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Related Categories: Intelligence and Counterintelligence; Military Innovation; Science and Technology; SPACE

BRAIN-COMPUTER INTERFACES MAKE MONKEY PONG POSSIBLE

Elon Musk's Neuralink continues to make significant strides in the development of its brain-computer interface (BCI), known as the "Link." The Link is an invasive BCI that is designed to be implanted on the surface of a brain, and connects to the brain through thin electrodes that transmit neural signals. In a recent trial with a Macaque monkey playing a video game, after just a few minutes of data the brain signals detected by the Link were decoded, so when the researchers unplugged the joystick the monkey was able to play the game using only its brain. Neuralink will allow a person using the Link to simply think about an action and the electrical signals sent from the brain will enable them, via the Link, to interact with a device such as a phone or keyboard. At this time, the technology is being positioned to help paraplegics regain the ability to walk. However, as the technology matures, numerous applications could emerge for the defense sector. (*Micky*, April 12, 2021)

THOUGHT-CONTROLLED EXOSKELETONS

In a similar vein, a group of scientists recently connected a robotic exoskeleton with a brain-computer interface (BCI), allowing a man who had lost his lower leg and foot to use his thoughts to control and use it. During the experiment, the man was able to sit and stand, as well as to squat down to pick up an object on his own. He also exhibited more control and a greater range of motion than is typical with traditional pre-programmed exoskeleton systems. According to Helen Huang, a North Carolina State University biomedical engineer and study participant, "autonomous control works really well for walking... but when it comes to more than just walking, such as playing tennis or freestyle dancing, it'd be good to have neural control." Unlike the Neuralink example, however, receptors were also located on the exoskeleton, and the patient had to go through extensive physical therapy to gain the ability to control the system with his thoughts. Nevertheless, the experiment constitutes a major breakthrough in the development of robotic exoskeleton systems. (*Futurism*, April 23, 2021)

WANTED: A SPACE JUNK REMOVAL SERVICE

Space debris, colloquially known as "space junk," poses a major threat to both commercial and military space assets. Space junk includes everything from retired satellites and entire spacecraft to small nanoparticles. As more and more satellites and spacecraft are launched, it has led to orbital congestion and a growing risk of collisions, making it challenging to conduct space activities and maintain assets in low-Earth orbit. Unfortunately, there is no one size fits all solution to orbit debris cleanup, and no company has demonstrated a proven ability to remove space junk in a cost effective manner. Further complicating the issue, according to Mariel Borowitz of the Georgia Institute of Technology, "these rapidly advancing technologies [for space junk removal] have the potential to be used for peaceful space activities or for warfare in space... given the dual-use nature of their capabilities, it's impossible to know for sure in advance how they'll be used on any given day." Other experts, such as Moriba Jah of the University of Texas at Austin, contend that the government needs to create market conditions for industry to engage in orbital space debris removal. To do this, however, nations will need to agree to treat near-Earth space as an ecosystem in need of environmental protection. (*Scientific American*, April 14, 2021)

DIRECTED ENERGY WEAPONS OF TERROR

Beginning in late 2016, a number of U.S. diplomats and intelligence personnel deployed in Cuba began reporting mysterious symptoms, such as ear ringing and pressure, intense headaches, loss of balance and hearing, and fatigue. Often referred to by U.S. officials as "Havana Syndrome," some victims have even experienced long-term brain damage. Unfortunately, these attacks have since spread to U.S. personnel around the world, and are believed to be caused by directed energy weapons. These incidents are now the subject of growing scrutiny, and the Pentagon launched a formal investigation into the phenomenon last year. At a recent House Armed Services Committee closed door briefing, Defense Department officials reportedly told lawmakers that, while they are not yet fully certain, Russia is seen as the likely perpetrator of these attacks. Officials did not rule out China as a possible culprit, however. According to Marc Polymeropoulos, a former CIA officer and victim of a suspected directed energy attack in Moscow in December 2017, "it takes you off the battlefield, it incapacitates you, it doesn't kill you... ultimately it's a pretty brilliant terror weapon." (*Politico*, April 22, 2021)

COUNTERING THE CHINESE NAVAL FLEET

U.S. primacy in the Western Pacific is increasingly being challenged by China, which has developed and deployed a number of advanced weapons systems to further its anti-access, area-denial (A2/AD) strategy. The U.S. Navy recently conducted a demonstration involving the teaming of manned and unmanned systems, showcasing how it would engage Chinese naval forces. As part of the exercise, a barge carrying emitters was used to simulate an enemy vessel. UAVs and unmanned vessels prioritized stealth to hunt for the barge by shutting off their active sensors and relying solely on passive electronic receivers. The drones were able to detect the barge's electronic emissions, transmit targeting data to a satellite, and cue an SM-6 missile to launch from the *USS John Finn*, which safely operated hundreds of miles away. Military experts warn that stealth and strong communications will be imperative in a battle with the PLA Navy, so while the operation was successful, it will be necessary to ensure that in the heat of battle communication and links between sensor systems does not falter. (*Forbes*, April 28, 2021)