

JULY 2019

3068 E Sunset Road, Suite 14
Las Vegas, NV 89120

Recap of the First Half of 2019

Since it has been 6 months since the last newsletter. We wanted to share some of the highlights that happened during the first 6 months of 2019.

CES was the first show we did in 2019. Markforged invited us to exhibit in their booth. It was wonderful hanging out with the amazing folks at Markforged. They are brilliant and friendly.

This show also gave us a chance to dine, drink and hang out with our favorite influencers. [Joel Telling](#) and [Jerry Berg](#) stayed with Kent Gilson and we had [Estefannie](#) and [Adrienne Tacke](#) visit us at the Markforged booth. Finished the show with drinks at Kent's with Josef and Michael [Prusa](#).

The same month Todd Enerson and Kent Gilson were invited to present at the first [Robotics Showcase](#) in San Francisco. Many amazing companies from [RavenOps](#), who organized the show, to conversations with the folks at [Houston Mechatronic](#). Todd got a good 15 minutes talking to [Trevor Blackwell](#) at the end of the showcase.

HD was invited to exhibit in the [SupplyFrame/Hackaday](#) booth in Shanghai. He flew out early and [William Ha](#) set up 5 presentation around Hong Kong to get Dexter and James in front of schools, universities and other robotic meetups.

A frigid trip to Wisconsin to meet with new and potential clients in late February wrapped up our travels as we turned our focus on production and scale.

Kent Gilson had a cross country trip in May as he presented at the New York Tech Faire then went to Boston to present at [ESC](#) and then off to the Bay Area for Maker Faire where he spent time with NASA and the Prusa brothers.

Had a fun time showing off Dexter in the Bay Area at the Hackaday [get together](#) and then James took Dexter to OSH ParK.

Lots for travel, production and new business in the first half of 2019.

Haddington Dynamics Discord Server Live!



We've created a Discord server. You can get quick responses from the Haddington team and see what other Dexter users are up to. Join here!
<https://discord.gg/YkfQRJa>

Dexter HD Kits and Fully Assembled robots available at our online store.

<http://hdrobotic.com/store>

[Onshape](#) has all the CAD files
[GitHub](#) has all the source code
[Thingiverse](#) has all the STL files

There are link to all of these and the community contributed open source material at <http://hdrobotic.com/open-source/>

Dexter Lends a Hand

We currently have a full wall of Markforged 3D printers, made up of 10 Onyx Pros and 2 Mark Two's. We call this our print farm. These printers are constantly working to produce the bulk of the Dexter HD parts. However, the printers are down nearly half the time because no humans are around to remove the finished parts from their plates. This is perfect opportunity to automate!

In April 2019 we tweeted a video of Dexter HD on a rail system ([see here](#)). This was the first step in the print farm Dexter and another step toward the ultimate goal of having Dexters build themselves.

This rail system is made up of off-the-shelf 8020 extruded aluminum, modular 3D-printed rack gear segments, and a new base design on which existing Dexters can easily be mounted. We hope to sell rail system kits soon. The robot can reach multiple rows of printers and the rail allows it to span the full length of the wall.

In addition to the rail system, we designed a custom bed-gripping end-effector, a blade mechanism to remove parts (we call it a guillotine!), and a filament sensor to let us know when filament is about to run out. The idea is that the robot slides over to a printer, lifts its cover open, grabs the plate, places it in front of the guillotine, plows the parts through the guillotine, returns the clean plate back in the printer, and starts the next queued print. The interface between the robot and the printer is the same as that provided by a human; it lifts the cover and uses the touch screen. This gives the system the potential to bring automation to any machines that humans normally control. To these steps in action, [click here](#).

We also developed an inventory system that enables us to keep track of the locations of all individual components in the manufacturing process. This system allows us to calculate exactly which parts and how many need to be printed. This is crucial when we are generating hundreds of parts a day.

All of these improvements to our internal manufacturing system improve our overall efficiency, allowing us to produce more Dexters per month and maintain our industry 4.0 vision of large-scale manufacturing done with additive manufacturing.

Dexter HD goes Headless

Dexter HD is no longer tethered to a computer. We have been working hard to get DDE (Dexter Development Environment) running on the robot. The new capability incorporates a full desktop Linux Ubuntu on the FPGA running two arm processors, so that DDE can run on the robot itself. This is an advantage in many ways. It removes the need to tie the robot to a computer to run DDE programs. It also makes setup as simple as pulling the Dexter out of the box and plugging it in. And it makes the new Tap and Teach work. (Tap and Teach is described below.) With the new headless abilities, a user could attach a Bluetooth keyboard and monitor and use DDE on the robot as well as a Linux desktop.



Dexter grabs a bed plate from a printer.



The part guillotine is a mechanism for removing parts from plates.



Sensors detect when the printers are about to run out of filament.

To see the print farm Dexter in action, [click here](#)

Introducing Tap and Teach – the control system that makes robot programming easy

Out of the box ease of training is the holy grail in robotics. The need to make programming easier is the great barrier for robotics and adoption into lower end markets. Cost is a significant factor, as the cost of automation/robotics equipment can be only a fraction of the cost of getting a robot useful. In fact, robot programming can cost up to five times more than the equipment.

Programming by example is the easiest solution, and that is where our control system shines. It provides more than just point to point instruction. It allows us to capture the entire path from recording and create agile movements in our robot that mimic human dexterity (hence the name Dexter).

When Dexter is plugged in, it will boot up and automatically calibrate. After that, you simply tap down on the end effector on the robot and it goes into teach mode. If you want the robot to go into the standard programming mode, you just tap the end effector up. In teach mode, you grab the robot and train it to perform the instructions that you want. Once you have completed training, you move the robot's J2 axis 20 degrees backwards from home and it will repeat the task in a loop. No computer, no code, no expensive third-party program cost. It's ready to go from the box.

What is also unique about this ability is that it is transferrable to other robots not produced by Haddington Dynamics. We are designing a retrofit kit for a variety of name brand robots on the market today. Putting our control system (board and optical encoders) on any robot will turn it into a Tap and Teach robot with dynamics haptics (force detection from mg – kg) and precisional accuracy improvements.

We don't need other companies' control systems. We just need their metal.

Scratch writes codes for Dexter

Our customer HKUGAC in Hong Kong purchased Dexters for its robotics classes. One of the students in the class, Kenny Hilton, wrote an interface to Dexter from the Scratch block programming language. Scratch is primarily used to teach programming to kids and may seem too simple to be useful, but we were amazed at how nice it was to write code for Dexter in Scratch. You can easily test small programs or parts of a program and then chain those together to make complex actions and behaviors. The block programming system enforces good design and avoids syntax errors and other annoying distractions. It interfaces with Dexter via a node.js proxy which is also a good introduction to that technology. The proxy is available and useful onboard Dexter for other tasks as well. For more see:

<https://github.com/HaddingtonDynamics/Dexter/wiki/Scratch-extension>

and be sure to check out the picture in the sidebar. Thanks, Kenny!

Haddington Dynamics and Dexter will be exhibiting in the Burton Precision booth at the Advanced Manufacturing Expo in Michigan.

August 20, 2019

Novi, MI Booth # 805

August 22, 2019

Grand Rapids, MI Booth #1002

Sign up for Demos [here](#)

Also in August we will be exhibiting at [Drive World Conference & Expo](#)

August 28-29 Santa Clara Convention Center in the Startup Zone



Back Row from left: Brandon Cheung, Sky Lam, Ching-Ho Lam, Ken Hilton, Elly Cheng. Front: William Ha. Not in picture is Teacher-in-charge, Laurence Cheuk.

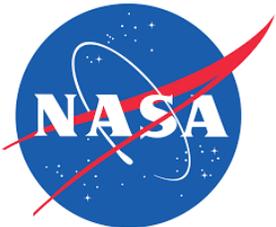
Buzz Robotics: A Use Case

Buzz Robotics is building a robot that cuts men's hair, starting with beard trims. Our aim is to deliver a superior experience at a cheaper price in a shorter time. We currently are building a prototype and seeking to raise a fundraising round in the early fall. Buzz Robotics is based in Oakland, Calif., and led by founder [Manish Sinha](#).

Manish and James Newton met face to face at Maker Faire Bay Area and walked through the interface. James designed the end-effector to hold the razor. Manish came to Las Vegas and worked with us in the shop. He had kind words regarding Dexter and the team. "Haddington Dynamics has been a joy to work with. Everything from picking up the arm, to learning how to use it, to follow up support-- HD has been there every step of the way. We've been very pleased with how committed they are to the success of their customers."

NASA Wants More

We reconnected with NASA's Garry Qualls at Maker Faire Bay Area and received another order from NASA for our latest Dexter HD. We also have two new FPGA projects and will be getting an introduction to the Space Manufacturing team.

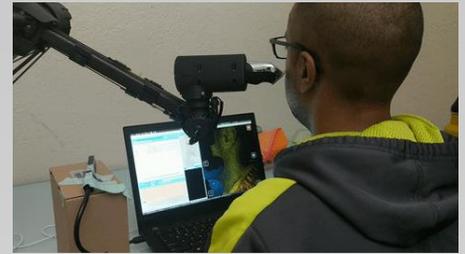


Capacity Grows

With the demand of Dexters we currently have and are forecasting with existing clients, we spent much of February and May focused on production and scale. This required the print farm automation and adding production and sales staff.

With an eye on scalability we have the head count and printers forecasted for 50/month up to 1,000/month production capabilities.

Currently, without adding any team members or equipment, we can produce eight robots a week. This includes printing, assembly and testing. Testing and break in account for the bulk of the process.



Buzz Robotics Founder Manish Sinha prototyping his beard trimming robot.



The Dexter that Manish went home with.



HADDINGTON DYNAMICS

Ode to Maker Faire

We heard the sad news that Make Media, producers of Maker Faire, has ceased operations. I, Todd Enerson, wanted to take a moment to highlight the benefit of this organization and the Faires it produced. Maker Faire had a huge impact on our company, and we at Haddington Dynamics wanted to say thank you.

Haddington Dynamics LLC launched at New York Maker Faire in October 2015. We decided that was the best place to launch in order to attract the early adopters of our disruptive technology. We offered a kit for less than \$2,000 to gauge interest. We had the capabilities to produce five kits and that is what we offered at launch. We sold out in an hour, thanks to the press we received at the Faire.

Even more impactful to our company were the folks we met. I want to highlight two of them.

Christopher Fry, an MIT research scientist, circled us on his Maker Faire guide and visited us at the booth. He regarded our technology as a solution to use technology to solve scarcity. You see his impact in our eventual Kickstarter. Fry wrote DDE and is a founder in Haddington Dynamics Inc. Also, through Fry we have James Wigglesworth, a brilliant engineer and another founder of HD Inc. Maker Faire brought us together, and when you use DDE and the robot you will know that Maker Faire created that opportunity.

Matt Cornelius was another influential presence during that first Maker Faire. Matt is the director of the HIVE at New York Institute of Technology (NYIT). Matt was hugely important in getting Dexter technology into NYIT. The introductions he made to other faculty there, such as Christian Pongratz, Dean of Interdisciplinary Studies, and Aleksandr Vasilyev, MD, PhD, in their medical school. Matt advises us on other opportunities on the East Coast and is an asset to HD's growth. NYIT's adoption of Dexter with classes and a club has brought Dexter to many students and also a variety of use cases. If you're a student using a Dexter in New York, Maker Faire created that opportunity.

Haddington Dynamics attended the big shows – MFBA and MFNY. We also got involved in the San Diego show and the one held in North County (San Diego). This brings us to another gift provided by Maker Faire: James Newton. James is responsible for our outreach in the Open Source community. If you visit our Github and wiki, know that Maker Faire created that opportunity too.

It wasn't just employees or advisors that Maker Faire brought to our company. It was also clients and partners. One of those, NASA, is mentioned in this newsletter. We met Garry Qualls at MFBA 2017. He loved the robot, came out for a Makecation and bought robots. That relationship continues. If our robots end up in space, know that Maker Faire created that opportunity.

With its impact on our company and community, it is easy to see why we are sad. We wanted to give a huge thank you to Dale Dougherty and the entire staff at Make Media. You created a wonderful vehicle for our business. It is our hope that Maker Faire will continue in some capacity. Your influence lives on in the opportunities you created for us and many, many others.



A few shots from our booth at Maker Faire Bay Area 2019



A group photo from the end of MFBA 2019.

**Back: Todd Enerson, Noah Farrar,
Mike Phillips**

**Front: James Wigglesworth, James
Newton, Kent Gilson**