Use of Collaborative Robotics in Mass Production of Freehand Components

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Hand guided cobots are a type of collaborative robot that take direct input from an operator holding and moving parts of it. Collaborative robots could be used to reproduce movements and actions made by humans. This allows for the accurate reproduction of complex items, such as ink drawings or milled parts. A robot that can replicate the inputs made by a human can easily reproduce those movements to manufacture objects without being given a computer-generated toolpath or direct measurements. The goal of this project was to design, construct, and program a hand guided robot capable of reproducing pen and paper drawings as proof of concept for this project's core robot control ideology. Over the course of the project, 5 distinct iterations of the robot were made. The 1st prototype was a functional model of the robot mechanisms made of Lego. The 2nd prototype was the same design made into aluminum parts to reduce mechanical failures. The 3rd prototype added a gear reduction to the drive motors to improve the resolution of the encoders. The 4th prototype was a partial rebuild to eliminate mechanical issues that affected previous prototypes. Finally, a new program was written for the 5th prototype, allowing it to record and follow movement paths so that drawings could be reproduced. The robot successfully demonstrated the viability of the core control idea and met the design goals set. In the future, a rewrite of the code as well as a zeroing system for the robot would be most beneficial.

Awards Won:

Patent and Trademark Office Society: Second Award of $500