



Bloom Automation improved its trimming robot's accuracy by introducing a mathematical model that takes an input – in this case, images of cannabis – and uses learned clues to identify parts of the plant.
 Photo courtesy of Bloom Automation

The Robots are Coming

Hurdles in funding and technology haven't stopped a Massachusetts robotics company from testing an automated cannabis trimming solution

By Joey Peña

Bloom Automation, a Massachusetts robotics startup, is bringing decades of experience in military and agricultural robotics and autonomous navigation to cannabis cultivators and processors.

Through research on cannabis operations, Bloom Automation's founder and CEO, John Gowa, discovered that cultivators largely trim cannabis manually or semi-manually, with some trimmers using motorized handheld

devices or machines. In those cases, the tools used were no more sophisticated than scissors, Gowa said.

He also discovered an "unbelievable amount of turnover" in processing facilities, and Gowa said that trimming cannabis manually can be stressful on workers' joints.

That – in addition to rising labor costs and falling prices for wholesale cannabis – contributes to the demand for automated trimming solutions,

he said. There's a need for a machine that doesn't use brute force or mangle the product it's trimming, he added.

Enter Bloom Automation's robot

"At the core, we believe ... robots can help bring a higher quality of cannabis to patients and consumers," Gowa said. "And that robots and automation will allow cultivators to produce this consistently and with greater availability."

But it hasn't been smooth sailing for the company. In its quest to make its trimming robot commercially available, Bloom Automation has encountered challenges in funding and technology.

Gowa shared Bloom Automation's strategies for navigating those hurdles.

Funding is an Issue

Raising money hasn't come quickly or easily, Gowa said.

"That's something I think the majority of cannabis entrepreneurs will be facing or are already facing," he said.

After hitting a high in the second and third quarters of 2015, funding and deals for robotics startups slowed

in 2016, and at a recent exhibition in Massachusetts, Bloom Automation was the only robotics company offering automated solutions for the cannabis industry. Investors outside the industry have a lot of questions about the cannabis sector and its regulations, Gowa said, and they can be hesitant to invest.

Bloom Automation had raised nearly \$1 million in seed and preseed funding as of June, and the company is planning a Series A funding round later this year. Bloom Automation recently started courting firms outside the marijuana industry, and all its funding as of June had come from cannabis investors.

The company's late 2016 participation in an Arcview Group investor forum – a gathering of cannabis investors, industry leaders and emerging business owners – jump-started its fundraising by introducing Gowa's team to investors interested in the cannabis industry.

It's important to understand that the cannabis sector is a serious industry with serious investors, Gowa said.

Be prepared to share your business plans, financial projections and a certificate of incorporation with potential investors, Gowa said. Letters of intent to buy your product or purchase orders from clients are good to show investors, too, he said. They demonstrate traction for your product.

"From our experience, investors in this industry are sophisticated," Gowa said. "They take the time to do their due diligence. Typically, they're investors in other industries, and they're not changing their practices. They're new to the cannabis industry but not new to investing, so you don't see funds being thrown around."

Potential investors who don't invest upfront can provide valuable advice, Gowa said, even if they don't write you a check right away. Be willing to run new models of sales projections



Jon Gowa is the founder and CEO of Bloom Automation, a Massachusetts-based robotics startup that is beta testing an automated cannabis-trimming robot.
Photo courtesy of Bloom Automation

EXECUTIVE SUMMARY

Bloom Automation, a Massachusetts robotics startup, is testing an advanced robot that has shown the ability to trim leaves from cannabis flower with 97% accuracy. But bringing the product to the commercial market isn't without its challenges. Funding and technology have been hurdles for the company, but CEO and founder John Gowa offered tips for navigating both:

- Participate in investor forums by The Arcview Group and be prepared to share with potential investors your business plan, financial projections, a certificate of incorporation and purchase orders or letters of intent to buy your product.
- Listen to potential investors who don't invest upfront; they can provide valuable information that helps you adjust your pitch.
- Partner with cannabis cultivators and processors to better understand operations; leverage their expertise to improve your technology.
- Evaluate whether a seed-stage cannabis accelerator can provide the necessary networking, mentorship, education and funding opportunities to jump-start your ideas into more formal, fundable businesses.

or adjust market size and the size of market opportunities in your pitch based on the investors' feedback. It fosters relationships with those investors, who may be more willing to open their checkbooks later.

"Sometimes we present our models or projections, and investors disagree and propose alternatives," Gowa said. "Listening and responding or adjusting as necessary is vital to maintaining the most accurate and reasonable projections."

Technology a Challenge

Technology in cannabis cultivation and processing is in its early stages or nonexistent, which makes it difficult to identify immediate solutions to challenges, Gowa said.

"We're working with a plant that no one has studied from a machine-vision or computer-vision aspect," he said. "The robot in the proof of concept was somewhat rudimentary, to say the least."

The first iteration was a three-axis robot commonly used by hobbyist carpenters and metal workers. Gowa's team mounted a handheld, commercially available electronic cannabis trimmer and a high-resolution camera to it. Its algorithm was based on just 100-300 images of cannabis, so in its

first tests, it could accurately distinguish flower from leaves only 50% of the time. That led to a "horrifying" amount of lost flower, Gowa said.

Bloom Automation improved the robot's accuracy by introducing a convolutional neural network to the newest beta model and using more than 5,000 images of cannabis to improve the beta machine's algorithm. A neural network is a mathematical model that works similarly to neurons in the brain. It takes an input – in this case, images of cannabis – and uses learned clues to identify parts of the plant.

Bloom Automation's team marked each image of cannabis with flower in one color and sugar leaf in another color. Then, they loaded the original image and the marked image into the machine for training. The more images they collected, the more often the computer correctly determined what was labeled flower.

Typically, automation utilizes more conventional "machine vision," Gowa said, which does a good job recognizing known shapes, such as squares, circles, patterns, letters and numbers. For image recognition in agriculture, which isn't always uniform, more sophisticated techniques, including artificial intelligence and machine learning, are needed, he said.

Forming Partnerships

Relationships with cannabis cultivators and processors have been critical to advancing Bloom Automation's technology.

"A big challenge we faced entering the industry was getting exposed to operations," Gowa said.

His initial research about cultivation operations was done online, and he used what he learned to reach out to licensed cultivators in California and Massachusetts. Now,

Bloom Automation works with its licensed partners to test its product and gather images of various strains of cannabis, which continuously improves the robot's algorithm.

The result of the improvements – and Gowa's networking – is that Bloom Automation's beta model of the robot is now able to distinguish flower from leaves with 97% accuracy in plants the machine has tested, Gowa said.

"Every customer we are working with now is enormously important to the quality and accuracy of the robot," Gowa said.

"Without our partners, it would be impossible to test, evaluate and improve the robots. We've found the industry very welcoming to innovation, which has been crucial to our progress. By joining up with customers from Step One, we hope to produce a product that will integrate seamlessly with their operations." ♦

IS A SEED-STAGE ACCELERATOR A GOOD FIT FOR YOUR ANCILLARY STARTUP?

Seed-stage business accelerators and venture funds – such as Colorado's Canopy Boulder – can provide necessary networking, mentorship, education and funding opportunities to ancillary cannabis businesses that need a jump-start.

Generally, funding and services are provided in exchange for equity. In Canopy Boulder's case, it invests up to \$80,000 per team for 6%-9.5% ownership in every company.

Bloom Automation participated in Canopy Boulder's spring 2017 program with 10 other ancillary startups that ranged from web-based application developers to retail ad management software companies and geolocated cannabis social networks. Overall, Bloom Automation's experience at Canopy Boulder was extremely beneficial, according to CEO and founder

John Gowa. The ready access to market information and mentors who help participants navigate research was also critical in Bloom Automation's formative stages, Gowa said.

"It didn't hurt that the people at Canopy Boulder were so rooted in the industry that when you were looking for market information, not only was it readily available, you had individuals there to guide you through the information: what regulations meant, or what licensing categories meant in particular states," he said.

Canopy Boulder's team encouraged startups to have due diligence documents – business plans, financial projections, a certificate of incorporation and purchase orders or letters of intent from buyers – on hand to better court investors.

"An accelerator like Canopy Boulder can be immensely important to

jump-start ideas into more formal, fundable businesses," Gowa said. "It gave us the tools and the foundation to really begin to build steam, in funding and in product and market development."

However, accelerators might not be the right fit for every startup, Gowa said.

"A company that has already started to generate substantial, sustained revenue is likely beyond the stage where an accelerator can be helpful," Gowa said. "It is important to weigh the benefits of a program that is more aimed at launching businesses from an early stage ... for example, from ideation and prototyping to incorporated and producing product. We found the typical participant at Canopy was not yet a revenue-producing company."

– Joey Peña