Robotic Renaissance
What is the future of industrial robotics?

Science fiction shows from the 1960s depict a future world of robots that would complete every portion of manual labor. Does everyone remember George Jetson at work? When you look around manufacturing facilities today you find some notable exceptions, but you don’t see the ubiquitous robot. So why hasn’t the science fiction of then become the science reality of today? And more importantly, how can this change in order for American manufacturing to become competitive again? And what does this mean for the future of mechatronics? For this answer, I posed my questions to Phil Voglewede, a professor at Marquette University and a bit of a robotics connoisseur. After many discussions, this is what we came up with.

To answer this question, we need to look back at the evolution of robotics in industrial environments. Robots were originally developed as stand-alone devices which are bought off-the-shelf. These types of robots excelled in applications that fit their design specifications, e.g., positioning parts exactly, welding and painting operations requiring complex motion. Robots are excellent going from one known position to another.

Unfortunately, many installations of robots did not meet the design specifications. The robots were typically oversized for these tasks, required failure-prone part-positioning devices or notoriously bad vision systems, and were large and bulky. As such, many industries eliminated their robotics installations and opted for fixed automation or manual operations depending on the estimated payback time. There was a time when the mere mention of robotics brought cringes to manufacturing engineers everywhere.

Robotics is now poised for a renaissance. The new view of robotics is based on modularity. Instead of one six-axis robot being utilized for all applications, there is a push to allow the common engineer to design the robot that fits the particular application. This is no different than what is being advocated with the LEGO MINDSTORMS or with VEX Kits through FIRST Robotics and similar programs. Future engineers already add electrical and/or mechanical components and program them on the fly to provide the flexibility needed for that particular application. Rather than scrap every part to create a new design, the parts from the old design can be utilized in new ways.

Industrial suppliers are already well along the path to make this vision a reality. For example, modular framing is ubiquitous in engineering. Motors and drives are being connected with smart connections for power and communication. Vision systems have become faster and more robust. Rapid prototyping will soon be able to create rigid links that are only limited by one’s imagination. We are truly on the verge of a robotic renaissance.

However, this modularity comes at an ideological price. It may lead the engineer to believe the “design-build-test-build-test” approach to engineering design is feasible, which we know is not. The power to understand these systems must now rely on the individual user and not the supplier. The engineer of today must be able to model and understand how these systems interact. Otherwise, we will repeat the problems of yesterday.

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A rigid, complex robot vs. a flexible, modular system.