2022 年英特尔杯大学生电子设计竞赛嵌入式系统专题邀请赛

参赛队作品简介

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作品题目 **（中英文对照）**	基于 RGB-D 相机的视觉牵引机械辅助系统 **VISIUAL MECHANICAL TRACTION ASSISTANCE SYSTEM BASED ON RGB-D CAMERA**		

作品简介

（中英文对照，中文限 500 字以内）

本项目基于深度学习方法，采用 Intel 平台，结合热门仿生机械手。核心 Intel 边缘计算主机的强大算力，为手势识别、仿生机械手运动、移动平台操控等模块赋能。从而开发出具有普适性的视觉牵引机械辅助系统，主要应用于远程无人作业，如隔离病房物资分拣、远程手术器材准备。区别于其他专用的工业机械臂，仿生机械手可适用于不同的无接触式作业，性价比更高。系统使用者可单人通过踏板远程移动平台至作业区，通过 SLAM 与可动相机得到位置反馈，并全程观察。到达准确位置后，使用者可开始实时视觉牵引。使用者可利用 RGB-D 相机实时提取手部信息，OBB 归一优化后投入 PointNet++神经网络计算，得到 21 关键节点的六维信息。逆向旋转缩放后，将 21 点放入建立的世界坐标系，得到准确坐标。然后将 21 点准确坐标投入仿生手臂运动算法模型，计算出各舵机旋转角度。最后将舵机旋转角度通过 Wi-Fi 或 4G/5G 模块传输至仿生手臂控制平台，操控仿生机械臂做出相应的姿势，实现远程实时牵引控制，满足所需的作业需求。

This project is based on the deep learning method, adopts the Intel platform, and combines the popular bionic manipulator. The powerful computing power of the core Intel edge computing host enables modules such as gesture recognition, bionic manipulator motion, and mobile platform control. As a result, a universal visual traction mechanical assistance system has been developed, which is mainly used in remote unmanned operations, such as material sorting in isolation wards and remote surgical equipment preparation. Different from other dedicated industrial manipulators, the bionic manipulator can be applied to different non-contact operations and is more cost-effective. The system user can remotely move the platform to the work area by a single person, get position feedback through SLAM and movable camera, and observe the whole process. After reaching the exact position, the user can start real-time visual traction. Users can use the RGB-D camera to extract hand information in real time. After OBB is normalized and optimized, it is put into PointNet++ neural network calculation to obtain the six-dimensional information of 21 Key Points. After reverse rotation and scaling, put 21 points into the established world coordinate system to get accurate coordinates. Then put the exact coordinates of 21 points into the bionic arm motion algorithm model to calculate the rotation angle of each steering gear. Finally, the rotation angle of the steering gear is transmitted to the bionic arm control platform through the Wi-Fi or 4G/5G module, and the bionic robotic arm is manipulated to make the corresponding posture, so as to realize remote real-time traction control and meet the required operation requirements.