Using Semi Flexible and Deformable Bionic Crawler Robot to Adapt Complicated Terrains

Sheng, Jiarong (School: Shanghai Pinghe Bilingual School)

Flexibility in structure is required for rescue tasks in disaster relief. However, most current track robots are with rigid chassis structures which are not suitable for unstable terrains or high obstacles. Therefore, this project designs a semi-flexible crawler robot with flexible chassis structure. By imitating the movement of mollusc, the new robot achieves its flexibility with the help of an articulated chassis connected by hinge structure. Two driving wheels are used to actuate the same track, such that different moving patterns can be achieved by means of differential motion of the front and the rear driving wheels. As a result, the new crawler robot can not only move forward and backward, but also tilt up like a “V” shape or bend down like a “^” shape. Hence, it rises the height between the front driving wheel and the ground, improving the robot’s ability of crossing obstacles. By simulating terrains in mountains, obstacle and trenches of different heights and lengths are used to examine the robot’s adaptability. The results show that the robot’s flexible structure can effectively make its movements more agile, thus crossing over complicated terrain with relatively higher obstacles. The robot can climb over obstacles with a maximum height of 180mm and cross over ditches with a maximum length of 195mm. Its loading capacity is 117.6g. Hence, the robot is considered capable of accomplishing the tasks of disaster relief assistance or prospection, and more adaptable to complicated terrains.

Awards Won:

Third Award of $1,000