG Junfeng

## 管理信息化 / Management and Informatization

- 169** | 基于IIGA的分布式装配置换流水车间调度/董海 王志彬  
Distributed assembly permutation flowshop scheduling problem based on IIGA/DONG Hai, WANG Zhibin
- 177** | 基于遗传算法的生产线多目标优化研究/贺田龙 邵明国 白晓庆 曹泽 李艳鹏  
Research on multi-objective optimization of production line based on genetic algorithm/  
HE Tianlong, SHAO Mingguo, BAI Xiaoqing, CAO Ze, LI Yanpeng
- 183** | 基于组合规则的作业车间AGV联合调度优化/钟宏扬 彭乘风 廖勇 李翔  
Combined rules based optimization for AGV joint scheduling in job shop/ZHONG Hongyang, PENG Chengfeng, LIAO Yong, LI Xiang