TEXAS STATE UNIVERSITY

The rising STAR of Texas

Title: Autonomous Performance Optimization in Robotic Assembly Processes.

Background: Robots today perform the mechanical assembly of various products that are typically repetitive and/or require precision component mating. The setup of the robot(s) and the automated assembly flow process necessitates extensive initial adjustment and requires continual programmer / operator attention as piece part batch variances are introduced into the process. The current requirement for human intervention introduces manufacturing delays and work flow stoppages, thereby reducing production efficiency. Many automation clients have sought the ability to reduce or eliminate the human factor involved in these requirements.

Invention Description: Inventors at Texas State University have developed an algorithm to address these weaknesses in automation systems as well as to improve overall system performance. This technique specifically addresses the problem by employing a Gaussian Process Regression (GPR) algorithm. Other techniques apply Bayesian functions, but this technique, with the inclusion of Gaussian Processes, specifies a mean function and a covariance function, which extends the probability of resolving random vectors as they are introduced. Therefore, this technique not only predicts the next solution to random variables as they develop, but accelerates the time to subsequent vector resolutions through parameter optimization. The algorithm has been developed and tested using a six DOF (degree of freedom) robotic arm (ABB IRB-140 and IRC-5 controller) that successfully mated a piece part (valve) with a fixed assembly (valve body).

Benefits: Due to the benefit of substantial improvement to an automated manufacturing process, incorporation of such an algorithm into every stage (multiple robot cells) could improve the complete manufacturing process line by an order of magnitude.

As this problem is currently under study by several university and research labs the application of such an algorithm in the near future is imminent and inevitable. The opportunity to introduce a proven technique for this process improvement is now, and will set the potential for the greatest market share.

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