Above: Jake Lieder & Thressa Schultz

UNIVERSITY OF MINNESOTA DULUTH STUDENTS LEARN 'HOW TO FLY' WITH MOTION CAPTURE

When the Upper Midwest Film Office approached Lisa Fitzpatrick about providing motion capture for a project that the organization was consulting on, it highlighted a problem. The Viz & MMAD (Motion + Media Across Disciplines) Lab that she runs for the University of Minnesota Duluth has a motion capture setup comprising 12 Vicon cameras and licenses for multiple Vicon software tools. Professors at the MMAD Lab had until then mostly used its Vicon system for biomechanics projects with Nexus. However, the MMAD Lab had barely explored the animation side of the system using Blade.

Lisa Fitzpatrick, Director, Viz Lab & MMAD Lab, University of Minnesota Duluth

Dan Fitzpatrick, MMAD Lab video producer, University of Minnesota Duluth

Hundreds of working-hours later, Lisa Fitzpatrick, a team of undergraduate students and MMAD Lab video producer, Dan Fitzpatrick (no relation), had produced a whimsical, partially-improvised short film about two characters playfully soaring through the air. Accompanying it was the true focus of the project, a behind-the-scenes video displaying the process of making the film and the skills that the team had developed in the process.

It was a lengthy journey, however, during which the team had to reacquire lost institutional knowledge of how to operate the university's Vicon system.

"When COVID happened, things really closed down," explains Lisa Fitzpatrick. "As we were coming back, I got this request from the Upper Midwest Film Office here in Minnesota and they asked if we could do animation and motion capture."

There was no current professor who specifically worked with the Vicon system and, over the course of the pandemic, any students who knew how to operate it had left the university and professors with biomechanics expertise had retired. Successive lockdowns meant that nobody had been able to come into the lab to learn from

information that was readily available to be able to optimize our space where we can still do everything we need," he says.

Rood highlights an interaction he had with Vicon Customer Support while he was trying to integrate third-party force plates with the lab's motion capture system. "They were able to dig up a random file that isn't even on the website. It's ancient at this point, but that's what was needed for our particular setup and it just works. That was impressive," he says.

HOW TO FLY

The demo that Rood, Schurman, Haeun Lee, Lisa Fitzpatrick and Dan Fitzpatrick ultimately put together to showcase the system was an animated short called How to Fly and the accompanying behind-the-scenes video, filmed and produced by Dan Fitzpatrick.

"We wanted to make the primary product be the behind-the-scenes video, and have the animated content be the secondary product," says Rood. "We specifically wanted to show the process rather than just the final product."

The video was carefully calibrated to make use of the Lab's capabilities while working around gaps in their knowledge or resources. Actors Thressa Schultz and Jake Lieder were brought in from the university's Theatre program to improvise an offbeat scene built around flight, with motion capture, green screen and conventional footage all shot in the same space in a three-hour shoot on February 28th, 2023.

Above: Jake Lieder & Thressa Schultz

"None of us had experience with this," says Schurman. "It was this moment of rapid creativity, doing the best we could in the moment, and it was fun! The production day went really well."

Dan Fitzpatrick agrees, "It was energizing! For years I've wanted to produce a video combining video and motion capture. I documented the process by shooting with three video cameras, then I synced the edited clips up with the animation and Blade files to create a split screen video."

The data was processed using Blade to animate characters from Adobe Mixamo in Blender for the final videos. Lee, a digital arts major, applied motion capture movements to characters.

The team spent over 470 hours prepping, rendering, animating, editing and syncing the files to produce the video, though Rood says that he believes they could do it in around half the time now that they have established a workflow.

"My biggest priority in this Lab has always been establishing standard protocols and infrastructure that will allow people to use this space ad infinitum," says Rood.

The knowledge base the team established can now be used and grown by the MMAD Lab's loose-knit

group of users. "I call it the collective brain, because both of the labs I run are like play spaces and they're very interdisciplinary, with people from art, biology, theater, computer science, communications and engineering all working together," says Lisa Fitzpatrick.

Rood speaks highly of his time working in the Lab. "Being able to go from the very theory-based stuff we learn in classrooms to a practical application while still in university has been just absolutely invaluable.

"There have been several times where in my studies in computer science I've been like, okay, I know how to use this tool. What do I use it for? So being able to identify good use cases and practical applications has been a very important skill that I've gained from this space and my interactions here," he says.

There are several potential projects in the works for the MMAD Lab. The university has plans that could see the lab used to tell stories about climate change, and it also plans to experiment with teaching applications for virtual reality to test the concept's viability.

*View How to Fly and the MMAD Lab's accompanying behind-the-scenes videos: **Here** and **here***

Brendan Rood, Student, MMAD Lab, University of Minnesota Duluth

Ethan Schurman, Student, MMAD Lab, University of Minnesota Duluth

outgoing students, leaving no-one with a working knowledge of motion capture.

"I didn't want to say, 'Oh no, we can't do that,' because I wanted to see if it was still possible, despite the loss of institutional knowledge," says Fitzpatrick. "That's where Ethan (Schurman), Brendan (Rood), Haeun (Lee) and Dan (Fitzpatrick) came in. I said, 'Let's relearn how to use this. Let's do a fun project so that we can all learn.'"

A STEEP LEARNING CURVE

Rood, who was an undergraduate studying computer science at the time, took it upon himself to learn from scratch how to run a motion capture project. "I came in knowing pretty much nothing, and had to document our entire system in enough detail that hopefully, when I'm gone, someone else can still do what they need to do in the space," he says.

The documentation and learning resources provided by Vicon proved crucial. "I found the tutorial playlist on the Vicon YouTube channel extremely useful," says Rood. "That was the main resource I used to learn the process. Also, the computer that had the system installed on it did have some old files that I was able to explore and reverse-engineer to see how they did it."

Fitzpatrick, meanwhile, cites the importance of Vicon Support in getting the lab's system up and running. "I've been blown away by how helpful the tech support staff is," she says. "Anytime we've called, they know exactly how to help us. We're very happy to work with them. There is not another company I would say this about!"

Schurman, a digital art major, who directed, animated and rigged the project, seconds Fitzpatrick's sentiment: "There was help and there was guidance and there was