Driver's-ed-inspired system could make automated parallel parking more accessible

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One of the most challenging tasks for drivers is parallel parking, which is why automatic parking systems are becoming a popular feature on some vehicles. However, the cost of designing and implementing such

computing-intensive systems can significantly increase a vehicle's price, creating a barrier to adding the feature in many models.

Now, researchers have developed a more efficient automated parking guidance control strategy that mimics the approach to parallel parking commonly used by human drivers. This new, simpler automatic parking method has the potential to reduce the computing and storage resources required in the vehicle, which could lead to lower system costs and higher adoption rates by vehicle manufacturers.

The results of the research is published in *IEEE/CAA Journal of Automatica Sinica*, a joint publication of the Institute of Electrical and Electronics Engineers (IEEE) and the Chinese Association of Automation (CAA).

"We observed the way students typically learn how to parallel park in driving schools and determined that they use a relatively simple three-step process," said Li Li with the Department of Automation at Tsinghua University in Beijing, China. "Unlike conventional approaches to automatic parking, our new method focuses on simplifying control rules and strategies, rather than adding complicated feedback controllers and technical assistance systems."

The three-step guidance control strategy is based on the parallel parking method taught in many driver education classes. First, drivers align their vehicle next to the car in front of the open parking space. Next, the drivers back their vehicle up while making a hard-right turn until reaching a critical angle position. Finally, the drivers turn the steering wheel to a hard-left position and continue backing up until arriving in the parked position.

"By reducing the parking process to three simple steps, we limit the number of variables to five, of which the maximum allowable steering

angle and velocity can be determined in advance," said co-author Lingxi Li, associate professor at Indiana University-Purdue University in Indianapolis. "Therefore, we can focus on controlling for just three variables—the starting point, the size of the open parking space and the critical angle position. This greatly simplifies designing and implementing the programming and computational resources for the onboard parking system."

The researchers plan to explore other methods of integrating human driving experiences in hybrid-augmented intelligence systems for future intelligent vehicle applications.

More information: Jiyuan Tan et al. Guidance control for parallel parking tasks, *IEEE/CAA Journal of Automatica Sinica* (2020). DOI: 10.1109/JAS.2019.1911855

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