Artificially Intelligent Electronic Waste Sorting Selective Compliance Robot Arm

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E-Waste makes up 70% of all toxic waste. The abundance of heavy metals such as mercury, lead and cadmium entering landfills leach our soil, groundwater, and atmosphere to horrific ends, yet only 12% of electronic waste is recycled. This is not because it is impossible, but because electronics are disposed of incorrectly. Currently, E-waste is sorted by hand, a method not only ineffective but costly. This project has targeted the reduction of electronic waste entering landfills by the invention of an E-waste sorting robot arm. Using an iterative design process, a prototype was developed using a robot arm and a camera that identifies electronics on a conveyor belt using supervised machine learning. The device then segregates waste into groups depending on its type and brand. A variety of engineering and robotics principles are employed for the device to function: a selective compliance design is utilized for its balance between speed, strength, and affordability; additive manufacturing provided a fast and affordable way to create rapid prototypes; a computer runs an open-source convolutional neural network to identify electronics via optics; a microcontroller calculates inverse kinematics to determine the coordinates of the waste; motor driver breakout-boards precisely control the steppers; relays activates the electromagnet end effector and conveyor; finally, a user interface provides easy control of key functions such as speed, detection certainty, homing and manual positioning. These technologies were interfaced to create a device that's affordable, fast, and effective at sorting electronic waste – preventing it from entering landfills and polluting our planet.

Awards Won:

Association for the Advancement of Artificial Intelligence: AAAI Memberships for 1st, 2nd, and 3rd Prize Winners (in-kind award / part of the 1st-3rd prize)

Association for the Advancement of Artificial Intelligence: AAAI Membership for the School Libraries of All 8 Winners (in-kind award / part of 1st-3rd prize and honorable mentions' prize)

Second Award of $2,000

Association for the Advancement of Artificial Intelligence: Third Award