

王志恒,杨庆华,钱少明,鲍官军,张立彬.气动侧摆关节的动态特性[J].农业工程学报,2012,28(7):19-26

气动侧摆关节的动态特性

Dynamic characteristics of pneumatic side-sway joint

投稿时间: 2011-09-19 最后修改时间: 2011-10-25

中文关键词: [机器人](#), [动力学模型](#), [试验](#), [侧摆关节](#), [气动柔性驱动器FPA](#), [机器人多指灵巧手](#)

英文关键词: [robots](#) [dynamic models](#) [experiments](#) [side-sway joint](#) [flexible pneumatic actuator FPA](#) [robot dexterous multi-fingered hand](#)

基金项目:国家高技术研究发展计划(863计划)资助项目(2009AA04Z209);国家自然科学基金资助项目(51075363);浙江省自然科学基金杰出青年团队资助项目(R1090674)

作者	单位
王志恒	特种装备制造与先进加工技术教育部/浙江省重点实验室, 浙江工业大学, 杭州 310014
杨庆华	特种装备制造与先进加工技术教育部/浙江省重点实验室, 浙江工业大学, 杭州 310014
钱少明	特种装备制造与先进加工技术教育部/浙江省重点实验室, 浙江工业大学, 杭州 310014
鲍官军	特种装备制造与先进加工技术教育部/浙江省重点实验室, 浙江工业大学, 杭州 310014
张立彬	特种装备制造与先进加工技术教育部/浙江省重点实验室, 浙江工业大学, 杭州 310014

摘要点击次数: **233**

全文下载次数: **93**

中文摘要:

针对目前气动关节存在的缺点,提出了采用气动柔性驱动器(flexible pneumatic actuator, FPA)直接驱动,模拟人手指侧摆运动的侧摆关节。介绍了侧摆关节的工作原理。根据热力学第一定律,结合关节的动力学方程,推导建立了关节的转角及输出力矩的动态模型,并进行了仿真分析研究了关节的动态特性;试验研究了侧摆关节的动态特性,分析了关节转角及输出力矩的实际动态响应较慢原因;采用了串联双闭环控制方法,对关节的转角及输出力矩进行了控制研究,结果表明:期望角度为 15° 时,关节转角闭环动态响应时间约为0.3 s,稳态相对偏差小于0.65%;期望输出力矩为188 N \cdot mm时,闭环输出力矩动态响应约为0.3 s,稳态相对偏差小于1.5%。侧摆关节可控性高,可满足多指灵巧手关节设计要求。

英文摘要:

Because of shortcomings of the existing pneumatic joints, side-sway joint driven by FPAs directly was proposed which could simulate swing movement of human hand. The operating principle of the side-sway joint finger was presented. According to the first law of thermodynamics, combined with dynamic equation of the joint, the dynamic model of the side-sway joint was established. Experiments were carried out to test the static and dynamic characteristics of the joint. There was certain error between experimental curve and theoretical curve, and the error cause was analyzed. Using a series dual loop control method, the output angle and output force of joint were controlled. The results showed: when expected output angle was 15° , the loop dynamic response time was about 0.3 s, and the steady-state relative deviation was less than 0.65%. When expected output force was 188 N \cdot mm, the loop dynamic response time was about 0.3 s, and the steady-state relative deviation was less than 1.5%. The side-sway joint can meet the requirement for designing multi-fingered dexterous hand joint.

[查看全文](#) [下载PDF阅读器](#)

关闭

您是第**5153791**位访问者

主办单位: 单位地址: 北京朝阳区麦子店街41号

服务热线: 010-65929451 传真: 010-65929451 邮编: 100125 Email: tcsae@tcsae.org
本系统由北京勤云科技发展有限公司设计