New method proposed to achieve better robot self-learning

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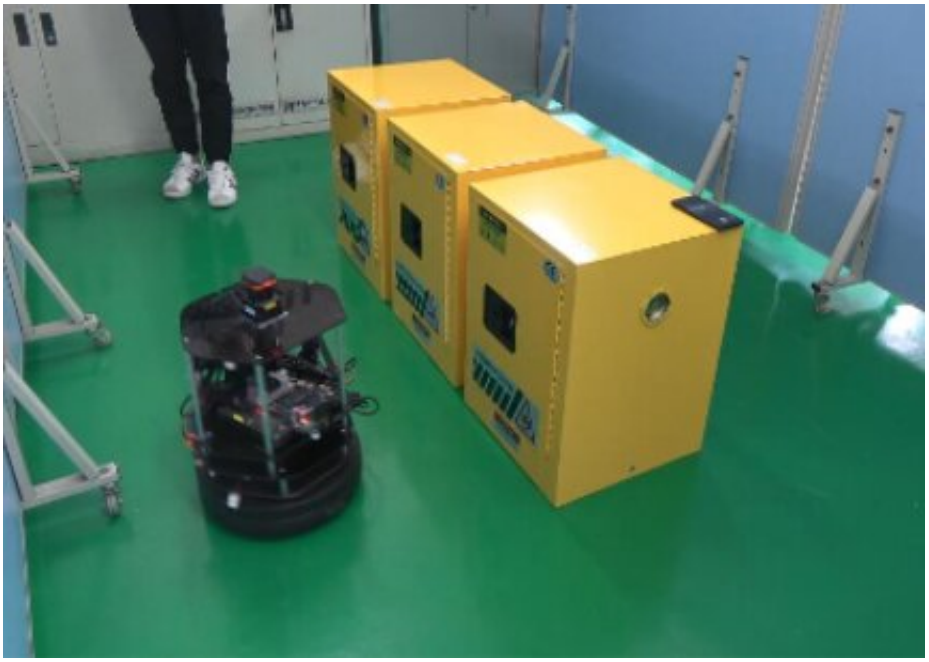

Reseearchers conducting experiment on mobile robot. Credit: HU Yanming

Human beings show amazing adaptability when dealing with complex tasks in daily life. This adaptability is the direct embodiment of individual learning ability, which enables human beings to improve their own behavior ability independently and incrementally.

Therefore, if robots can have this ability, they can automatically generate new behavior patterns according to the real-time acquisition of data and

cases. This ability shows obvious intelligence, which is called behavioral intelligence.

Recently, the researcher at Shenyang Institute of automation of the Chinese Academy of Sciences developed a new method developed a new method to improve the behavioral intelligence of robots, related results were published on *IEEE Transactions on Cognitive and Developmental Systems*.

The researcher proposed a new framework of incremental learning method based on Q-Learning and adaptive kernel linear (AKL) model. The framework allows robot to learn new behaviors without forgetting the previous ones. Under the new method, robot behaviors can be evaluated by means of autonomous learning and imitation learning, and the model structure and parameters can be changed in real time using a novel L2-norm kernel recursive least squares (L2-KRLS) algorithm.

Besides, they conducted two experiments to validate the performance of the new method. Results showed that the proposed framework can incrementally learn behaviors in varying environments. Local -greedy policy-based Q-learning is faster than existing Q-learning algorithms. At present, this achievement has been applied in robot autonomous navigation.

More information: Yanming Hu et al. Incremental Learning Framework for Autonomous Robots based on Q-learning and the Adaptive Kernel Linear Model, *IEEE Transactions on Cognitive and Developmental Systems* (2019). DOI: 10.1109/TCDS.2019.2962228

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