

Intelligent learning navigation system helps drivers save fuel.

BMW Group Research and Technology are developing an intelligent navigation system – for increased convenience, performance and fuel economy.

Munich. Navigation systems are a popular and reliable way of getting to a desired destination. Now the BMW Group's Research and Technology arm is opening up whole new possibilities for navigation systems technology, by endowing them with artificial intelligence and teaching them basic learning skills. Even without entering a destination, this will allow navigation systems of the future to do things like warn of traffic hold-ups or improve fuel efficiency.

Learning to be proactive.

The researchers have converted a BMW 3 Series model into a prototype platform for a navigation system that can predict where the driver will be heading, and what route will be chosen, even when the driver has not entered a destination. Project manager Andreas Winckler dubs the system a "self-teaching route predictor". He continues: "We are working on getting vehicles not only to react to the driver's commands but also to be proactive. In that way a vehicle will be able to prepare itself for future events. The upshot is increased convenience, performance and fuel economy – in other words, everything you would expect of BMW EfficientDynamics."

To develop this proactive capability, the navigation system must first be "taught how to learn". A secure profile is created for each driver in which past journey history is recorded. This will include not only destinations, short cuts and "rat runs" used en route, but also information such as time of day and seat occupancy. Andreas Winckler has already acted as a guinea pig himself: "If it's a Monday morning, my car decides that my workplace will be my likeliest destination. If my child is also on board, the navigation system will plan for a detour past the school. Or if it's a Saturday morning, my personal route planner decides that I'm most likely to be heading to the sports centre." The prototype has already developed a formidable talent for this kind of forecasting: success rates have now risen to around 70 percent, compared with 30 percent at the start of the project.

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Increased convenience, performance and fuel economy.

All this helps to make the driver's life considerably easier. Early warnings of congestion, rapid selection of the most likely destination, as opposed to the most recent or one from the address book, and cross-checking of predictions against the personal calendar function in the driver's Smartphone are just the first of many potential functions.

Things really start to get interesting when the developers go on to integrate the intelligent navigation system with the vehicle's own internal systems – that is to say when data from the navigation system is integrated in the BMW EfficientDynamics fuel-saving features. By way of example, regenerative braking presently only operates when the engine is on overrun, say when actually descending a hill. But with proactive navigation, regenerative braking can already start saving fuel well before the downhill section – because the system knows that at that point on the route the battery will be recharged. And if the driver plays his part too, for example by making use of information about a currently hidden speed limit that's coming up 500 metres ahead, reducing his speed gradually rather than hitting the brakes at the last minute, then proactive energy management on future vehicles could achieve fuel savings of between 5 and 10 percent. To take a completely different situation, the system can also help out if the driver is about to join a motorway: the combustion process can be modified, the engine oil and coolant temperature adapted and the automatic transmission prepared for the upcoming gearshift. This will make more power available for accelerating on the slip road. "With this concept of integrating intelligent learning navigation into our vehicles we will be able to further refine our BMW EfficientDynamics strategy and to systematically introduce the new features in our products," says Professor Dr Raymond Freymann, Director of BMW Group Research and Technology.

Expandability.

The developers are currently hard at work on further potential features too. For hybrid drive vehicles in particular, information about, say, the beginning and end of upcoming speed restrictions can prove very useful, allowing the battery charge to be optimally managed and utilised. The BMW Research and

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Technology prototype is also equipped with the road sign recognition camera already used on the new BMW 7 Series. This camera can “teach” the navigation system about any speed limits it may be unaware of. Another potential application would be to use the vehicle’s sensing systems to inform the intelligent navigation system about the radius of upcoming corners, or about road topography. Robert Hein, head of Future Navigation and Data Services, has big plans: “The magic word for the future is integration. The great advantage of innovations like the intelligent learning navigation system is that we don’t need to weigh the vehicle down with additional heavy control units. At present however, the big constraint is memory capacity. But we are optimistic that by the time the next generation of vehicles comes on the market this problem, too, might have been resolved.”

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