As younger generations join the overall population of injured and paralyzed Veterans, we are seeing more and more interest in adaptive gaming. Of course gaming (A gamer is someone who plays interactive games, usually video games, although games can also come in other forms, such as tabletop or physical games) isn’t strictly limited to any one generation. In response, the Assistive Technology team is working on improving the offerings we have to provide to injured Veteran gamers.

Much of video game play is effected through two handed controllers, body movement (e.g. Wii), and video recognition (e.g. Kinect). This presents a problem for our Veterans that have either lost the use of one or more extremities. One handed game controllers do exist, are fairly basic, and not very ergonomic. Many gamers make do with a normal controller, using it onehanded, and actuating the second joystick against a table or other surface while they control the primary joystick with their functioning hand.

Individuals with Tetraplegia who are gamers are left with even more limitations, fortunately there is a “joystick” for this particular population. The Quadstick game controller is a mouth operated game controller for individuals with tetraplegia.

QuadSticks have four sip & puff sensors and a lip position sensor….The QuadStick is directly compatible with the PS3, Android, and many PC games that use a joystick, mouse or keyboard. Through the use of a 3rd party USB adapter, XBox 360, XBox One, and PS4 consoles can be used, as well as PC games that require an XBox 360 controller.

The QuadStick appears to the host device as a PS3 compatible Gamepad, Mouse, Keyboard and Flash drive.

The connections between the input sensors and the signals sent to the host are configurable by the user and can be quickly changed between pre-configured profiles, while playing a game, to match different situations in the game. Specific configuration profiles can easily be created for games that require combinations or unique control inputs.”

Other products, such as the LP Pad capitalize on gross muscle movement rather than fine motor skills.

A device that has been mentioned in this newsletter before is the Cross Compatible Gaming Device (CCGD). It makes it possible to use any USB input device on any gaming console- sometimes requiring the use of a PC.

Figure 2
CronusMax Plus CCGD

as an intermediate I/O device. This opens up the possibility of using a headtracking mouse, eye tracking, and other keyboards/joysticks for game play.

More games are being developed to help with cognition and therapy treatment. At last year’s Technology in Rehabilitation Conference, several iPad/tablet games were showcased that developed individuals’ ability to perform a series of activities based upon cause and effect. Also at that conference, the DOD showcased a program they had sponsored. The game is a first person shooter that required the player to complete specific therapy exercises in order to effect certain actions within the game (e.g. perform a squat or lunge to pick up a weapon, fire, etc.). The system utilizes a Kinect motion capture camera (and some fancy programming wizardry) to determine whether the player’s actions were appropriate, and provides hints/instruction if an exercise isn’t performed improperly. The goals of these particular programs are to aid in rehabilitation through interactive game play.

Our AT team is currently working on developing a one handed controller built on the wiimote platform, but with more capabilities than in its’ current configuration. It will be cross-platform compatible with the use of a CCGD. More to come- stay tuned!
The McGuire VA Assistive Technology Program established two educational affiliations with the University of Virginia and Virginia Commonwealth University BioMedical Engineering Programs. These affiliations allow us the opportunity to have trainees come and learn about clinical rehabilitation engineering through hands on experience with design and development of rapid prototyping for specific patient needs.

Lindsi Sparks is a biomedical engineering trainee from Virginia Commonwealth University. Here are some of her thoughts about her experience:

**Why did you want to do an internship at the VA?** I came to the VA in spring ’16 to shadow and do needs finding for a class that I was taking. During my visit, I learned about the field of clinical rehabilitation engineering and immediately knew this was a field that I wanted to learn more about and expose myself to.

**What do you like about learning at the VA?** I have enjoyed being able to interact with patients and hear their life stories and seeing how assistive technology has such a positive impact on their lives.

**What areas of AT are you interested in and like working with? And Why?** I enjoy working on individualized projects. I like being able to meet with the patient and see their problem in person and then talk together about what methods they think would or would not work for them and then taking the problem back and begin designing a solution. Many times, the designers do not get to see how their designs are used with people but the VA allows me to almost immediately get feedback on my designs.

**Why are you passionate about AT?** AT allows me to give back to my community and help others while applying my engineering designing skills.

Christina Stiebris is a biomedical engineering student from the University of Virginia and spent a one week observation with the AT Program. Ms. Stiebris indicated that, “this externship with the VA AT team taught me how dynamic rehabilitative engineering is. I was shown the holistic view of engineering – applying engineering skills and assistive technology to patients in certain context, such as the environment and who will be using or setting up the device.”

The AT Program also is working with the Occupational Therapy program at Virginia Commonwealth University providing them with education about Clinical Rehabilitation Engineering and collaborating with occupational therapy. In addition, the AT Program provides training opportunities to learn about design thinking and putting those skills to the test.

**Meet McGuire’s AT Team**

Lindsi Sparks working on a design using SolidWorks

Whitney Kallenbach moved to Richmond from Olean, NY for a job with Sheltering Arms in 2009. After working there for a little over 4 years, she got a job as a Recreation Therapist on the Spinal Cord Injury Unit at McGuire VA. In October, she moved from the Spinal Cord Injury Unit to working in Adaptive Sports Program.

In her own words, here is some more information about her.

**How long have you been at the VA?** 3 years

**What do you like about working at the VA?** I like helping Veterans, who have given our country so much, the opportunities to participate in recreation. I also love when they tell me how much participation has changed their lives.

**What areas of AT are you interested in and like working with? And Why?**

**My main area of interest is adaptive sports equipment, but I am interested in learning almost anything I can because there is so much to learn and the technology changes so quickly.**

**Why are you passionate about AT?** A lot of times when someone has a disability they think some of the things they previously enjoyed such as bike, golf, ski, shoot, run, etc.– are things they will never be able to do again. It is so amazing to help them to participate in their passions with the proper adaptations. It can be such a confidence boost for them and that confidence can lead to a lot of other areas of their lives.

Tell us about other interests outside of the VA.

When not working, I love to spend time with my husband Tom, our 6 month old daughter, Cece, and our dog, Mowgli. I enjoy exploring Richmond and I especially love going to the pool and the beach during the summer. I am an avid sports fan and cheer for the Florida Gators and the Buffalo Bills, even though there isn’t much to cheer about.
Marine Josh Burch was 20 years old in September of 2015 when he sustained a C7 level spinal cord injury. He was stationed in Japan at the time and was on leave in Guam when the injury happened. Although this injury was life-changing, Josh hasn’t let it stop him from doing things he loves, and even trying new things.

Josh first tried adaptive sports equipment, a handcycle, as part of his inpatient rehab on the Spinal Cord Injury unit at McGuire VAMC with his Physical Therapist and Recreation Therapist. Upon first trial, it took longer for Josh to get in and adjusted in the cycle than the time he could actually ride. Each day he was able to ride longer and longer, and through the Assistive Technology program Josh was able to get his own personal hand cycle which he uses to cycle with friends and family.

Josh has also been an active participant in various adaptive sports—trying sports that he did not play even before his injury including kayaking, air rifle and tennis. Surprisingly to him, Josh says his favorite sport in adaptive tennis, which he plays with the VA adaptive sports department and community organization Sportable. Josh’s younger brother also likes to challenge his skills on the weekends. Through adaptive sports clinic, Josh was also able to obtain a sports wheelchair which helps him to move more efficiently on the court. By participating in adaptive sports, Josh has met friends that have similar injuries to him and states that this supportive environment has helped him in the rehabilitation process. Josh states, “participating in adaptive sports has improved my confidence. It’s a good feeling knowing that I can go and play these sports on my own and get back into the sports world.” Josh gets to and from the sports on his own using hand controls to drive his beloved adapted Chevy Silverado, which he also was able to adapt to meet his needs with help of the Assistive Technology Driver’s Rehab program.

Josh is looking forward to participating in his first National Veterans Wheelchair Games in Cincinnati, OH in July.
emitter (Blumoo, Logitech Harmony). With the built-in and selected skills, or apps, you can set reminders and calendar events (Google Calendar), ask about the weather, play music (Amazon Prime Music, Spotify, iHeartRadio, Pandora), listen to audiobooks (Audible), get news updates (NPR, Fox, BBC, CNN, AP, etc.), do your banking (Capital One), or even order pizza (Domino’s). And as Amazon says, more features and products are added to the Echo’s capabilities over time through updates, making this product far more flexible and modular than the typical ECU.

For the right user, a product like Amazon Echo or Google Home, which has similar capabilities as a direct competitor to the Echo, can really empower them in their own home and connect them to the outside world. However, if the patient lacks a strong voice or has incurred a brain injury that makes it difficult for them to learn and memorize voice commands, the Echo will not be a good fit. It lacks alternative access methods such as switch scanning, head/eye tracking, or sip ‘n puff input. Additionally, the Echo may not fulfill all of a patient’s needs; there are currently no Echo-compatible accessories to open doors, control beds, make calls or send texts, use a computer, or alert a caregiver to a medical emergency. Perhaps some of these features will be added – particularly phone access – but that remains to be seen. For the time being, traditional ECUs will continue to be the standard for circumventing a person’s disability, but they better watch their backs!

Figure 1. The Amazon Echo Dot and the Google Home are at the forefront of the smart home control hub conversation. Both products are compatible with a variety of third-party accessories and come packed with features.