

穴盘苗移栽机末端执行器设计与虚拟样机分析 Design of the End-effector for Plug Seedlings Transplanter and Analysis on Virtual Prototype

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关键词: 穴盘育苗 移栽机 末端执行器 设计 虚拟样机

摘要: 针对现有穴盘苗移栽机工作过程中易伤苗、作业效率低等问题, 设计了移栽机末端执行器。根据移栽机实际移栽作业要求, 采用SolidWorks进行末端执行器虚拟样机设计, 并采用COSMOSMotion插件分析机械手指运动轨迹, 联合COSMOSWorks插件进行基质有限元模型分析。运动模拟试验表明机械手指水平位移量主要受斜楔块位移量 Δh 影响, 而垂直位移量主要受机械手指初始插入角度 α 影响, 并且机械手指产生的作用力主要作用于基质块边缘, 不会对基质中的幼苗茎产生损伤。移栽试验表明末端机械手指平均移栽成功率为95.76%, 平均伤苗率为3.06%, 满足移栽作业要求。 With the aim to solve the problem of seedlings damaged and inefficiency of plug seedlings transplanter, the end-effector was redesigned. According to the actual operational requirements, SolidWorks was used to design the virtual prototype of end-effector. COSMOSMotion was used to analysis trajectory of mechanical finger and COSMOSWorks was used to analysis finite element model of matrix. It showed in motion simulation experiment that the horizontal displacement of the mechanical fingers was mainly affected by the slider displacement (Δh), while the vertical displacement was mainly affected by the initial angle (α) the mechanical fingers insert in. The forces generated by mechanical fingers distribute in the matrix block edge and won't damage the seedling stems. The experimental results showed that the success rate of transplanter was 95.76%, the rate of seedlings damaging was 3.06%, and it could meet the operational requirements of transplanting.

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