

Take your autonomous driving test with new DeepRacer from AWS

Thanks to Amazon Web Services (Seattle, WA, USA; <https://aws.amazon.com/>) you can design your own machine learning environment and test it with a grey robot car that looks like something out of a Pixar (Emeryville, CA, USA; <https://www.pixar.com/>) movie.

The AWS DeepRacer is a 1/18th scale, radio-controlled, 4WD car with an onboard Intel (Santa Clara, CA, USA; <https://www.intel.com>) Atom processor running Ubuntu 16.04 LTS, the Robot Operating System (ROS), and the Intel OpenVino computer vision toolkit; a 4 MPixel 1080p camera;

802.11ac WiFi; multiple USB ports; and two hours' worth of battery power.

AWS DeepRacer is also a machine learning tool that works off the principles of reinforcement learning. Where supervised learning is a technique involving facts and inferences, reinforcement learning allows an agent to learn in an interactive environment via trial-and-error. The agent processes feedback from actions and learns how to achieve a predetermined goal.

In this case, the AWS DeepRacer is the agent and the feedback involves crashing into things. Developers who work with the Deep-



Racer can take advantage of virtual training courses, however, before sending their cars careening into the real-life test environment.

AWS DeepRacer comes equipped with a fully-configured cloud *continued on page 6*

Artificial intelligence and 3D camera enable facial expression-controlled wheelchair

Developed by Brazilian company HOOBOX Robotics (São Paulo, Brazil; www.hoo-box.com), the Wheelie motorized wheelchair kit uses artificial intelligence and a 3D camera to enable users to move the wheelchair using simple facial expressions.

According to the National Spinal Cord Injury Statistical Center, it is estimated that there are approximately 288,000 people in the United States living with spinal cord injuries, and about 17,700 new cases each year. Additionally, a 2018 study (<http://bit.ly/VSD-SPSTUDY>) showed that physical mobility has the largest impact on the quality of life for people with spinal cord injuries. For people dealing with such injuries, mobility is often enabled through



HOOBOX Robotics' Wheelie 7 kit allows users to pick from 10 facial expressions to control their motorized wheelchair moving forward, turning and stopping.

caregivers or through a motorized wheelchair with sensors placed on the body that require special education to operate, according

to Intel (Santa Clara, CA, USA; www.intel.com), with whom HOOBOX Robotics has partnered.

Company CEO Paulo Pinheiro first developed the idea for the Wheelie a few years back when he noticed a girl in an airport who could neither move her hands nor legs and was entirely dependent on someone else to move her wheelchair. At one point, according to a press release, the girl in the wheelchair had a big smile on her face and Pinheiro was inspired to consider the idea of developing a wheelchair that lets people use facial expressions to move the wheelchair.

At the Consumer Electronics Show 2019, HOOBOX Robotics and Intel showcased the wheelchair kit, which *continued on page 6*

continued from page 5 environment that uses the reinforcement learning feature in Amazon SageMaker and a 3D simulation environment run in AWS RoboMaker. Developers can run an autonomous driving model through simulated race tracks for virtual evaluation or download the race tracks to the AWS DeepRacer and try running the real-life version.

Attendees at re:Invent (<https://reinvent.aws.amazon.com/>) 2018 were invited by Amazon Web Services to attend a reinforcement learning workshop and learn how to use the AWS DeepRacer car. Developers who want to take advantage of this autonomous driving development kit at home can order the DeepRacer online.

All users of this new machine learning tool can enter the AWS DeepRacer league, compete in live racing events at AWS global summits, and participate in virtual events and tournaments. Top competitors will be invited to the AWS DeepRacer 2019 Championship Cup at the next re:Invent conference, in 2019. 🏆

continued from page 5 detects 11 different facial expressions—including smiles, frowns, kisses—and translates them into motorized wheelchair controls. Used to detect facial expressions is an SR300 Intel RealSense 3D depth camera.

The SR300 camera features a 640 x 480 monochrome infrared camera, a 1920 x 1080 color camera, and a class 1 laser-compliant, coded-light infrared projector system. To generate a depth frame, the infrared projector illuminates a scene with a set of predefined, increasing spatial frequency coded infrared vertical bar patterns. These patterns are warped by the scene, reflected back, and captured by the infrared camera. The infrared camera pixel values are then processed by the imaging ASIC to generate a depth frame, and subsequent depth frames create a video stream that is transmitted to a client system, according to Intel.

Facial expressions are captured with the camera and interpreted by AI algorithms run on an Intel NUC Mini PC mounted to the chair. Interpretation of the facial expressions is done in real time using the Intel Distribution of OpenVINO toolkit and Intel processors, and is reportedly fast enough to execute a responsive motion change for both a comfortable experience and user safety. Also included in the kit is “The Gimme” gripper, a navigation sensor, Wheelie software, electrical accessories, and a camera gooseneck.

“The Wheelie 7 is the first product to use facial expressions to control a wheelchair. This requires incredible precision and accuracy, and it would not be possible without Intel technology,” said Pinheiro. “We are helping people regain their autonomy.”

Wheelie 7 reportedly takes only seven minutes to install in any motorized wheelchair available on the market. 🏠

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