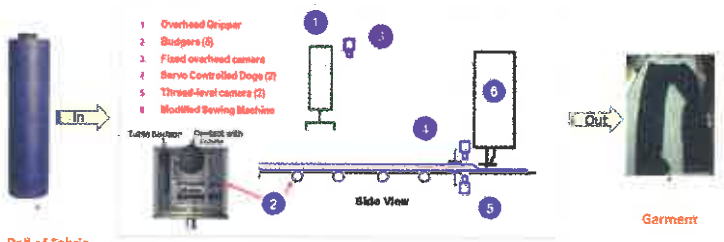
A Robotic Sewing Facility to Make Garments for Everyday Wear. By Kathlyn Swantko

Transforming Apparel Production

In August 2014, a $2 million Innovation Grant from the Walmart Foundation was awarded to Georgia Tech to further its "CRAFTed with Pride in the USA" project. The project is under Georgia Tech's Center for Research in Apparel Fabrications Technologies (CRAFT), working in collaboration with SoftWear Automation, the company that is commercializing the technology, and Georgia Tech's Mechanical Engineering School. The goal is the creation of a fully-roboticized sewing facility that will boost U.S. apparel manufacturing and bring this much needed supply-chain function back to America.

"Today only 2.5 percent of apparel consumed here is produced domestically," notes Dr. Sundaresan Jayaraman, principal investigator on the project. "We plan to increase this figure by building on our breakthrough innovation for developing seamstress-less sewing."



The garment is progressively assembled as it passes through each Work-Cell shown in detail here; it consists of the Seamstressless Sewing Machine and associated Fabric Handling and Transport System (FHTS), e.g., Overhead Camera, Gripper, and Budger.

The project's primary objective is to fundamentally redesign and transform today's apparel value chain. "Through our research utilizing advanced machine vision and robotics, it will be possible to create high-skilled, high-paying jobs in the United States," explains Jayaraman. "We are transforming the manual cut-and-sew process into a cost-effective automated high-tech operation, which will be better positioned to profitably serve the 'fast fashion' market."

Challenges of the Project

The fundamental challenge was the creation of an innovative thread-count-based fabric motion-control, developed in close collaboration with SoftWear Automation. This enables the technology for automating sewing and removes the need for a sewing operator.

The key is the robotic transformation of a two-dimensional fabric into a three-dimensional garment, which involves two or more pieces of fabric whose shifts must be controlled, coordinated, sewn together, and emerge as an integrated unit. According to Jayaraman, the flexibility and movement qualities of textile fabrics can easily cause distortion during sewing, which up until now have frustrated previous efforts to eliminate the seamstress.

The team has addressed the issue of controlling and coordinating the fabric through the implementation of a thread-count-based fabric motion control, a non-Euclidean measure (geometric measure), and a high-speed machine vision system for handling robotics and materials. Jayaraman stated, "Humans cannot count threads as they sew, but a robotic machine can!"

Since denim accounts for a significant portion of imports and is easier to handle than fine silk, the project's initial target is blue jeans. Once the technology has been successfully developed for denim, it can be enhanced to account for all types of fabrics.

Future for the Project

According to Jayaraman, the various building blocks for automated sewing are currently being developed. At the same time, a low-cost fabric-handling and transport robot to handle the repetitive movement of fabric parts during sewing has been developed and is being commercialized by SortWear Automation. Jayaraman expects that by the end of the two-year period, a fully-functional automated Work-Cell with a seamstress-less sewing machine will be ready for commercial deployment.

This project is also considered as critical for national security and economic prosperity. Jayaraman noted, "Manufacturers and retailers will be able to deliver products rapidly in small lots, in varying designs, and at competitive prices. It will also minimize inventory in the value chain, and reduce markdowns for retailers and chargebacks to manufacturers. By strengthening the U.S. domestic manufacturing capabilities, both the defense and civilian sectors will benefit." ●

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