TheStandard

VICON - 2018 EDITION

Biomechanics and Sport. Clinical Sciences. Film.
Gaming. Object Tracking. Virtual Reality. Broadcast.


Denver


Los Angeles


Oxford

Welcome to the 2018 edition of The Standard

Welcome to the 2018 edition of The Standard, featuring customer stories and case studies from around the world, and covering applications from all parts of the Vicon family. In this edition of The Standard, we have collected stories from the stage to the ice rink, hospitals to VFX studios, and from customers both old and new.

This magazine is about you and your work, celebrating and educating others in what you do, how and why. We are proud – proud of how you use the equipment and the way that it touches people's lives all over the world, from improving the way that a patient is treated, to the blockbuster films that we see on the big (and small) screen.

Before we dive in, if you would like to have your story or case study featured in the next edition of The Standard, please drop us a line at marketing@vicon.com.

We hope you enjoy reading this as much as we enjoyed putting it together.

Phil & Elicia

Auburn Uses Vicon Mocap to Stop ACL Tears Before They Happen

For competitive athletes, an injury is almost a given at some point. If the athlete is lucky, the injury will be minor and the recovery time will be short. But for some, serious injuries are the beginning of a lengthy rehabilitation cycle, or even the end of a promising career. But what if it didn't have to be like that? What if athletes were able to test themselves in order to better understand their individual risks, and prevent injuries from happening in the first place?

An ambitious new study at Auburn University hopes to turn this idea into reality by identifying the root causes of ACL tears, one of the most common and serious injuries that athletes face.

From there, it hopes to create a training routine that will specifically act to lower those risks. By tracking current collegiate athletes throughout their college careers, Auburn is working to create a method that offers healthy, incoming athletes an ACL risk assessment before they even step on the court or field. With this information, trainers could prepare supplemental workout regimens tailored to individual athletes. This might include additional weight and flexibility training, or even retraining the athlete to avoid making certain movements. From Auburn's point of view, the more predisposed you are, the more you need to train away the risks.

Working out of the Auburn University Biomechanical Engineering Lab (AUBE), Dr. Michael Zabala, an assistant professor in mechanical engineering, started this process by looking at the root causes involved with ACL injuries, specifically in female athletes involved with soccer and basketball. Each year as many as 200,000 athletes at all levels from recreational to professional suffer ACL tears. Statistically, female athletes are far more likely to have ACL problems – in soccer, three to five times as likely; in basketball, two to seven times.

In order to create a risk assessment for athletes, Dr. Zabala and his team first need to isolate and identify the warning signs. The study currently involves 15 female soccer and basketball players, and that number is expected to grow over time. As part of the study, each athlete annually records a series of movements using high-speed optical cameras designed for motion capture. The goal is to be able to record them while healthy, to create a baseline. If they happen to suffer an ACL tear, they'll undergo a second set of motion capture recordings after they have recovered and returned to their sport.

By comparing the movements of those athletes that went through rehab alongside their baseline scans – along with the movements of those that played their entire collegiate career without an ACL injury – the team hopes to be able to predict future injuries in incoming athletes based on the way they move and how their knee is naturally aligned. To do this, the team at Auburn needed cameras capable of capturing the most intricate and exacting details of athletic movement. This led Dr. Zabala to Vicon.

"We're trying to do this all inclusive analysis for multiple avenues to try and really wrap our minds around why this is happening, why someone's at risk."

To gather the data, Dr. Zabala and the AUBE lab created an enclosed test area measuring 30 feet by 32 feet, lined with 10 Vantage V5 cameras surrounding the interior of the enclosure. Seven of the cameras are anchored at a height of eight feet, while the other three are positioned at waist level, giving a complete field of coverage and multiple angles for each movement. At the start of their season, athletes enter and engage in around 30 exercises that require them to run, cut, do box jumps, engage in balance tests and more, while the cameras track each knee and record the most exact details possible.

One of the reasons Dr. Zabala selected Vicon cameras was that the high-speed motion capture cameras helped to cut down any drift associated with the movement calculations, a problem familiar to most sports researchers who frequently use more portable, but less exact inertial sensors. The lab also uses two force plates as well, to record impact data along with the movements.

Although ACL tears do occur when contact is involved, the majority happen through non-contact movements, like suddenly changing speeds and coming down from a jump at just the wrong angle. These injuries can happen in a game, in practice, or even walking down the stairs. There is very little margin between an athlete cutting left to right and going on to score a goal, and someone cutting right to left and spending the next six months to a year recovering. Precision matters, which is why the lab selected Vicon.

"We're trying to do this all-inclusive analysis for multiple avenues to try and really wrap our minds around why this is happening, why someone's at risk," said Dr. Zabala. "The reality is that there are probably a lot of different factors that put someone at risk, but if we can understand as many of those as possible, and then ultimately relate those back to the actual injury, then we can start to look at determining who is at greater risk. From there we can look at how to prevent it happening in the first place."

Dr. Zabala's study will require several years' worth of data before it can begin to move on to offer a true risk assessment, but there may soon come a day when one of the most common and devastating injuries that an athlete can face becomes a minor concern.

"The reality is that there are probably a lot of different factors that put someone at risk, but if we can understand as many of those as possible, and then ultimately relate those back to the actual injury, then we can start to look at determining who is at greater risk. From there we can look at how to prevent it happening in the first place."

Georgia Tech Helps to Bring Robotics to the Masses

Despite seeping into nearly every industry around the world, the field of robotics has a major problem: accessibility.

There are countless theories on how robots might be used to benefit humanity, but robotics is an expensive field, mostly controlled by private organizations and well established academic labs with the funds to indulge their experimentation. It's simply inaccessible to most. That's where Georgia Tech's Robotarium comes in.

Housed in the Van Leer Building in Atlanta's Georgia Tech campus, the Robotarium is an attempt to democratize the study of robotics, specifically swarm robotics. It offers a platform where academics and amateurs, students and hobbyists, or anyone that wants to move beyond simulations in order to test theories using physical robots, can do so at no cost. It's able to offer this thanks to generous grants, dozens of small, remotely controlled robots and a series of eight high-speed Vicon Vantage cameras, capable of tracking several fast-moving objects at once with precision.

Swarm robotics is particularly appealing to researchers, as it turns a group of robots into a collective entity that obeys simple instructions while performing multiple tasks in parallel. Its very nature allows for an inherent redundancy, as single (or several) individual robots can fail and the group can still complete the task. Multiple robots can also search an area more quickly and with higher resolution than a single robot.

One day, this capability could aid in diverse situations, from disaster relief and personal defense to construction in inhospitable locations: basically, in any situation where robots would be more effective than humans. But unfortunately, there has been a fundamental bottleneck when it comes to resources and accessibility.

The Robotarium is the brainchild of roboticist Magnus Egerstedt, a professor at Georgia Tech's School of Electrical and Computer Science, who realized that advances in swarm robotics were being stunted by a lack of accessibility. Swarm robotics testbeds are rare and almost always private, so Egerstedt set about creating a communal platform with funding from the National Science Foundation and the Office of Naval Research.

The prototype Robotarium used up to 20 custom-built robots in an area roughly 4.2 feet by 3 feet, with a standard camera tracking system overhead. Over the last year, the project has grown in size and scope, and now features up to 50 robots in the swarm. Ongoing improvements will expand that number even further to 100 robots – including fast-moving quadcopters. This led to an upgrade to Vicon's IR-based motion tracking system.

Vicon's IR-based motion tracking system was designed to work with high numbers of objects, fast moving and otherwise. On top of a live stream for users to watch, the cameras provide precise position and orientation data information. With dozens of small robots moving at once, standard cameras cannot accurately track each movement, making the data less useful to high-end research.

"We're sending data back for world class research. We can't send our users back stuff that is not precise," said Dr. Sean Wilson, director of operations at the Robotarium. "The sub-millimeter precision of Vicon is imperative. The ability to separate different robots from one another just by the patterns of balls that we basically just stuck onto the robots is incredibly useful. It makes tracking so much more streamlined."

The Robotarium is open to anyone who wants to use it for academic or hobby purposes – the team is considering ways to allow commercial research without those groups dominating all the available time. Users can design an algorithm to control the robotic swarm, using the Robotarium's software, or they can import their own. After a project has been approved (which involves a simple check to ensure the purpose of the test is legitimate and won't harm the robots), users enter a queue and wait their turn. During their turn, users have around 10 minutes to control the robotic swarm within a 12 feet by 14 feet arena. Once the experiment is complete, the robots deactivate just long enough to recharge their 20-minute batteries through inductive charging coils in the floor, before they are reassigned to a new user.

The Robotarium currently has around 300 users from all walks of life, including groups from Stanford, Arizona State and even the Girl Scouts of America, who are using the Robotarium to get girls interested in science, technology, engineering and math (STEM) programs. As user numbers grow, so too does the demand on the Robotarium's equipment. But rather than seeing that as a limitation, the team at the Robotarium take it as a challenge.

"We are excited because as our user base continues to grow and we introduce more and more robots, I think we're going to push the limits of Vicon," said Dr. Wilson. "This is new ground for us, and we intend to push the Vicon system to the limit to see just how many objects the software can track at once. It's going to be exciting."

5 minutes with Brian Mitchell

Managing director at Audiomotion Studios.

Tell us a little about Audiomotion

Audiomotion is a VFX facility that specializes in motion capture and provides character animation for video games, VR, film and TV. The company was established in 1997 and is based just outside of Oxford in the U.K. Our facility is equipped with three stages, which are all kitted out with the latest Vicon Vantage V16 motion capture cameras. Audiomotion has worked on many AAA game titles and feature films, such as Gladiator, World War Z, Maleficent and Miss Peregrine's Home for Peculiar Children. For film series like Narnia and Harry Potter, we've provided the movement for the centaurs, minotaurs, fauns and elves you see on screen.

We've had the good fortune to work with some brilliant clients, directors, actors and sports stars over the years. Some of the more well-known being Steven Spielberg, John Boyega, Andy Serkis and Liam Neeson.

We've also worked with musicians like the Black Eyed Peas, will.i.am and Take That, as well as travelling to various locations to capture sportsmen like Cristiano Ronaldo, Lionel Messi, Harry Kane and Rory McIlroy. We've even managed to squeeze a full F1 pit crew into the studio. Although not every day includes a star-studded cast, we've also had some more unusual requests, and chariots pulled by horses, dogs and cats have all been captured too.

What made you set up Audiomotion?

Audiomotion was originally set up to supply both audio and motion captured animation to a small group of game developers who saw the potential of the technology. Little did they know how it would evolve into what we see today.

Vicon cameras have been installed at Audiomotion since its very beginning. What sets them apart from other motion capture systems on the market?

We have worked with several generations of Vicon cameras and software over the years, and have seen the progression and innovation delivered by Vicon. We review the market and test other suppliers when we upgrade the studio, and we have always found Vicon to be the most accurate and reliable product available on the market at the time.

This year marks 20 years of Audiomotion – congrats! What's the key to your success?

The key to our success is down to the knowledge, experience and the understanding we have gained over time, along with our skilled team. Our relaxed, yet professional approach allows us to integrate creative arts and performance with some very precise technology. Our focus is to provide actors the freedom they need, while we capture every nuance of their performance.

How has motion capture changed over the last decade and how have you responded to those changes?

One of the biggest changes has been the ability to live stream actors' performances directly into game engines. This means we can broadcast the performance in real time for the directors, allowing them to walk around the virtual world, seeing the actor as the CG character in real time. Actors can see themselves as the CG character within the virtual environment like a mirror, which enables them to develop their performance and truly bring the character to life.

What upcoming Audiomotion projects are you most excited about?

We have two major feature films coming out in the next six months, but as always, we're not able to talk about them just yet. Both will be a high point for the company and crew. We'll have the popcorn at the ready!

Vicon helps Ninja Theory battle for independence with Hellblade: Senua's Sacrifice

As the developer of triple AAA games such as Heavenly Sword, DmC: Devil May Cry and Enslaved: Odyssey to the West, Ninja Theory has been a pioneer of performance capture from the beginning.

After 15 successful years of working with big publishers like Sony, Bandai Namco and Capcom, the company made the creative and business decision that its next game would be their first independent, self-published title.

The result was Hellblade: Senua's Sacrifice, a gripping action drama that takes performance capture and the single player action-adventure genre to a new level, without the budget of a major publisher behind it.

"The ethos of Hellblade is that we wanted to make a game with creative freedom, but obviously to create a game independently, we had to self-fund it," said Dominic Matthews, commercial director of Ninja Theory. "Previously we've had teams of 80 to 100 people working on our games. We've had the budget to fly out to LA or New Zealand and do a big shoot in a big studio, capture performances and then process all of that data into game. But doing that is incredibly expensive.

"The aim was always to create a Ninja Theory game, a game that really embodies what we're all about," Matthews continued. "Included in that is bringing characters to life, with performance capture underpinning it. But our budget just simply wouldn't allow us to go abroad to shoot these things, or even to shoot it in a UK studio. It just wouldn't have been possible."

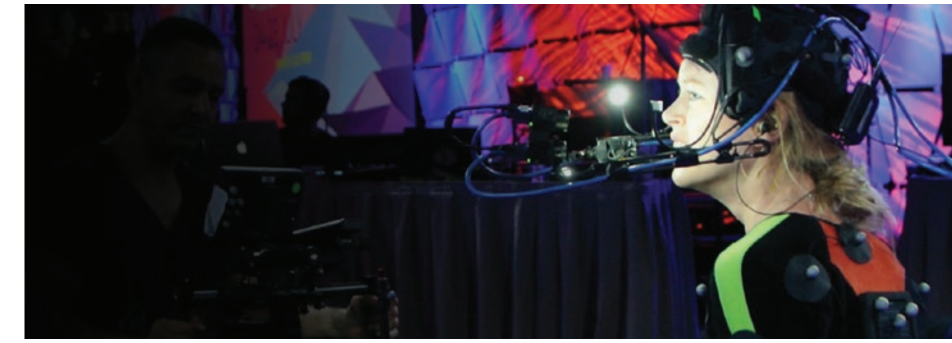
Custom-built capture

High-quality performance capture was incredibly important to Ninja Theory's plans for Hellblade. "That's when we reached out to Vicon," says Matthews. "We explained our situation and said, it's a small budget and we want to try to create an in-house mocap studio. The response from Vicon was 'great, we would love to help you in doing that.'"

Vicon worked with Ninja Theory to create a studio using a dozen Bonita cameras. "The Vicon guys helped us set up and were on hand to support us," explains Matthews. "But it was relatively straightforward: just get the cameras out of the box, get them set up, calibrate them, and take it for a spin."

"In the spirit of our DIY nature of putting this together, the cameras are attached to wardrobe poles from IKEA, while all the lighting that we have in our mocap space is actually ceiling tile lights from Amazon," he adds. "We've managed to put together an entire mocap space for an absolute fraction of the cost of flying out somewhere – or the equivalent of what it would cost for four or five days in a UK studio."

Ninja Theory's headquarters in Cambridge, England can't draw upon a resource like a studio space. Instead it has one large boardroom.



"We had to convince people internally that we could use it for two purposes," said Matthews. "We could shoot all of our cinematic scenes there, but still use it as a meeting room. But honestly, over time it's just turned into a full-on mocap space! With the help of Vicon, we've been able to not only save a lot on costs, but also give ourselves the flexibility to be able to go into our own boardroom and shoot whenever we like."

No frills, but plenty of thrills

Once it was up and running, the development team – 20 people rather than the hundreds usually found on a typical AAA game – were able to explore the potential of on-site performance capture. "Normally we would have a four-week shoot, and we'd need to do everything in that time," says Matthews. "But we dotted shooting both the cinematic and in-game animations throughout the entire project."

Vicon's Blade software was used for capturing the motion, as well as initial tidying up and processing, relabelling and filling the data where needed. The pipeline moved into Autodesk MotionBuilder to construct the scenes, get them in the right location and do a first pass on polishing. Following that, Autodesk Maya was used to bring in the facial animation and carry out a final polishing. Audio also got involved at this stage, with Maya renders as reference. This was all exported into Unreal Engine to get it triggered in-game, followed by adding lighting and effects.

The game is full of customized animations of specific situations and character motions, developed to replace the typical in-game HUD that shows health indicators.

"When Senua is injured, we wanted the players to understand that through the way she looks and moves," said Matthews. "So we captured all of that. Our animators were able to use the Vicon rig to capture different movements, for instance one day we concentrated on an injured walk and got an actress to try out some walk cycles. That just wouldn't have been possible if we weren't in house. We had the flexibility to try things out. We would shoot something in the morning, and it would be in game by the afternoon."

Even the actress used for Senua was in-house – Ninja Theory found that video editor, Melina Juergens, was excellent at playing the role.

"So not only did we have the studio on hand 24/7, but we also had our actress in five days a week," laughs Matthews. "She could take a break from making our trailers and development diaries, to try out different movements or scenes. We might say to Melina 'in this scene, there are flames all around you, and you need to be coughing because of the smoke'. We had that ultimate flexibility to capture whenever we wanted, and to try things out."

There is a section in the game where Senua is moving through waist-high water, and she's having to move hanging bodies out of the way. "We ended up hanging all of our shoes from the ceiling so we could capture her wading through moving objects," says Matthews. "You wouldn't be able to do that easily in a mocap suit, and if you did, it would be very expensive."

Other very subtle animations were created – things like Senua's breathing, or having just a little bit of a limp, or tiredness in her walk.

"The whole game is a battle and a struggle, and we wanted it to feel like that," Matthews explains. "The aim was to make players relate to and engage with Senua at a deep level, so the more realistic and nuanced we could be, the more likely a relationship would develop between player and character. A big chunk of that is down to the bespoke animation that we were able to capture."

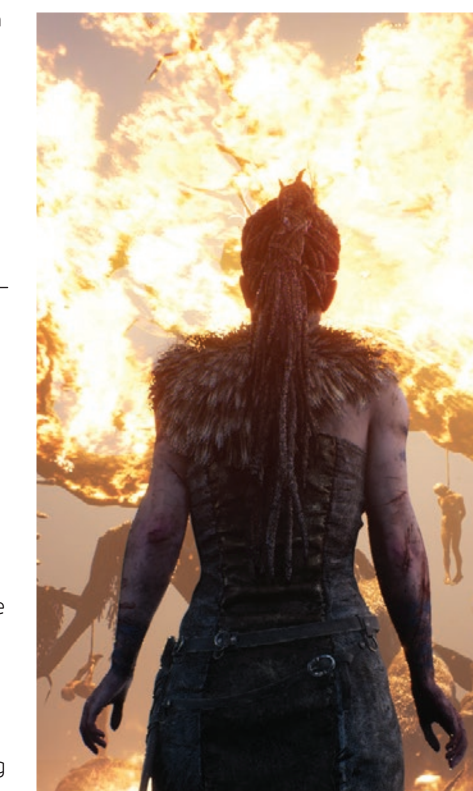
Independent thinking

Matthews claims that the quality of the data captured in the boardroom studio has been as good as, if not better than, anything that Ninja Theory has used on any of its previous projects.

"There's absolutely no compromise there," he says. "The shooting volume that we've got is certainly comparable to any of our other games – we've not had to make any compromises, but we've saved a lot of money.

"Our noble aim when we set out was, if we can make Hellblade work as an independent AAA model, it could prove something to the industry. Not only can we continue to make the games we want to make, that our fans want us to make, and make them successful, but other developers who find themselves in a similar situation to us can also do so. And players will get more diversity and creativity in their games too."

Behind the Scenes: Hellblade Shoot Setup
https://youtu.be/lkgclsSGmgc



Vicon & IMU

The last 12 months have been transformational for Auckland, New Zealand, headquartered IMeasureU (IMU).

by Matt Clarke, former IMeasureU CEO & now Business Development Director, Vicon

After a successful capital raising in late 2016, we started looking for distribution partners in the biomechanics research, clinical and sports science markets who could leverage our technology into their existing customer base and help us execute on our ambitions to build a global sensor and software business.

It was during these exploratory distribution conversations that acquisition of IMeasureU became a possible outcome. Many of IMU's clients (all early adopters of inertial sensors for field-based biomechanics research) were and are motion capture users, and use their Vicon systems as the ground truth from which to compare their IMU data. This, coupled with Vicon CEO Imogen Moorhouse's vision to bridge the gap between the lab and the field, plus her long-standing relationship with IMeasureU Chief Scientist and Co-founder Dr Thor Besier, quickly enabled trusted and open lines of communications between our two organizations.

The IMU and Vicon teams were excited and proud to announce Vicon's acquisition of IMeasureU in July 2017. The respective company synergies in the biomechanics research market, both Vicon and IMU's traditional core businesses, are clear. Customers will save huge amounts of time and money when conducting their research, via simple and seamless data synchronization of their indoor motion capture system and outdoor inertial system. Vicon has the enviable reputation as the gold standard in motion capture globally, and native integration of indoor and outdoor data capture will serve only to enhance this. Besides bridging the gap between the lab and the field, another key tenet of the acquisition is Vicon and IMU's combined ability to bridge the gap between biomechanics researchers and athletes. It has never ceased to amaze me that universities with some of the smartest scientists and greatest young athletes in the world do not connect the dots between those two cohorts.

"Being able to measure and monitor the impact loads of every step during training and competition provides an unprecedented ability to understand and act upon an individual players load profile."

Coaches have long recognized the high performance and injury prevention value in movement efficiency and training load optimization, but have been constrained by the limitations of technology in getting accurate, actionable insights from the field that still allow athletes to move in their natural unencumbered environment. Conversely, biomechanics researchers have long known that their expertise could add value to athletics programs. IMU, backed by Vicon and powered by research, will deliver sport coaches, physical therapists, strength and conditioning coaches and athletes precise, applied, actionable insights that improve performance and reduce the risk of injury.

The first example of this is IMU Step, which consists of two high frequency, synchronized sensors on each ankle, which collect data on each step that an athlete takes. That step data is then analyzed via scientifically validated algorithms in the cloud and presented back to athletes and coaches as actionable insights via mobile/desktop/web apps. The IMU Step solution was built to help running-based sports like basketball, cross country, field hockey and American football to better manage lower limb load and reduce injury risk.

"Being able to measure and monitor the impact loads of every step during training and competition provides an unprecedented ability to understand and act upon an individual player's load profile," said Dr. Thor Besier, IMU Chief Scientist and founder of the Human Performance Lab at Stanford University. "Putting these data into the context of bone tissue adaptation then provides the athlete, coach, trainer and support staff with the information they need to make an informed decision to optimize training workload and return-to-play scenarios.

IMU Step will bring about new understanding of injury biomechanics as we move outside the lab and obtain accurate measurements in the real world. As my colleague, Irene Davis at Harvard University says, 'This is biomechanics in the wild!'."

Dr. Besier, along with IMU co-founder and head of development, Mark Finch, leads Vicon's inertial research and development function in Auckland. Thor and Mark, who met at the Auckland Bioengineering Institute and Auckland University, retain strong links with academia.

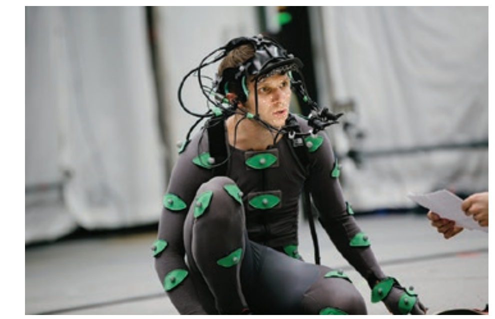
It's via these links that Vicon and IMU will stay on the leading edge of wearable biotechnology, for example, the machine learning work we are doing with the U.S. and Australian military to automatically identify and characterize different activities and movements in military, sport, and clinical settings.

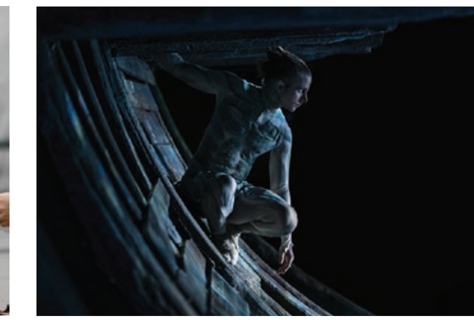
With IMU Step and IMU/Vicon data sync due for release early 2018, and a whole bunch of other research, sport science and clinical applications in the pipeline, I'm genuinely excited about what lies ahead for Vicon and IMU customers in 2018 and beyond.

"IMU Step will bring about new understanding of injury biomechanics as we move outside the lab and obtain accurate measurements in the real world."

Vicon helps the Royal Shakespeare Company bring The Tempest to life

Based in Stratford-upon-Avon, the Royal Shakespeare Company is one of the world's most renowned theater companies.





Known for performing the works of Shakespeare and his contemporaries, the organization puts on around 20 productions a year, regularly tours the UK and internationally, and has produced the multi-award-winning Matilda: The Musical.

Ever eager to push boundaries and bring the works of William Shakespeare to a younger audience, the theater company set about creating a ground-breaking production of The Tempest in collaboration with Intel and in association with the Imaginarium Studios, to mark the 400th anniversary of Shakespeare's death in 2016. Evoking the same magic as that of the masques of Shakespeare's day, the production stars Simon Russell Beale as Prospero and Mark Quartley as the sprite Ariel. Premiering on stage at the Royal Shakespeare Theatre in November 2016 before transferring into London in summer 2017 and being broadcast live into cinemas, the innovative production has gone down in history as the first major stage production to feature live motion capture.

Alongside their collaboration with Intel, the RSC worked closely with leading production company and Vicon customer The Imaginarium Studios, as motion capture technology featured heavily throughout the performance, allowing the production team to create digital characters live on stage. In order to seamlessly combine classical theater with contemporary technology, Vicon's optical camera system was used to track the whereabouts of moving objects on stage – some of which were held by the actors themselves.

'The biggest challenge for us was making sure that the worlds integrated correctly, as this theatrical production of The Tempest included technology which had never been used on stage. By bringing in the expertise of Vicon and the use of their motion capture cameras, the performance was further enhanced and greatly added to the audiences' experience.' said Ben Lumsden, then Head of Studio at The Imaginarium Studio.

Opening in Stratford-upon-Avon

Using Vicon's cameras and object-tracking software, Tracker, members of the Royal Shakespeare Company were able to capture and track various objects, such as the tambours, on stage. It also allowed them to monitor the position of screens used to project virtual characters like Ariel. This meant that the production team could automate the projection of animated visual elements onto the moving objects on stage to provide the audience with a Pepper's ghost effect. With precision tracking capabilities, the Vicon system maximized the impact of this illusory experience. Tracker data also enabled the augmented reality aspects of the production and allowed imagery to be projected onto screens in real time.

"Certainly, the RSC haven't done anything like this before and to my knowledge it has never been done to this scale or this ambition on the stage," says Pete Griffin, production manager at the RSC. "I think for me the most exciting bit was being able to apply cutting-edge technology to a live environment."

The set-up was complex and required a bespoke software solution, which saw a collaboration between Vicon and d3 technologies to develop a new pipeline. Using the data generated by Tracker, the team was able to drive d3's software using the PosiStageNet protocol – an industry standard that is used to drive interactive effects and lighting on stage.
The d3 system with Vicon integration "performed robustly and reliably for the whole run in Stratford – 82 performances, which although expected from my point of view, is still pretty impressive, given how hard we were pushing the tech, " Griffin reports.

Taking a final bow at the Barbican

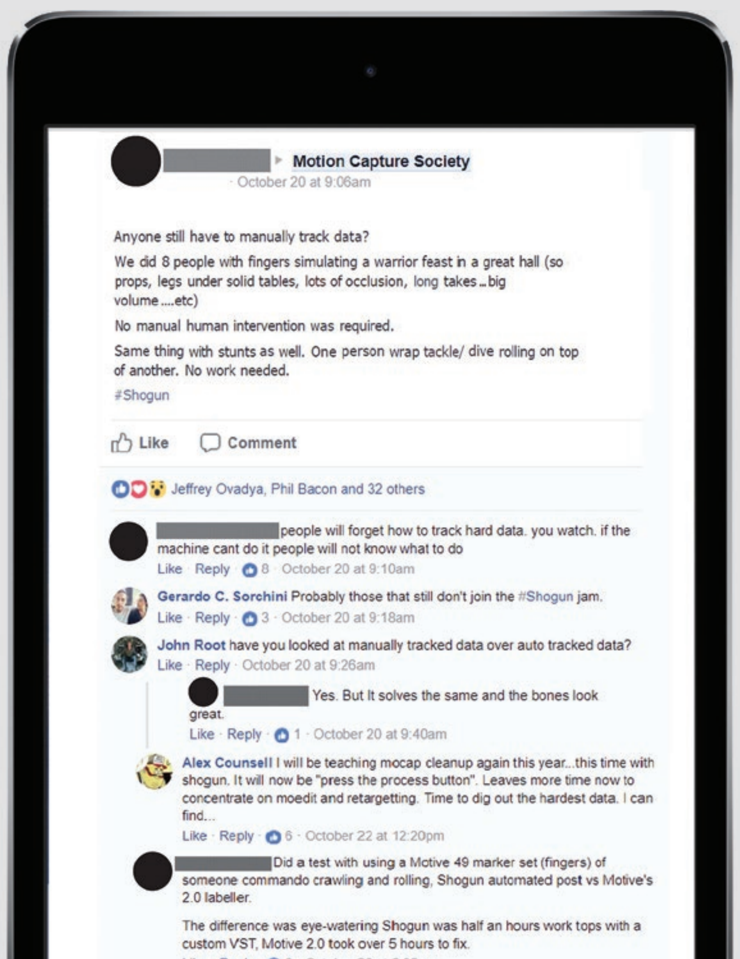
With a long-standing relationship with one of London's most iconic theaters, it was only right that the cast of The Tempest took their final bow at the Barbican. As the Barbican stage is larger and wider (proscenium arch format) than that of the thrust stage of the Royal Shakespeare Theatre, this final performance required a slightly different technical set-up in order to utilize the acclaimed cutting-edge technology.

Typically, cameras would be placed farther away in order to extend the tracking area of a space. However, with limited auditorium space at the Barbican, this wasn't an option for the production team, who instead utilized Vicon's Vero cameras. As the Vero cameras have a wider field of view, it was easy for technicians to place the cameras around the stage and continue to capture the movements as they happened on stage. This afforded the team a greater level of flexibility and the capacity to efficiently track movements at a very low latency. The Vicon cameras and Tracker software ensured that the performance finished its successful run and set the stage for future use of motion capture technology in theatrical performances.

The RSC production is now available to buy on DVD (www.rsc.org.uk).

VICON Social Media Highlights

2016 - 2017


[redacted] ▸ **Motion Capture Society**
· October 20 at 9:06am

Anyone still have to manually track data?

We did 8 people with fingers simulating a warrior feast in a great hall (so props, legs under solid tables, lots of occlusion, long takes...big volume.....etc)

No manual human intervention was required.

Same thing with stunts as well. One person wrap tackle/ dive rolling on top of another. No work needed.

#Shogun

Like · Comment

Jeffrey Ovadya, Phil Bacon and 32 others

[redacted] people will forget how to track hard data. you watch. if the machine cant do it people will not know what to do
Like · Reply · 8 · October 20 at 9:10am

Gerardo C. Sorchini Probably those that still don't join the #Shogun jam.
Like · Reply · 3 · October 20 at 9:18am

John Root have you looked at manually tracked data over auto tracked data?
Like · Reply · October 20 at 9:26am

[redacted] Yes. But It solves the same and the bones look great.
Like · Reply · 1 · October 20 at 9:40am

Alex Counsell I will be teaching mocap cleanup again this year...this time with shogun. It will now be "press the process button". Leaves more time now to concentrate on moedit and retargetting. Time to dig out the hardest data. I can find...
Like · Reply · 6 · October 22 at 12:20pm

[redacted] Did a test with using a Motive 49 marker set (fingers) of someone commando crawling and rolling, Shogun automated post vs Motive's 2.0 labeller.

The difference was eye-watering Shogun was half an hours work tops with a custom VST, Motive 2.0 took over 5 hours to fix.
Like · Reply · 6 · October 22 at 2:35pm

MOOV selects Vicon to bring high-quality 3D animation to Quebec City's first motion capture studio.

Inside Boeing's Drone Laboratory:

Why you should be using Vicon Motion capture technology for drone tracking and control.

Motion Capture Society

Oshri Even Zohar ▸ **Motion Capture Society**
March 28

Shogun rocks!

Like · Comment

Jeffrey Ovadya, Phil Bacon and 26 others

Jeffrey Ovadya Thanks for the kind feedback, Oshri! Are there any specific features you find beneficial? I will happily pass them along to our development team.
Like · Reply · 1 · March 28 at 9:41am

Oshri Even Zohar I've written several reports to beta list... Basically, the robustness of maintaining good solving in places where blade gave up... (yoga with an extremely flexible performer) 🙂
Like · Reply · 4 · March 28 at 10:06am

[redacted] Its soooo much better than blade !!! its faster and handles occlusion so much better. Im running things side by side through blade and shogun and theres so much less work to do to the shogun files. shogun took 4 minutes to finish the files, blade took 6. there was 30 seconds worth of post work on shogun and about 10-15 min, in blade. (two people dancing holding hands with finger markers)
Like · Reply · 12 · March 28 at 3:02pm

[redacted] its kind of amazing. I didnt have to adjust any of the shogun parameters right out of the gate and its working flawlessly. Conversely blade just tends to explode until you dial in the settings just so.
Like · Reply · 3 · March 28 at 4:18pm

Dave Massikotte Vicon > anything else!
Like · Reply · 3 · March 28 at 8:01pm

Lululemon's New Bra Took Two Years of Research to Create.

Engineers studied the ways breasts move to craft the perfect sports bra.

Susan Mayes

S_Maysey Great work @JodieMcClelland @TheAusBallet hips captured with @Vicon today @latrobe @LaTrobeSEM

Post Magazine

post_magazine #PODCAST: New Video from @Technicolor & @Vicon looks at the #history of #MotionCapture and its #evolution into #AR/#VR: bit.ly/2ySDAdb #postproduction #VFX #VirtualReality #AugmentedReality #CG #animation #production #filmmaking

Vicon Helps Iran's Largest VFX Studio Shine

As the largest producer of games, animation and visual effects in Iran, Raymon Media Company has a reputation for providing integrated, high-quality services to game developers and filmmakers.

Located in eastern Tehran, the studio sits in the creative capital of the country, an area that is quickly becoming known for producing some of the most state-of-the-art animation throughout the Middle East. And with the VFX industry in the region expanding at an exponential pace and bringing increased competition with it, Raymon Media needed to be ahead of the curve to stay on top.

Raymon Media occupies a 4,000-square-meter facility with capacity for around 250 animators. It prides itself on identifying and supporting young creatives within the industry, and to attract and retain the rising talent throughout the area, it needed to stand out. Although animation is still a relatively new industry in Iran, Raymon Media elected to invest in up-to-date technology in order to ensure that it can offer high-quality content that rivals the best studios around the world.

"It was important for us to broaden our offering and adopt new techniques to create realistic, natural and lifelike movements, especially as we look to take on more high-profile projects in the future," said Ali Nemati, Head of the Motion Capture Studio at Raymon Media.

Before adopting a mocap system, the animators at Raymon Media created characters using computerized 3D animations. The process is effective and common throughout the VFX industry, but the team often found it challenging to create human characters that looked and moved with a high degree of realism. With the development of a game called Javanmardan in the pipeline, the company recognized that it needed to take its character animation to the next level.

Powerful Insight

Raymon Media set its sights on creating a large, 154-square-meter mocap volume. But as the team had no prior mocap experience, it was vital that they received the right advice to help them to create and maximize the best capture volume for their requirements. After looking at all the options, Raymon turned to Vicon.

"We looked at a couple of other systems as well as Vicon, but two factors really stood out to us when making that final decision," said Nemati. "First, there was a significant level of support offered to us by Vicon's local distributor ASG Co. Having a presence on the ground was very important and certainly helped during the procurement process – especially the reassurance of support once the system was installed. The second factor was the superior quality of the Vicon system and software."

Raymon Media chose Vicon Vantage cameras, investing in a 24-camera Vantage 16 system. At 16 megapixels, the Vantage is the world's most powerful mocap camera, able to deliver the high-quality data and tracking capabilities that Raymon Media needed, along with speeds of up to 120 fps. Powerful analytics and intelligent system updates also came as standard, ensuring optimum performance during capture sessions.

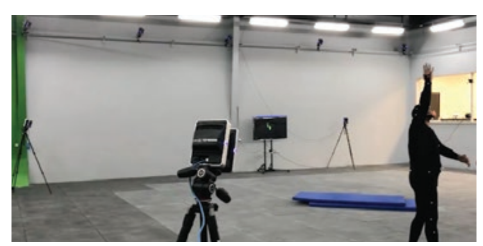
"After testing the Vantage system, it became clear just how accurate the tracking data was. Additionally, Vicon's Blade software allows us to easily create and overlay images onto CG environments," explains Nemati. "The system has provided us with high-quality results within a reasonably short amount of time."

Raymon Media's newly installed Vantage system is now the largest mocap studio in the Middle East, enabling the studio to enhance the realism of its animations and shave hours off post production.

Calibrating the Future

The studio is capable of full-performance, full-body capture of up to seven people simultaneously, giving Raymon Media a flexible and high-quality solution. The consultation process with Vicon's sole Iranian distributor ensured that the new studio fulfilled all of Raymon Media's requirements – from using the full potential of the space to providing robust and reliable data by integrating Vicon's Blade data-processing and capture tool.

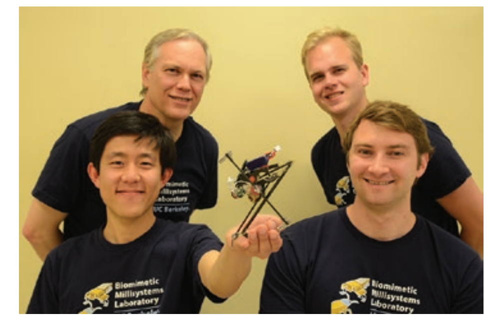
"For us, the challenge was guaranteeing a high-quality, full-performance capture rig for our studio space," Nemati adds "The Vicon team used their knowledge and expertise to design the space and deliver a system that's easy to use. They familiarized us with the whole motion capture process, teaching us how to set up the system, position and calibrate the cameras, capture the data using Vicon's Blade software, and integrate it to create a seamless pipeline with our existing CG software. It's been a great investment."



"We looked at a couple of other systems as well as Vicon, but two factors really stood out to us when making that final decision."

UC Berkeley Uses Mocap to Help Build a Pint-Sized Rescue Robot

When search and rescue workers respond to a structure that has collapsed, one of the greatest threats they face is another cave-in while seeking out survivors.



Over the years, there have been several attempts to address this, from mobile cameras to audio sensors to drones and more, but they all face severe limitations when it comes to navigating unstable wreckage.

Researchers at the University of California Berkeley's Biomimetic Millisystems Lab are currently working on a possible solution to this problem: a small, maneuverable robot inspired by a species known as Galago senegalensis - more commonly referred to as a "bushbaby."

The bushbaby is a small nocturnal primate, typically no more than 30 cm long. Their powerful legs can propel them over two meters high, due in part to the elastic energy storage found in the tendons of their lower legs. A bushbaby's legs act in a similar way to the way in which the gears in a compound bow make it possible to release an arrow with more power than arm strength alone.

Their motion in flight also allows them to remain compact and then extend their feet at the last possible second, which enables them to chain huge jumps together, one after another, off multiple surfaces.

The jumping abilities of bushbabies have been extensively recorded and documented by a host of researchers. That made the small creature ideal for the Biomimetic Millisystems team, as they considered new ways to harness features of animal movements and control strategies to improve the capabilities and performance of small robots. This led to the creation of their new project, Saltatorial Locomotion on Terrain Obstacles, or Salto for short.

Developed by roboticist Duncan Haldane, electrical engineering and computer sciences professor Ron Fearing, electrical engineering PhD student and postdoctoral scholar Justin Yim, and postdoctoral scholar Dr. Mark Plecnik, the group began work in 2015. The result is Salto, a pint-sized robot roughly the size of a smartphone, which is capable of jumping huge distances and navigating obstacles. Although still very much a prototype, it can spring up, bounce off walls, and – in theory – move through small and unstable places quickly, with relative ease.

To help develop Salto, the researchers turned to Vicon. The motion capture lab at Berkeley now consists of two Vicon MX Giganet boxes and 12 MX T40 cameras, operating alongside Nexus version 1.8.5 software, all aimed at providing highly accurate pose tracking, which is necessary for controlling Salto.

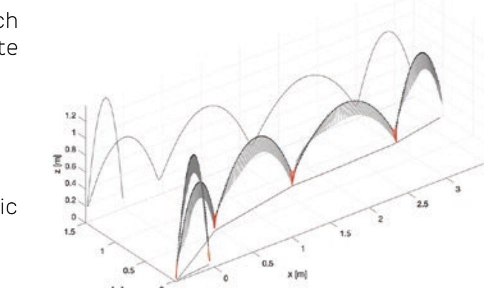
The Vicon system offers pose tracking at 100Hz over an area of roughly two meters wide by four meters long. Recorded data is then sent to a laptop running the Robot Operating System (ROS), which estimates Salto's velocity based on the pose data. It then calculates control signals and sends necessary data back to the robot over an XBee radio connection. The Vicon system replaced a set of high-speed cameras, which lacked Vicon's detail and required a separate system to process the data.

"Vicon is a very convenient way to take high-quality measurements of robot performance, and is sufficiently fast for good real-time control of our highly dynamic terrestrial robots," said Yim. "The ease and consistency of setup made it smoother to run day-to-day robot experiments."

The current version of the robot, known as Salto-1P, features a durable, but lightweight carbon fiber shell. It has a takeoff velocity of over four meters per second, and spends around 70m/s on the ground during each stance. The team controls the battery-powered robot by setting its orientation in the air, based on its location, how fast it's going, and where it will touch a solid surface. Once it lands, the optical system detects contact. The controllers then transmit a burst of energy to send it airborne again, and repeat.

Ultimately, it will be up to the end users to decide how best to use Salto, including the type of controls and cameras or observation tools with which they want to equip the robot. There is still a lot of work to be done before the little robot can be used in a real-life rescue situation. For now, the team will continue to work on precision controls, followed in the near future by onboard sensors, in the hope that one day, their little robotic bushbaby will help save lives.

"Vicon is a very convenient way to take high-quality measurements of robot performance, and is sufficiently fast for good real-time control of our highly dynamic terrestrial robots."



The Ice Hockey Research Group Braves the Ice with Vicon to Study the Effects of Hockey

For Canadians, hockey is more than just a pastime – it's a way of life. From a young age, many Canadians learn to skate. It can become as natural as walking to some, but the reality is that skating – and especially hockey – can take its toll.

Over the years, there have been several attempts to document the physical effects that skating and hockey can have on the human body. But there has always been an obvious and prohibitive obstacle: how do you conduct delicate, scientific research in the cold, on ice?

The Ice Hockey Research Group (IHRG) working out of McGill University in Montreal, Canada, found the answer to exactly that question when it turned to Vicon.

Mocap on Ice

The IHRG was created to evaluate the ergonomic and mechanical function of skates, sticks and protective equipment – in respect to performance and safety when used by people on the ice. A research partnership with Bauer Hockey Ltd. and the Natural Science and Engineering Research Council of Canada (NSERC) provides both financial and testing materials, which has led to the development of a unique graduate biomechanics program focused on how people use and react with ice hockey equipment.

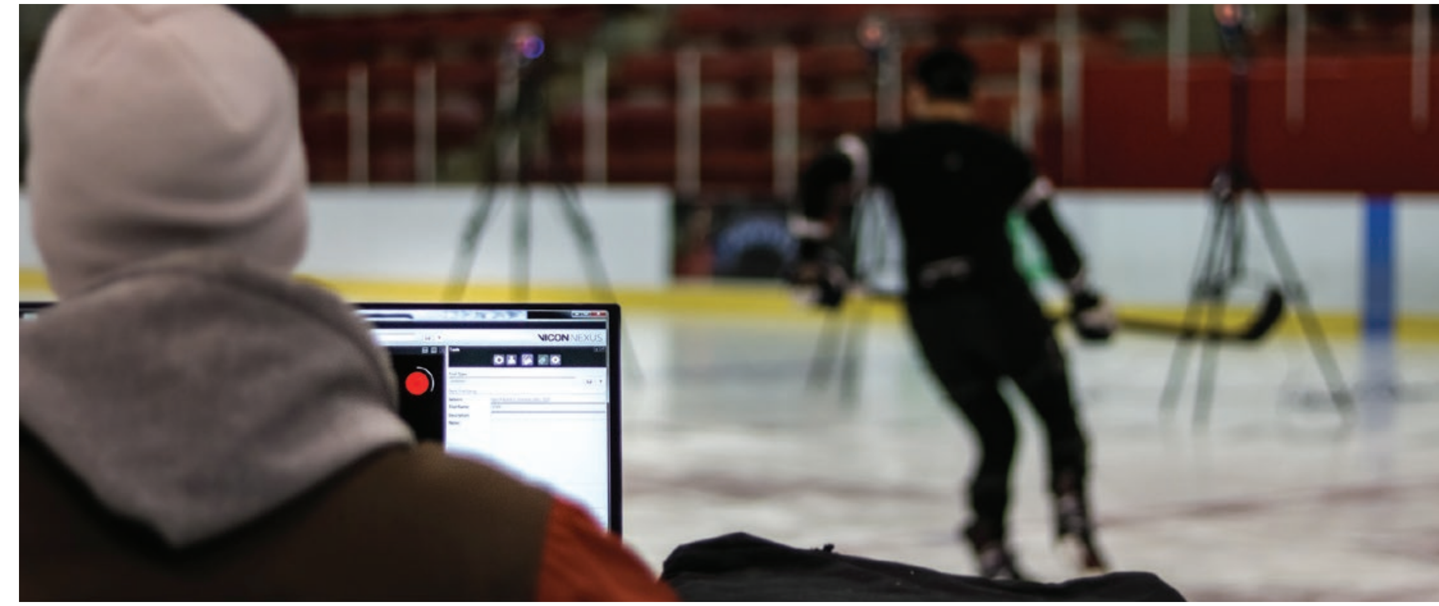
The problems with using sophisticated tools to track skaters on ice are numerous. The cold temperatures and humidity can wreak havoc on delicate equipment over time, and attempting to create a temporary, portable solution typically involves placing hazardous wires and objects directly on the ice. Previous studies have attempted to recreate the movements of a hockey player using synthetic ice or a skating treadmill, but these lacked the validation of what it is actually like on the ice. It also limited the strides of people on skates, which on ice tend be around five meters.

In 2014, Dr. David J. Pearsall, IHRG Director and Associate Professor of Kinesiology and Physical Education at McGill University, decided to risk it and try Vicon's motion capture (mocap) cameras and software, equipment that carried a reputation for durability. The IHRG team began by creating a synthetic ice rink in order to get a sense of where the cameras needed to be placed and positioned. Once they were confident of their configuration, they prepared for the real thing.

"The Vicon setup on the ice replicated the in-lab configuration on a larger scale," explains Philippe Renaud, IHRG Research Assistant. "This included extra safety measures, such as added weights to tripods for greater stability, and suspended cable bridging over the skating ice path, plus special gloves to type on the computer in the cold. It worked out really well."

The Vicon system initially consisted of T-Series cameras running Nexus software, which were placed on and around a rink. Once the team knew where everything was going, they still needed to be able to get in and out quickly. According to Pearsall, the process was similar to a pit crew team in motor racing.

"Ice time is costly," said Pearsall. "We can't leave the cameras set up permanently, so we have to set up, test and take everything down within three to four hours. Everyone knows their jobs. We've got it down to a fine art."



Hitting the Ice

The first on-ice study that the IHRG conducted compared the skating start biomechanics of male ice hockey players with different levels of skill and experience. Since then, the IHRG completed and published a second study, authored by Jaymee Shell, a masters graduate student at McGill University at the time. Shell studied the biomechanical differences between male and female players to identify potential factors that may be implicated in lower body injuries.

"As reported in prior running research, frontal plane differences between genders in hip and knee movements exist," said Shell. "We wanted to look at male and female ice hockey players and see if similar lower body kinematic differences existed or were greater."

The indoor ice rink's cold temperatures and high humidity were challenging for the cameras. There was the fear that the reflection from the ice would obscure marker tracking, but the equipment had no issues. The study represents a major achievement in 3D mocap, as the team was able to expand its range and calibrate a large 15m × 3m × 2m capture volume on the ice to record skating kinetics, with high intra-trial reliability. They did run into an issue, but the team was able to turn to Vicon application engineer John Porter, who Shell says, "saved her project."

"It wasn't the cameras' fault at all – the cameras did exactly what they had to do," she says. "But having the Vicon support through the study was really invaluable. I can't praise the support team enough for what they did. I might still be labeling my data if it weren't for them!"

Following Shell's publication, the IHRG decided to incorporate some of her methods and include female athletes in more of its studies.

Speeding Ahead

Soon after Shell completed her study, IHRG upgraded their system to include a Vantage and Vero optical camera, bringing the total number of cameras to 18. Soon after the upgrade, the IHRG expanded their studies to include puck shots, which brought with it the added risk of a puck bouncing back and hitting a camera. To compensate, target nets were placed far enough back out of the capture area to reduce the risk of any collisions.

The team later added a Bonita camera alongside the Vantage to overlay the video with stick figure motions, making it easier to communicate their findings with others. EMG and force sensors were later introduced, all synchronized through Vicon software.

"To date, we've achieved a 15-meter FOV over the ice surface," Pearsall explains. "In skating, when you're at full speed, you can do 15 meters in two strides. As well, the increased pixel count and resolution of the Vantage cameras helps maintain the resolution needed to track the full-body marker set."

The IHRG's success has also led to studies in other fields beyond hockey, including working with groups to better understand how footwear performs on snow and ice. With the help of the Vicon cameras, the team is able to collect more data than ever before, which could prove to be invaluable to people that consider the ice a second home.

"...having the Vicon support through the study was really invaluable. I can't praise the support team enough for what they did. I might still be labeling my data if it weren't for them!"

Hip Hop Heritage creates a digital afterlife for British breakdancers

Arts charity uses Vicon motion capture to preserve the signature moves of a pioneering generation of UK B-boys long after their originators have stopped spinning.

These days, some of the popping and locking may be due to ageing joints, but thanks to arts charity Hip Hop Heritage, a pivotal moment in British urban dance has been motion-captured for posterity.

The data, recorded by Vicon's mobile capture unit, and shown in the recent 'Afterlife' exhibition at Wolverhampton Art Gallery, preserves the signature moves of pioneering 1980s UK breakdancers, if not at the peaks of their careers, then at least within head-spinning distance of them.

Going beyond photography

The project was masterminded by Hip Hop Heritage founder Martin Jones: a former entertainment agent, organizer of the World Street Art Championships, and manager of breakdance crew Wolverhampton B Boys, whose members included future drum and bass pioneer, Goldie.

In 2014, Jones's photos of the 1980s UK B-boy scene became the core of a national archive, currently held at Dudley Archives and Local History Service. But when Wolverhampton B Boys member Keiado 'Kiddo' Anderson mentioned that his movement had been captured at Loughborough University, Jones began to explore mocap as an additional recording medium.

"Motion capture provides a much more detailed analysis of dance technique than video," he argues. "It gives a 360-degree view of the dancer, at low, mid and high levels, and it can be user-controlled. Video can show you a great move, like a slam or a head spin, but you can't analyze it clinically, as you can with mocap."

Recreating a dance revolution

On top of that, there simply isn't a lot of video. Aside from lone 1985 documentary Electro Rock, very little contemporary footage exists of 1980s British B-boy technique, with its unique fusion of then cutting-edge New York style and older British genres such as Northern soul and jazz fusion.

To rectify the situation, Jones turned to one of the stars of Electro Rock: former London All Star Breakers member – and in Jones's estimation, "probably the best-known breakdancer of that era" – Dolby D (David Bramothe). Along with former Kylie Minogue rapper Jazzy P (Pauline Bennett) and Yorkshire-based dancers 10 Tonn (Shane Fenton) and Sammy (Sammy Palmer), Dolby D was one of four UK breakdance pioneers recorded during a two-day shoot at Wolverhampton's Newhampton Arts Centre theater in April 2015.

The shoot, overseen by Vicon support manager Bob Dimmock, used an array of 10 Bonita B10 cameras to record the dancers' moves, resulting in over 25 usable takes per dancer, averaging 15 seconds in length. Vicon staff then processed the data in Blade, Vicon's motion-capture software, and later in Shōgun, Blade's successor.

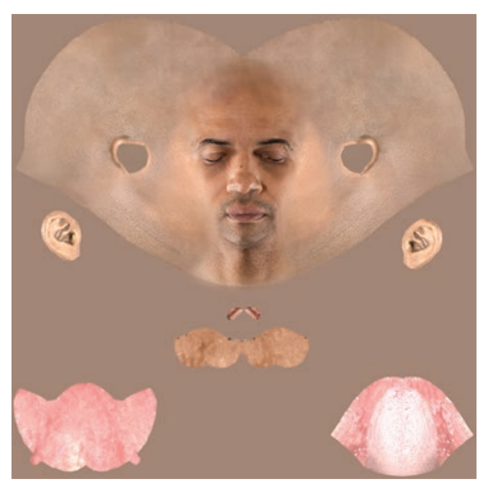
"Using Shōgun gave us a big advantage and delivered clean, usable data automatically in one pass," says Dimmock.

Bringing data to life

Meanwhile, in 2017, Martin Jones secured funding from Artsfest, the University of Wolverhampton's arts festival, to take the cleaned data a step further. Working through local producer Ben Field, Jones contracted CG artist Christian Darkin of Anachronistic to turn the live recordings into an animated digital version of Dolby D performing his signature moves.

To maintain fidelity, Darkin stuck closely to the processed data. "I was surprised at how sharp it was," he says. "What people call clean-up is often you as an artist making your guess at how the movement works. But this project wasn't just about getting something that looked good: it was about cataloguing what someone does with their arms and legs when they do a certain move."

To test the data, Darkin imported it to 3ds Max via MotionBuilder, assigning it to a basic CATRig. For the final animation, the data was retargeted to a stock Poser figure. Darkin adjusted the figure's face to match that of Dolby D, making further adjustments within ZBrush, before exporting the rigged character to 3ds Max. The facial textures are based on reference photos of the dancer, composited in Photoshop to create a diffuse map.

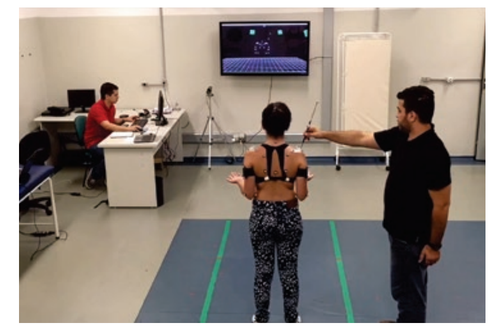


Spinning and windmilling forever

We're commemorating what [the originators of those moves] achieved as dancers. Through motion capture, we've captured their essence, and through the archive, we're giving them an afterlife so that they can carry on forever."

Expanding Possibilities: Vicon Brings New Options to Brazil's Nove de Julho University

The use of motion capture in the medical field is becoming more and more common, especially when it comes to issues related to movement.



Clinics and research groups around the world are using the technology to help patients and test subjects lead better lives, but it requires sophisticated equipment and expertise, which means that each group currently using mocap tends to focus on one specialty. The Nove de Julho University (UNINOVE), however, is an exception.

Located in São Paulo, Brazil, the Nove de Julho University is one of South America's largest private higher education institutions. The school features five campuses and a dedicated research center, including the human movement analysis laboratory (NAPAM). The lab is currently working on a major project featuring a multidisciplinary approach, with three groups each using mocap technology to improve the lives of patients.

Professor Paulo R.G. Lucareli, a full researcher and professor in Masters and Doctoral Programs in Rehabilitation Science at the Nove de Julho University, discussed the multidisciplinary approach to clinical research and the role Vicon played to make it a reality.

How long have you been using Vicon?

I've been a Vicon customer since 2001. Vicon helped me to start my career in gait analysis. I continued to use Vicon cameras and software as I expanded into other fields, including foot, upper limbs (scapula) and jaw movements. I chose Vicon because of the quality of products and an excellent relationship with the Vicon support team.

Could you tell us a little about the project you are using Vicon on?

Using Vicon high-speed mocap cameras and Nexus software, the team specializes in clinical and investigative practices in movement analysis for musculoskeletal disorder, methods of application and analysis and clinical research. The focus of the research is on motion analysis, biomechanics, functional assessment and musculoskeletal disorders. The project began in 2013, with some of the results having been released as published papers, but patient care and research are ongoing.

What were the main benefits of using Vicon?

Besides the quality of the cameras and software, having the ability to integrate and study several areas all related to rehabilitation. The laboratory does not focus only in one area of knowledge, and we are integrating different professionals into the project. That allows us to provide assistance to many more patients. We have been able to make the analysis of movement apply to different areas of knowledge using the Vicon system.

What are the specific goals of the project?

The laboratory has three lines of research in full operation and constant development. All lines of research are in collaboration with professors and researchers at the UNINOVE, under Prof. Daniela A Biasotto-Gonzalez, Prof. Fabiano Politti and Prof. João C F Correa.

The first line of research uses motion capture to record the kinematic model in order to evaluate jaw movement in patients with temporomandibular joint dysfunction (TMD). That has led to a working model that is currently being used to test the effects of TMD.

The second focus is to create a model to quantify the movements of the scapula, upper limbs and trunk for patients with shoulder dysfunction. The model is currently being used to better understand the role of scapular dyskinesis and to evaluate the effect of load progression on muscle strengthening in patients with shoulder pain.

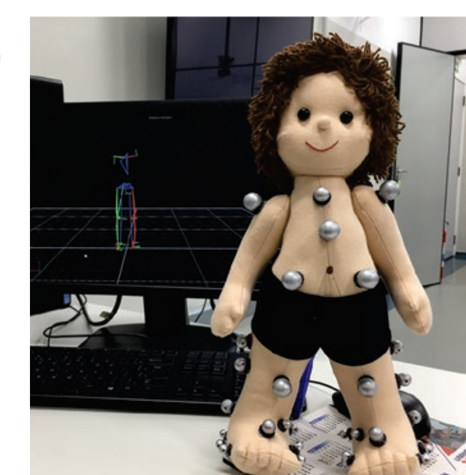
The third and largest of the focuses involves the analysis of different clinical tests and different functional tasks of patients with patellofemoral pain. This project uses the associated Plug-in Gait and OFM models to quantify major clinical tests involving motor control and biomechanical changes in patients with patellofemoral pain, and is also being used to identify which functional task is most sensitive to differentiate patients from healthy women.

What is the biggest challenge you've faced?

The main challenges of the projects were to validate the models showing that they are reproducible, and that they can be used to identify the movement dysfunctions, and to quantify the effects of the treatments offered to the patients. These challenges were solved with exhaustive reproducibility studies of the models.

What is the project's timeline?

All projects started in 2013 and are in constant development. Some results have already been published, but patient care and research are ongoing.



From Hollywood to Hospitals: How the Texas Back Institute is Using Mocap to Revolutionize Spinal Care

The Texas Back Institute (TBI), a private multi-disciplinary spine care center headquartered in Plano, Texas, is dedicated to improving the lives of patients through research, knowledge and wide-ranging treatment approaches.

For more than 40 years, the institute has integrated the best of science and education into innovative care for all types of spine conditions. Focusing on the head, neck and lumbar regions, TBI's team of physicians can address everything from chronic lower back pain to scoliosis in adults and children. But to do so, they need as much information as possible.

Data lies at the heart of good treatment decisions, whether it is surgical or non-surgical in nature. This led TBI to build an advanced motion capture lab, supported by a generous grant from a New York investment firm that specializes in orthopedics, Viscogliosi Brothers. The genesis of the lab began two and a half years ago at the hands of Dr. Ram Haddas, TBI's Director of Research, and a PhD and medical engineer.

Dr. Haddas saw the potential to create a research environment that not only met TBI's demanding specifications, but would also incorporate the best technology that the industry had to offer. Even today with all the recent advances in medical technology, there is limited research on human motion and the spine - and what does exist focuses primarily on gait. With its new lab, TBI would be able to produce research that had a big impact on the analysis and treatment of spine surgeries commonly performed at TBI and beyond.

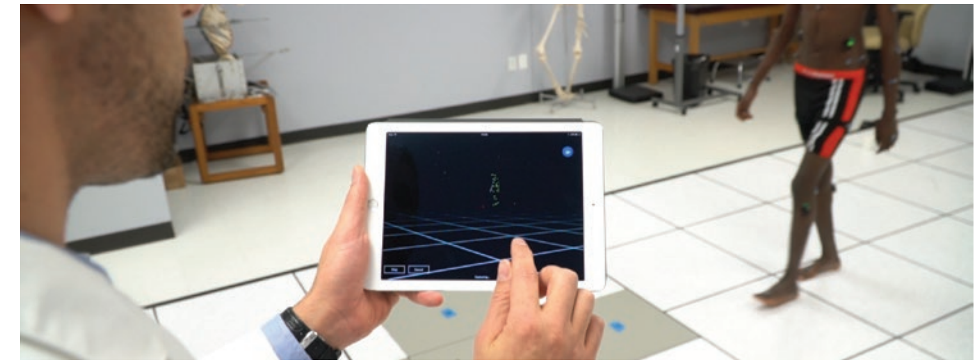
A dream setup

With the support of his TBI colleagues, Dr. Haddas was able to design and equip his dream lab. As a research assistant in college, Dr. Haddas became familiar with motion capture thanks to a Vicon system he encountered. The idea and its potential for the medical field stuck with him, and when the opportunity to create the lab arose he explored several solutions, ultimately deciding that Vicon outshone the competition.

The TBI system consists of ten 16-megapixel Vantage cameras set up throughout a 900 square foot lab. The setup features five cameras in the back and five in the front, alongside two Bonita video cameras, one in profile, so doctors can see a patient's gait from the side, and the other positioned in front – this particular camera is critical to assessing the pain scale. The camera records fine facial movements like an eyebrow or lip twitch, which occur when a patient experiences pain. The camera is used as a sort of psychological test, helping to identify the correlation between pain and motion.

The pain that patients feel and how it's measured is a critical part of the assessment and treatment process. It is regularly measured by a highly subjective rating system where patients rate discomfort on a one-to-ten scale. However, everyone has a different perception of pain, depending on a whole host of factors. Vicon and integrated EMG data can help to quantify pain and establish more objective criteria.

Physicians can compare, for example, what a patient says with how fast they're walking or their range of motion. There is a proven relationship between physical and mental states, and through Vicon data and analysis, medical teams are able to scientifically correlate the two.



"We know pain inhibits motion. Before treatment or surgery, patients tend to take shorter steps, and they adopt a wider stance to accommodate loss of balance."

The sophisticated features of the Vantage system, including the onboard sensors within the cameras that detect excessive heat or movement, have also made the entire process simpler and more efficient. This comes in handy when someone bumps a camera, which can happen frequently in a lab environment. If this happened in the past, capture would need to stop and the whole system would need to be manually recalibrated. Now, recalibration is quick and done with a single click.

Medicine in motion

Due to its global reputation and proximity to nationally renowned medical centers in Texas, the Texas Back Institute motion lab is extremely busy. In the first year, 100 patients visited the lab, and that number doubled in the second. Patients come to obtain analysis for a wide range of issues, including degenerative disc disease, osteoporosis, spinal stenosis, fractures and sacroiliac joint pain. Candidates for surgical procedures generally undergo testing one week before their operation for a baseline study, then return for a short-term follow up. They then finish with a final visit about a year after surgery.

Rather than focus on treadmill analysis, patients walk freely in the lab, as it more accurately mimics real-world movement conditions. Surgery is traditionally based on static imaging, but as soon as patients start to move, things change. The Vicon system allows physicians to see precisely how patients enter their gait cycle, and it enables analysis of joint angles and movements. When the spine is engaged, the lumbar, neck, thorax and head can all be affected.

A full-body marker set includes a total of 41 markers. The TBI surgical team has also developed a spine model, adding nine additional markers. After the cameras are calibrated, the team collects data on gait, speed and cadence, measuring every joint angle – including the ankle, knee and hip – in three dimensions and at 300 frames per second. Electromyography (EMG) data measuring electrical activity produced by the muscles is also fully-integrated within the Vicon software platform. This provides physicians with a full picture of how much muscle energy a patient is expending in the gait cycle, the degree of swing in lumbar balance tests, lifting and balance details and more.

With height, weight and other measurements, the team can also calculate a patient's exact center of mass and displacement. During a one-minute test, physicians can track the extent of displacement of the center of mass of a scoliosis patient, which averages almost a full meter, while a non-affected person moves only 20–25 centimeters.

These advances are all made possible for the first time thanks to the Vicon equipment and the TBI lab. Dr. Haddas also recently developed a new method for quantifying dynamic balance testing in spine disorder patients. After testing is complete, all data is processed using an auto-labeling technique. Reports are then generated for physicians.

"While there is almost unlimited data from Vicon, it needs to be distilled. We generally provide five to ten highlights for the doctors." As Dr. Haddas explains, the data summarizes walking speed, step length and width, and range of motion. "We know pain inhibits motion. Before treatment or surgery, patients tend to take shorter steps, and they adopt a wider stance to accommodate loss of balance."

Inspiring outcomes

Reports generated by the lab help with patients' diagnoses and establishing controls, pre- and post-surgery, for both the short and long term. For surgical patients, one-year reports can be compared not only to pre-surgery reports, but also to healthy control subjects. Part of Dr. Haddas' goal is to educate the medical community – physicians, physical therapists and the medical insurance industry – about how mocap-aided human motion studies can be used to better diagnose, treat, rehabilitate and track spine conditions.

But the ultimate objective, says Dr. Haddas, "Is for every patient to be completely healthy and equal to someone who requires no surgery at all." A lofty goal, but one that everyone involved is extremely proud to be a part of.

Take a closer look at the TBI Lab:
https://youtu.be/BjNZ3n-Z2Zw

How Uruguay's Leading Pediatric Rehabilitation Center Uses Mocap To Help Children and Teens

In 2012, Teletón Rehabilitacion Infantil, one of Uruguay's leading rehabilitation centers for children and teenagers, came up with an idea to help better serve its patients.

Using a piece of proprietary software and a handful of cameras, the medical facility decided to record the gaits of its young patients in order to help them gain increased mobility. The team at Teletón learned quite a bit about gait analysis in the process, but they soon hit a technical wall.

Tracking the movements of patients with a range of neuro-musculoskeletal injuries ranging from cerebral palsy to myelomeningocele can significantly increase the recovery time after an operation and help with non-invasive therapies, including various forms of physical therapy. But as with any medical science, it requires precise measurements. "Close enough" is not acceptable when it comes to the health of a patient, so Teletón decided to upgrade its system to include eight Vicon Vantage 5-megapixel motion tracking cameras and the Nexus software.

Nicolas Peña is Teletón's Gait Lab engineer, and he explains how motion capture cameras are being used to help improve the lives of patients, and why Teletón chose Vicon.

Could you tell us a little about Teletón?

Teletón is a non-profit rehabilitation center that treats children and teenagers with neuro-musculoskeletal diseases to promote their family, school, work and social inclusion. We have two offices in Uruguay – one in Montevideo that opened in 2006, and another in Fray Bentos of the Rio Negro Department – which opened in 2012.

Since its founding, we have managed to help more than 4,000 children and teenagers.

What led you to gait analysis for your patients?

As one of the leading rehabilitation centers in our country, we have to give the best services to our patients, offering them the best possible solutions. Children with cerebral palsy, for example, often need orthopedic surgery, and gait analysis has shown that the outcome of surgeries improves when understanding the biomechanics of how kids walk. That's why we started this entire project.

How many people work in the lab?

The team includes two physical therapists, one physiatrist, two orthopedic surgeons and an engineer (me). It is a small team, but one of our main strengths is the teamwork. We do all of our data gathering in interdisciplinary teams.

What role did Vicon play?

In 2012, we developed our own software for gait analysis with some small motion capture cameras. From that moment on, we started to learn a lot about gait analysis and started studying more and more patients. In 2013, we inaugurated our first Gait Lab, where we only had kinematics. At a certain point, the software limitations, the lack of flexibility for biomechanical modeling and the need for third-party hardware integration started to be an issue.

When it was time to upgrade, we purchased an eight Vantage camera system (5-megapixels), two force plates and an EMG system. We also started using the Nexus software to calculate kinematics and kinetics through Plug-in Gait, and we also calculate the output angles using a functional model calibration. We've been working with the new system for a year now, and we are very happy with the results and the possibilities.

Why did you choose Vicon?

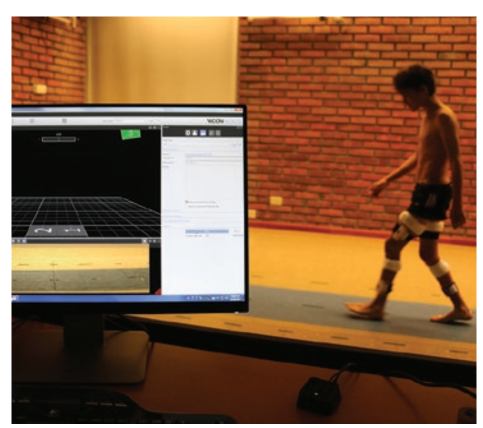
Because Vicon is a company with a long history in motion capture and life sciences. Ultimately, the software's flexibility allows us to do what we need, and the hardware produces quality, precise data. The integration of third-party hardware has also been helpful. Other leading hospitals frequently use Vicon as well, which is convenient.

What have the biggest challenges been?

We wanted to make the most out of Nexus, so learning all of the features took a lot of time and energy – not because the software is difficult to use, but because it is very flexible and it lets you do almost whatever you want. The support team helped us a lot with this.

What have the main benefits of this system been?

It helped to create a more reliable infrastructure and a superior technology base. It has also been a big time saver and helped us avoid repetitive work. Creating our own pipelines and the ability to adapt the user interface has been a huge help as well. It is also nice to work with the world-leading company of motion capture.



Development in Motion Capture: Are the Life Science and Entertainment Markets Out of Sync?

Out of Sync. Jealous. This is how I would describe the Life Sciences (LS) and Entertainment (ENT) markets for motion capture.

by Alex Muir, Asia Pacific Group Manager, Vicon and Managing Director, Logemas

The Life Sciences market is peering over the partition at its flashy colleague, thinking how exciting their life must be, meeting movie stars and attending premieres.

Meanwhile, the Entertainment market struggles through their morning coffee wishing they had a regular 9–5 job like the more stable Life Science market. You would think our customers from different markets are poles apart. I think they are just out of sync. What is important for the Entertainment market right now is almost the least important thing for the Life Science market, but in the next period that changes.

I have always loved the line from the Simpsons, "Very few cartoons are broadcast live, it's a terrible strain on the animator's wrists." And I have always thought that it sums up our LIFE SCIENCE customers… Very few papers are published in real time.

Traditionally, the difference has always been real time. Real time is/was of the utmost importance to the Entertainment market and the Life Science market couldn't care less. Now the advances in real time requested by the Entertainment market are really driving advances in the Life Science market. Now that we have real time sorted for the Entertainment market with Vicon Shōgun, the Entertainment market is really interested in the biomechanics advances from the Life Science market to solve their animation skeletons. One market's advances have always driven the other, but just out of phase. The Vicon staff and I know best what all our customers are doing, and when we can leverage all of this information it is truly one of the most satisfying moments of my job (Peking Duck at Da Dong in Beijing is a close second).

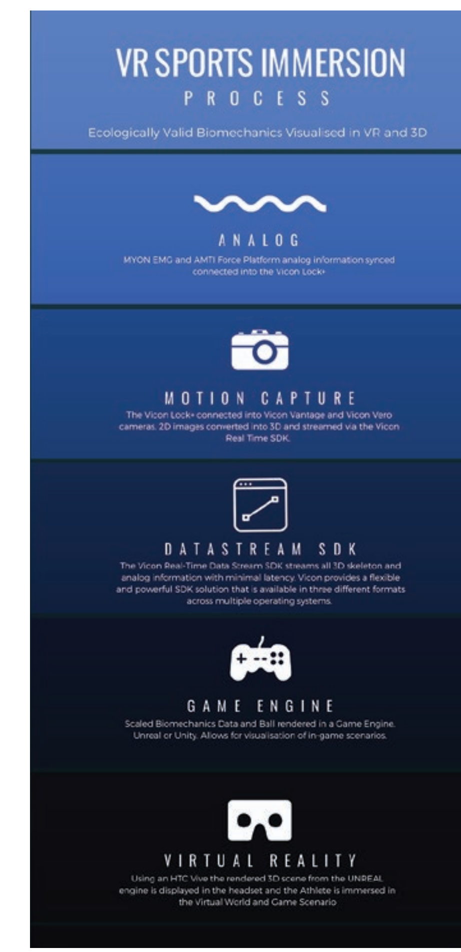
One of those moments for me was at the ISB conference in Brisbane earlier this year. We wanted to take the real world question of, "What if we immersed an athlete into a Virtual Reality scenario to measure their ability under changing game situations?" Think that sounds pretty easy? Just an extension of Wii tennis? Not exactly. The hard part was making sure we didn't change the game/athlete behavior, but kept the ability to measure at biomechanics lab levels. We were able to combine Life Science standards perfectly with an Entertainment application and make it valid for both.

We took third-party information from force platforms and EMG via the Vicon Lock+, synced with the Vicon motion capture data in Nexus, overlaid synced HD video from the Vicon Vue, used the Vicon real time SDK to pipe the information to the Unreal Game Engine, calibrated the game world to be in the same world space as the real world, displayed this in real time through the Vive VR headset, and displayed force vectors and biomechanical data in real time through a game engine, but most importantly, met the goal of immersing an athlete into the game situation while still maintaining the situation as ecologically valid.

The advantage of using a game engine is being able to change the athlete's perspective, all at the press of a keyboard. The Life Science community is able to leverage advances in programming and tools created for games like The Killing Floor or Batman Arkham City.

It is truly mind-blowing that a game engine that was developed to kill virtual creatures with your Enforcer Sub Machine Gun could be driving advances in athlete performance and rehabilitation.

Clearly, I am breezing over some of the challenges and we were able to stand on the shoulders of giants. However, we reached a moment where the two main markets for Vicon were no longer out of sync – they were actually perfectly aligned. I know examples of this are going to become more and more frequent.



Innovation, Acquisition, Expansion Vicon 2017

by Imogen Moorhouse, CEO

In my article published in the 30th Anniversary edition of "The Standard," I took a look back at the achievements and progress made over the 30 years Vicon had been in business.

The closing paragraph concluded, "for Vicon motion capture in whatever form it takes." Given the recent events at Vicon, with an acquisition and a move for the head office after 32 years in our original location, this latest edition of "The Standard" provides a good opportunity to update you on the future for Vicon.

Since the 30th Anniversary edition article in 2014, we have been very busy with new product launches in our core passive optical technology area. We have refreshed and grown our entire camera range and launched a new game-changing entertainment software, Vicon Shōgun, to very enthusiastic market response. This included some fantastic social media commentary from customers, both old and new. We will continue to push the boundaries in our main market areas and to take care of our valued user base, but believe that there should also be a focus on the future use of different motion capture modalities, not only from a technical standpoint but also, importantly, accessibility.

We are now in an exciting period where the form, function and use of motion capture is changing for Vicon and the wider market. In the past, motion capture modalities (passive, active, inertial, etc.) were siloed technologies with distinct and separate use cases. As motion capture techniques have become more widely used, users simply want to utilize the best technique for the analysis required, rather than being entirely focused on the movement acquisition technology itself.

Vicon has always been an innovator in motion capture technology and it is time for us to broaden not only our technological appeal, but also the accessibility of our systems, meaning lowering barriers to entry across all aspects of the system. This change in philosophy cannot be applied only to the technology itself. From the initial and ongoing investment needed to acquire and operate the motion capture technology, to the training required to install and use the systems and the presentation of outcomes, all must change to truly make motion capture fully accessible.

With the recent acquisition of IMeasureU, we have the opportunity to bring a non-optical capture modality into our offering. Inertial systems have the advantage of being able to capture data unencumbered by the laboratory, studio or the requirement to have line of sight to cameras in the field. The power of using Vicon optical technology coupled with native inertial devices will bring many advantages to our customers. In addition, the IMeasureU technology has the capability of delivering outcomes to coaches who are helping injured athletes return to play through the implementation of cloud technology, tablet-only system control and user-specified dashboards. I strongly believe that these techniques will also benefit our Vicon customers in the longer term.

And finally, a few words about our recent move. Vicon HQ has been located in Botley, a suburb of Oxford, UK since the company's beginnings in the early 1980s. But over recent years it was becoming obvious that we were outgrowing the facility and that it was no longer suitable for our needs. Throughout the late summer, Vicon UK moved to a ground up refitted, world class facility in Yarnton, close to Oxford. The facility has vastly improved and expanded production facilities, with four motion capture volumes that can be combined in several ways up to a single 14m x 26m x 6m volume for large scale captures and testing.

We continue to be inspired by you, our valued customer family, and are committed to bringing new technologies to enhance and complement the use of motion capture, whatever the requirement.