

Johns Hopkins Startup Developing At-Home Rehabilitation Game



People often skip the exercises recommended for physical rehabilitation at home, but five biomedical engineering students are hoping to change that with an interactive program designed to make the exercises more engaging.

“We have multiple versions of the video game,” says Rahul Yerrabelli, a biomedical engineering student and chief technology officer of MoTrack Therapy (short for motion tracking therapy). “One version prompts people to do an exercise in a certain amount of time and scores how they move. It provides live corrective feedback and even has music to make it fun.”

In 2015, Yerrabelli participated in a Johns Hopkins University student-run hackathon called MedHacks. In collaboration with Benjamin Pikus, Parth Singh, Himanshu Dashora and Adam Polevoy, the group tailored existing plug-and-play computer vision technology that works with the camera on a laptop or desktop computer to read and track hand movements. They focused on physical rehabilitation for patients with hand conditions like wrist fractures and carpal tunnel.

The students then developed a software program and incorporated machine learning to gauge the extent to which a person can do the exercises over time, predict future performance, and predict how long it might take the individual to recover. “Afterwards, it sends that information to the patient’s clinician,” says Yerrabelli. “We will see if the technology can help improve recovery times.”

With support and funding from Johns Hopkins University Tech Ventures, Yerrabelli started MoTrack Therapy with his classmates in 2016 and is currently testing their innovation in the clinic, as well as devising a version that works on a mobile phone.

“Gamification, computer vision, and machine learning technologies have already started transforming fields outside of health care,” says Yerrabelli. “Now they’re making their way into medicine.”



BRIAN FITZGERALD / THREE IN A BOX

Artifact App Improves Accuracy of Patient Data in Medical Records



An accurate medical record is not only important for patients’ health but for hospital and provider performance as well. In the past, when information entered by a provider was missing or unclear, clinical documentation specialists contacted the provider but often found their queries went unanswered. Now, thanks to an app, Johns Hopkins providers can answer queries quickly.



PAUL ZWOLAK / MARLENA AGENCY

Surgeon Peter Greene, chief medical information officer for Johns Hopkins Medicine, along with hospitalist Daniel Brotman and Technology Innovation Center staff members started working with outside company Artifact Health in 2014 to customize the Artifact app to meet a “wish list” for Johns Hopkins Medicine providers and integrate it into Epic.

The old workflow for answering a documentation specialist’s question was time consuming and cumbersome, requiring a provider to access the medical record via desktop. To make this process simpler, one of the items on the wish list was availability on mobile, tablet or desktop, so providers could answer questions on the go.

Information in medical records can affect the performance of physicians and hospitals, because a hospital’s

ranking is based in part on metrics established by the Centers for Medicare and Medicaid Services that assess observed patient outcomes against expected outcomes.

As an example, if a 77-year-old man enters the hospital in sicker condition than what is captured in the medical record, that patient’s outcomes are assessed as if he entered in better health than he did. This can make the hospital treating him appear less effective in delivering care.

Since the app’s rollout, which began at Howard County General Hospital in 2016, providers’ response rates have jumped, says Redonda Miller, president of The Johns Hopkins Hospital. “We wanted to streamline the necessary querying process to make life easier for physicians, so they can spend more time pursuing their passion: caring for patients.”



A look at innovative developments outside the halls of Johns Hopkins Medicine

Apps for Vision Impairment

Be My Eyes connects people who are blind to sighted helpers via a live video connection. When someone requests assistance—for anything from knowing the expiration date on food to navigating new surroundings—the volunteer receives a notification. After a live video connection is established, the volunteer can answer questions. Currently, the app has more than half a million users in 150 countries who speak more than 90 languages.

The TapTapSee app photographs objects and says what they are out loud. After the user double-taps the device's screen to take a picture of an object, the image is analyzed and recognized within seconds. TapTapSee can also upload an image from a device's camera, repeat the verbal identification, share the identified image and save the image with an identifying tag.

VisionConnect provides a searchable directory of services in the United States and Canada for children and adults who are blind or visually impaired. Listed services in the directory include Braille and reading instruction, employment services and low vision services, training in daily living skills, computers and other technology, and use of guide dogs. VisionConnect also provides home survey checklists, ideas for managing medications, resources and tips for living independently with visual impairment, and personal stories. Health care providers can use the app to create lists of service providers for patients.

Insights for Tech Entrepreneurship at Johns Hopkins



Reporter's Notebook: Excerpts from an interview with Myron "Mike" Weisfeldt, Senior Medical Director, Johns Hopkins Technology Ventures

Only a small (but growing) percentage of faculty understand that entrepreneurship is part of academic life today at Johns Hopkins. This is a new aspect to our culture, and it brings different expectations and different ways of going about successful academic advancement. If you are a faculty member who wants to do this as part, if not a major part, of your career, you need to learn and understand how to get started and how to make an impact. There's a huge education, almost a new language you need to learn.



When an inventor presents their program for a grant or to a potential investor, there's a format for the presentation they need to understand. It's not like a 10-minute talk at

the American Heart Association meetings. There's the science. The unmet need. How big is the market? How much money is being spent on this? What is your discovery and who's competing with you? Why is your idea or solution better than others? What's the next step? That's a very different talk.

Johns Hopkins has always had the potential for a competitive advantage—it's just never been a focus.

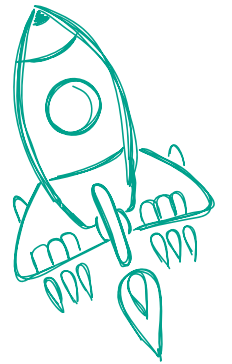
Academic promotion criteria have really stifled people. They thought about their commercial idea, but on many occasions they said I'm not going to pursue this because it's not going to help me with my career.

Patents and commercially oriented research and accomplishment were not endorsed by the institution as academic activities worthy of recognition by promotion. JHU institutional leaders and others have changed that and it is a big cultural shift that has happened incredibly fast. Research, creative education and being an outstanding

clinician have always been the paths to promotion. We now have innovation as a path to advancement. The number and types of patents on the CVs have become incredibly important. But even more important is the impact of the commercial ideas on human health.

With the Fast Forward 1812 building, we have a group of business professionals next to startup businesses with fully equipped laboratory spaces at a reasonable cost underwritten by the institution.

This proximity of people and purpose and vision, and the ability of the entrepreneurs to walk in and talk with the person who's handling their intellectual property and patents, makes this a truly entrepreneurial community.



Learn more about Johns Hopkins Technology Ventures and opportunities for learning the language of entrepreneurship by visiting ventures.jhu.edu.

Virtual Reality System Helps People with Low Vision



Using a Samsung Gear VR virtual reality headset in combination with a Samsung Galaxy phone, ophthalmology researcher Robert Massof is helping people with low vision see better.

"You put these goggles on, and it's like looking at a 65-inch TV from two-and-a-half feet away," Massof says. "The virtual reality capabilities display videos and still images that look like you are in an IMAX theater."

It was 25 years ago that Massof developed his original head-mounted video imaging system (LVES), for magnification. But the cost and size were limiting, and significant

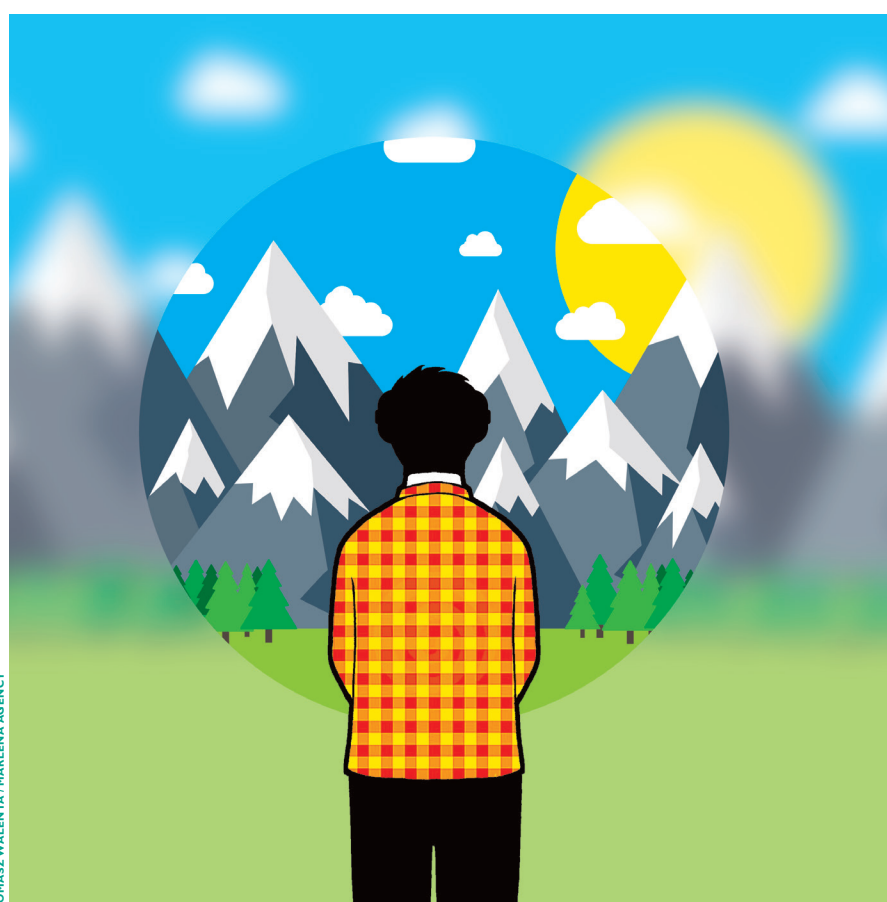
computer processing power was required to capture live video and display the images in virtual reality.

"Today," says Massof, "what used to take a room full of computers to do can now be done with a smartphone."

To magnify a person's surroundings, the LVES computer program works with a Samsung Galaxy phone and Samsung Gear headset. When a user views live video from the phone's camera, a bubble on the screen magnifies the area of interest and a touchpad on the side of the headset adjusts the size of the bubble and amount of magnification. Web content, streaming video and games can also be viewed with the system.

A ready-to-use LVES package is available from IrisVision, a company started by a University of California professor who collaborated with Massof. The system can be tailored to the buyer's specific visual impairment and is available for approximately \$2,500.

Massof's next step is to make it possible for the wearer's eye movements to be tracked inside the headset so simple eye movements drive the view, rather than head movements. "When reading or doing a visual search, you can make eye movements more quickly than head movements," he says. "It's a much more natural way to look at things."



TOMASZ WALENTA / MARLENA AGENCY