Control of snake-like robots for high mobility and dexterity

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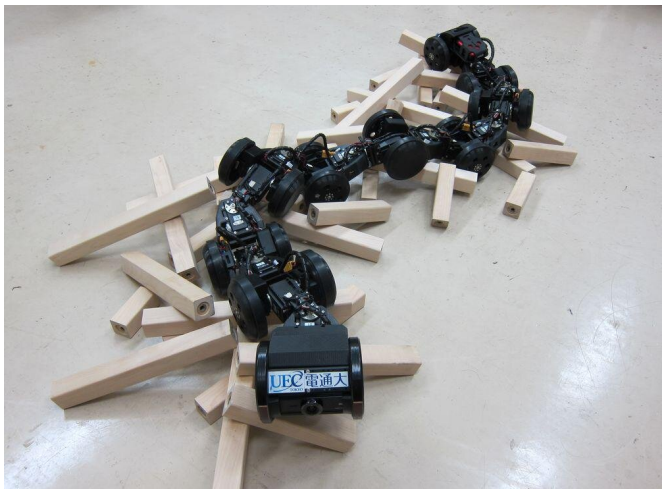

The snake-like robot T^2 Snake-3. Credit: University of Electro Communications

Snake-like articulated mobile robots can enter narrow spaces and climb obstacles using their long and thin bodies, and are effective for inspection of narrow spaces and search-and-rescue operation on disaster sites. However, it is difficult to control their precise movements because they have so many actuators.

Now, Motoyasu Tanaka and colleagues at the University of Electrocommunications Tokyo, propose methods to control snake-like robots for three-dimensional steering, stair climbing and manipulating objects, and have developed the snake-like robot T^2 Snake-3. In three-dimensional steering, the robot follows the surrounding terrain by relaxing its joints, and then resumes to move from the robot's posture. The operator can easily control and move the robot on uneven terrain by this method. For climbing stairs, the robot autonomously shifts its motion on stairs from head to tail at the appropriate timing because data of sensors attached to the bottom of the robot are used to trigger the motion. For manipulating an object, the position and orientation of the gripper attached onto the robot's head is controlled by keeping the appropriate posture by autonomously selecting the allocation of the lifted/grounded wheels. Although the robot T^2 Snake-3 has approximately thirty actuators, the operator can easily operate the robot by using these methods and a gamepad.

The robot T^2 Snake-3 entered narrow spaces, climbing a one meter high step, climbing stairs, and rotating valves by using the proposed methods. The snake-like robot was controlled effectively for inspection equipment and disaster response.

More information: Motoyasu Tanaka et al. Development and Control of Articulated Mobile Robot for Climbing Steep Stairs, *IEEE/ASME Transactions on Mechatronics* (2018). DOI: 10.1109/TMECH.2018.2792013

Motoyasu Tanaka et al. Task-Space Control of Articulated Mobile Robots With a Soft Gripper for Operations, *IEEE Transactions on Robotics* (2018). DOI: 10.1109/TRO.2018.2878361

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