

Video to embed: https://www.youtube.com/watch?v=qo_rtzEI_7Y

Voodoo Manufacturing triples 3D printing production using collaborative robots

Voodoo Manufacturing in Brooklyn, New York, runs a rapidly growing 3D printing farm scaling up to handle large production runs to compete with injection molding. The startup urgently needed to automate the manual loading and unloading of plates in their printers and selected a UR10 robot arm from Universal Robots because of its quick integration with peripheral systems.

The UR10 robot arm gently places a plate with an orange Pokémon figure on a conveyor, picks up a new blank plate from a hopper, places it back in the 3D printer, and queues the system to start a new build. Products ranging from prosthetic hands to protective dog eyewear are now produced in this setup, called “Project Skywalker,” that Voodoo Manufacturing believes to be the first-ever robot operated cluster of 3D printers.

The collaborative robot is helping Voodoo Manufacturing take 3D printing from a technology mostly used for producing prototypes and high-value components to become a viable alternative to the mass production of plastic parts done through injection molding, a more cost-intensive production process.

“When we were looking for a robotic arm, we were looking for one that could do the tasks, but would also be easily programmable and get up and running very quickly,” said Jonathan Schwartz Chief Product Officer of Voodoo Manufacturing. “For us, Universal Robots’ UR10 was a great option,” said Schwartz, mentioning that the collaborative safety features were imperative.

The UR robots are classified as “collaborative” due to their built-in safety system that makes the robot arm automatically stop operating if it encounters objects or people within its route. A feature that enables humans and robots to work side-by-side with no fencing as usually required with traditional industrial robots.

“So instead of building a factory with caged-off areas and potential hazards, we are now able to create a friendly workplace with continuous and spontaneous improvement and interaction between humans and robots,” said Schwartz.

Voodoo Manufacturing estimates that the cost of implementing a UR robot was about five times less expensive than a traditional industrial robot due to the quick integration that did not involve safety cages, light curtains, and other safety measures usually needed when robots work in a factory setting.

Universal Robots+ platform enables fast integration

Getting a proof of concept for Project Skywalker was a race against time as Voodoo Manufacturing was pitching investors. “We didn’t have a couple of years to put something through R&D, we needed it here and now. We got the UR10 out of the box and were able to get it running within just a few hours,” said the CPO who also needed a gripper that could be seamlessly integrated at the end of the robot arm. “One important aspect for choosing the UR10 was that there were really good

peripherals that we could use with it,” said Schwartz, who chose a two-fingered gripper from Robotiq.

The gripper is part of the rapidly expanding Universal Robots+ platform that features plug & play products for UR robots. Cynthia Kradjel, Account Manager with Universal Robots distributor Axis New Jersey, a part of Power-Flo Technologies, recommended the UR10 with the Robotiq gripper as she knew the gripper’s UR+ certification meant hassle-free integration. “A UR+ product is tested and proven, the gripper software has even been integrated right on the robot’s own touch screen, which eliminated countless hours of trial and error, scripting code,” she explained.

Charlie Fenwick, industrial engineer at Voodoo Manufacturing, emphasized how the UR+ integration ended up being the deciding factor in choosing the right robot solution. “We looked at different robot arms, but none of them had the ability to easily interface with the peripherals required to get the complete application up and running,” he said. “Getting the gripper to work with the arm was almost like building a Power Point slide, by just dragging blocks of information onto the screen. All you have to do is link up the different blocks and it basically runs itself,” said Fenwick, adding that his team unexpectedly finished the project ahead of schedule.

Harvesting – the low hanging fruit

The UR10’s work assignment of loading and unloading plates is called “harvesting”, which took up 10% of all labor hours. This low-value-added activity is what Schwartz describes as “a perfect and almost quantifiable task” that he felt confident in being able to automate with speed, accuracy, and precision.

Voodoo Manufacturing has 160 3D printers. By placing the UR10 on a mobile base roaming the 18,000 square feet factory, the company will be able to use the collaborative robot to tend 100 printers. By adding another UR10 to its fleet, Schwartz will take the startup from 30–40% printer utilization up to 90%. “And from here on out as we scale, we can just buy more arms as we have more and more printers,” said Schwartz, who is not hesitant to call Project Skywalker “a massive success,” adding that “even though we shouldn’t have been surprised by the results, we all had this strong realization of how much of a game-changer this would be.”

Lights-out production triples output

The key to tripling output is the fact that the UR10 robot can run overnight. “We can monitor the robot through our own software and access the status of any given printer to see whether it’s printing or idle, which means we can deploy this in our factory and run it 24/7 without any human oversight,” says Schwartz, who describes it as “magical” first morning he came in to find more than 30 completed print runs handled by the UR10 overnight.

Voodoo Manufacturing’s three year goal is to reduce cost by 90%. The increased output compared with the reduction in labor cost provided by the company’s first UR10 means that the robot will pay itself back in less than six months. “If we’re going to increase our output ten-fold over the next couple of years, we have to do that without increasing our costs by 10x and the robots will be instrumental in achieving this,” said the CPO, emphasizing that automating the harvesting was just the first step. “Beyond this there are many other opportunities in our factory to automate; whether it is removing parts from the build plates, or cleaning them, or inspecting them for quality, or eventually even packing and shipping.”

Right now, Voodoo can compete with low-volume injection molded parts, but if the company is to compete at higher volumes such as batches of 100,000, they need to continue executing their

automation strategy. In the long term, Schwartz envisions Voodoo scaling up its operation to around 10,000 3D printers. These printers will be able to use new materials and make products that you can't see are 3D-printed. For the Brooklyn startup, automation is more than simply a way of cutting costs. "It's the only way we'll survive to be a large company that employs hundreds, if not thousands, of people," said Schwartz. "In taking on such massive and deeply entrenched industry such as injection molding, automation is going to be our primary weapon."

The robots will fuel reshoring

A weapon that doesn't kill jobs, he added. "The UR robots free our employees from a lot of the tedious tasks that we currently do in our factory and move them into higher-value positions that require more critical thinking," said Schwartz who is really excited to be building a factory in Brooklyn. "Over the past 30 years, manufacturing has left the United States mainly because of the very cheap labor costs overseas; but we feel that is changing with new technology such as this robotic arm. Now we can build a factory that can actually compete on cost with Chinese factories. In the next ten years, we're going to see manufacturing come back to the United States, and I predict an increase in manufacturing jobs available right here."

Sidebars:

About Universal Robots

Universal Robots is a result of years of intensive research in robotics. The six-axis robot arms weigh as little as 40 lbs. with reach capabilities of up to 51 inches. Repeatability of +/- .004" allows quick precision handling of even microscopically small parts. After initial risk assessment, the collaborative Universal Robots can operate alongside human operators without safety guarding. If the robots come into contact with an employee, the built-in force control limits the forces at contact, adhering to the current safety requirements on force and torque limitations. Universal Robots was co-founded in 2005 by the company's CTO, Esben Østergaard, who wanted to make robot technology accessible to all by developing small, user-friendly, reasonably priced, flexible, industrial collaborative robots. Since the first collaborative robot (cobot) was launched in 2008, the company has experienced considerable growth with the user-friendly cobot now sold in more than 50 countries worldwide. The company, which is a part of Teradyne Inc., is headquartered in Odense, Denmark, and has subsidiaries and regional offices in the USA, Spain, Germany, Italy, Czech Republic, China, Singapore, India, Japan, Taiwan and South Korea. U.S. regional offices are located in Ann Arbor, MI, Long Island, NY, Irvine, CA and Dallas, TX.

Learn more: www.universal-robots.com

About Voodoo Manufacturing

The Brooklyn startup has created a niche for itself producing plastic parts in runs of fewer than 10,000 items using an army of 160 3D printers. A production run typically takes less than two weeks, and some orders can be turned around in 24 hours. Voodoo uses a technology known as fused deposition modelling (FDM), which extrudes molten plastic out of a hot nozzle and lays it down on a flat surface, one layer on top of the next. Voodoo's goal is to build a competitive solution to injection molding which typically requires first making a mold that can cost thousands of dollars, whereas Voodoo only requires a 3D file to get started.

Learn more: www.voodoomfg.com

Download all high res images here:

https://www.dropbox.com/sh/m550p6snmpdisnn/AABr8F1f_P2jxeAasDGhHGSHa?dl=0

Suggested captions (number corresponds with file name):

(1, 2, or 43)

Voodoo Manufacturing occupies 18,000 square feet in an old Brooklyn warehouse

(8, 20, 40)

Getting a product printed at Voodoo Manufacturing just requires sending the company a 3D file

(10)

Voodoo runs 8 hour shifts, five days a week, by employing collaborative robots and having them run overnight, the company can triple output.

(17 or 19)

10% of all employees' time is spent "harvesting" the 3D printers, unloading and loading the print plates.

(23 or 26)

Voodoo has many manual tasks that the company will automate with robots as the next step. Part separation is one of them.

(29)

"Programming the UR10 robot arm with the Robotiq gripper was almost like building a Power Point," says industrial engineer with Voodoo Manufacturing, Charlie Fenwick. "You simply drag blocks of information onto the screen, link up the different blocks and it basically runs itself."

(31 or 32)

Voodoo ended up choosing the UR10 robot arm from Universal Robots as it interfaced seamlessly with the Robotiq gripper through the UR+ platform. The Brooklyn startup 3D printed their own extensions to the gripper, enabling it to grab the build plates.

(34, 36, 41, 45, 48, 50)

The UR10 is the largest of Universal Robots three models, with a span of 51 inches and a payload of 22 lbs.

(46)

Jonathan Schwartz (right) and Max Friefeld, CPO and CEO of Voodoo Manufacturing, were racing against time to find a robot arm that could be integrated in what they believe to be "the first ever robot operated cluster of 3D printers."

(47)

Jonathan Schwartz, CPO of Voodoo Manufacturing, was able to get the UR10 robot arm with the Robotiq gripper up and running in just a few hours.

(49)

Lights out manufacturing: Voodoo Manufacturing can run the UR10 robot unattended overnight and remotely monitor operation through their software.

(51)

Robotiq's 2-finger gripper kit showcased in the Universal Robots+ showroom, a platform of certified plug & play products for UR robots.

(52)

Teach method: The UR robots can be programmed by simply the grabbing the robot arm and moving it through way points entered on the robot's teach pendant.