Model Series, Innovation and Technology Communications
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Automatic intelligent parking: Audi at NIPS in Barcelona

- **A model version of the Audi Q2 autonomously masters complex parking situations**
- **Machine learning as a key technology for piloted driving**
- **Personal interaction with specialist and HR experts from Audi**

Ingolstadt, December 5, 2016 – It's one of the world's most important specialist conferences for artificial intelligence: Every year the Conference and Workshop on Neural Information Processing Systems (NIPS) presents advances in the fields of machine learning and computational neuroscience. Audi is showcasing its expertise at the conference for the first time. From December 5 to 10, 2016, in Barcelona, the premium automaker is showing with the aid of a scale model how a car develops intelligent parking strategies. The car manufacturer is also providing specialists and potential applicants with information on jobs in innovative fields.

Self-learning systems are a key technology for piloted driving cars. That's why Audi has already built up a wealth of know-how in machine learning. The company is the only automaker represented at NIPS with its own stand and a showcase. A 1:8 scale model car – the "Audi Q2 deep learning concept" – is demonstrating an intelligent parking process. On an area measuring 3 x 3 meters, it autonomously searches for and finds a suitable parking space in the form of a metal frame, and then parks itself there.

The Audi Q2 deep learning concept's sensor technology consists of two mono cameras, facing forward and toward the rear, along with ten ultrasonic sensors positioned at points all around the model. A central on-board computer converts their data into control signals for steering and the electric motor. On the driving surface, the model car first determines its position relative to the parking space. As soon as it perceives the position, it calculates how it can safely drive to its targeted destination. The model car maneuvers, steers and drives forward or in reverse, depending on the situation.

The model car's parking ability is made possible by deep reinforcement learning. In other words, the system essentially learns through trial and error. To begin, the car selects its direction of travel at random. An algorithm autonomously identifies the successful actions, thus continually refining the parking strategy. So in the end the system is able to solve even difficult problems autonomously.

*The collective fuel consumption values of all models named and available on the German market can be found in the list provided at the end of this MediaInfo.

The Audi Q2 deep learning concept is a pre-development project of Audi Electronics Venture (AEV), an AUDI AG subsidiary in Gaimersheim, Germany. In the next step, the developers are transferring the parking-space search process to a real car.

The Audi global network encompasses not only research institutes, but also companies from hotspots in California's Silicon Valley, Europe and Israel. The premium manufacturer is working with partners including Mobileye, the world's leading company in the field of image recognition. In this partnership, the two companies combined their expertise to develop a deep learning-based software for environment perception systems. Audi will use the software for the first time in 2017, in the central driver assistance controller (zFAS) in the new generation of the Audi A8. NVIDIA, a leader in the field of hardware systems with an associated development environment, was an important partner in the development of the zFAS. These technical solutions will enable the customer to enjoy piloted driving in traffic jam situations as well as piloted parking.

Audi is further intensifying its collaborations with partners from high-tech industries through an increasing degree of integration of components with artificial intelligence (AI). These forms of artificial intelligence are important for dealing with challenging situations such as urban traffic. It enables piloted driving cars to evaluate their complex surroundings and perform necessary driving maneuvers accordingly.

Also at NIPS to gain insights into these and other exciting developments will be AI specialists interested in working on innovations at Audi. Specialists and HR experts from the company will be at the event to provide them with information on a range of career opportunities. At Audi the specialists will have opportunities to help shape the role of AI in the automotive industry by applying their knowledge in the areas of machine learning, cloud computing, data analytics and vehicle architecture.

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