

BRAIN TO VEHICLE TECHNOLOGY - TAKING THE ARTIFICIAL OUT OF INTELLIGENCE TO IMPROVE THE DRIVING EXPERIENCE

25 January 2018

Nissan took the opportunity at this year's Consumer Electronics Show (CES) to showcase its latest efforts to add a layer of artificial intelligence (AI) to its vehicle driving technology.

Nissan announced that it is developing brain to vehicle (B2V) technology for fitment into its future vehicles which is intended to enhance both vehicle safety and vehicle enjoyment, with applications in both autonomous and non-autonomous driving scenarios. Nissan's implementation of B2V involves a vehicle analysing the driver's brain activity via specialist headgear worn by the driver whilst the vehicle is in motion. Brainwave analysis is done in real time, with its application differing depending on whether the vehicle is in autonomous mode or manual mode.

In autonomous mode, B2V technology will allow the vehicle to detect a driver's perception of the vehicle's driving performance and adjust itself to better suit the driver's expectations on how the vehicle should be driven. Examples of such analysis range from the speed that the vehicle is travelling at or whether it should be more active in driving style or more passive. Analysis of brain activity over time is intended to shape autonomous mode characteristics over time for that driver, in a similar way to how modern automatic transmissions are designed to adapt shifting styles based on the previous driving behaviour of the driver over time.

Nissan sees B2V technology assisting autonomous mode driving by providing a bridge between the driver and the vehicle, so that the vehicle is reacting and adapting to the driver's expectations during an autonomous drive. The goal here, according to Nissan, is for a vehicle being driving in autonomous mode to be a partner to its occupants in the driving experience and thereby enhance the autonomous driving experience, rather than simply being a conduit for a functional vehicle journey from point A to point B.

Nissan also points out that B2V also has an application in manual driving as well as autonomous driving. In manual driving mode, the aim of brain analysis is to identify intended driving actions, such as accelerating, braking or turning, as soon as the driver has thought of such actions but prior to such driving actions being executed. At its demonstration at CES, Nissan explained that its B2V technology is sufficiently quick to accurately predict a driver's proposed driving actions in the short gap in time between the action being thought by the driver's brain and the action being executed by the driver. It is during this small gap in time that B2V would have a role to enhance the vehicle's driving characteristics by anticipating upcoming driving actions and assisting the driver by starting such actions in advance of the driver doing so. Examples of this would be where the driver is about to turn a corner on a winding road by shifting the transmission to a lower gear and starting to turn the wheel, or if an emergency situation is anticipated, to start engaging the brakes or hazard lights. B2V technology in this type of application could have two different effects: it could improve the driver's driving experience behind the wheel by enhancing the driver's driving skills, or it could enhance the safety of a vehicle by using the driver's senses (and the driver's brain's analysis of their own senses) as an additional sensor for the engagement of a vehicle's safety systems in an emergency situation.

One necessary element of Nissan's B2V system is for the driver to wear a headcap to enable the vehicle to analyse the driver's brain activity when the vehicle is in motion. The cap used for demonstrations didn't appear to be too intrusive on the example drivers, but the cap still had a reasonable bulk to it in order to incorporate the required sensors. As B2V technology is being progressed by Nissan, hopefully improvements will be made to the headgear that will need to be used to facilitate this technology, so that such headgear becomes lighter and less obtrusive to the user and to avoid the headgear potentially becoming a liability to the user in the event of a collision.

It also remains to be seen whether Nissan will widen its application of B2V technology to other occupants in an autonomous vehicle, so that the autonomous driving experience will be influenced by more than one particular occupant in an autonomous vehicle. Whether Nissan chooses to explore this potential, and how Nissan will prioritise differing occupants' conflicting perspectives on an autonomous driving experience, will be an interesting potential future development in B2V and AI technology.

Another unanswered question would be whether B2V technology will be implemented with communal Level 5 autonomous vehicles, as Nissan's use cases appear to be focussed primarily on Level 4 autonomous vehicles that are privately held. Extending B2V technology to communal Level 5 autonomous vehicles raises questions on availability and maintenance of the required headgear (such as users having to purchase compatible

headgear or addressing issues such as hygiene if communal headgear is offered), how to distinguish between various users of communal vehicles (where previous preferences and data is retained for future use in the same vehicle or across a vehicle fleet) and ownership of a user's data that is retained as part of the use of the technology.

Whilst it is still early days for B2V technology, Nissan has shown a significant advance in vehicle technology by being able to use the driver's brain as an additional input source for data in the vehicle driving process, whether the vehicle is in autonomous (Level 4/Level 5 autonomous driving) mode or as a driver aid when a vehicle is being manually driven (Level 2 autonomous driving). The potential for B2V technology to add a layer of AI to autonomous driving is apparent, and has the potential to be a more sophisticated form of AI than an algorithm might be in conjunction with other data sources. However, the potential for B2V technology to enhance safety for non-autonomous driving should not be underestimated, and demonstrates how advances in autonomous driving technology will continue to have application to non-autonomous vehicles in the future.

For more information on Nissan's Brain to Vehicle technology, please refer to [Nissan's webpage on brain to vehicle technology](#). For more information on levels of autonomy for autonomous vehicles, please refer to [SAE International's Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles](#).

NOT LEGAL ADVICE. Information made available on this website in any form is for information purposes only. It is not, and should not be taken as, legal advice. You should not rely on, or take or fail to take any action based upon this information. Never disregard professional legal advice or delay in seeking legal advice because of something you have read on this website. Gowling WLG professionals will be pleased to discuss resolutions to specific legal concerns you may have.

Related [Automotive](#), [Tech](#), [Autonomous](#), [Connected](#), [Electric](#) and [Shared Vehicles](#)