Lei Cai et al., Adv Robot Autom, 6:3 (Suppl)
DOI: 10.4172/2168-9695-C1-011

Turning behavior elicited by electrical stimulation in a robo-pigeon

Lei Cai[1], Zhendong Dai[2], Hao Wang[2], Wenbo Wang[2], Yaohong Ma[1] and Jianguo Shi[1]
[1]Biology Institute of Shandong Academy of Sciences, China
[2]Nanjing University of Aeronautics and Astronautics, China

Pigeons can be an ideal animal for the study of flying bio-robot, not only because it has sustained flying ability, load-bearing and good orienting abilities, but also because it has superiority in motion concealment, obstacle avoidance and a complete autonomous intelligent in against environment interference. In order to develop bio-robot pigeon, we studied the movement regulation function of the midbrain nuclei and other adjacent structures in pigeon. Electrical stimulation was applied in investigating the movement regulation mechanisms in pigeons under light anesthesia and freely moving conditions respectively. In the acute experiment (under light anesthesia), the pigeon was fixed to a special head adapter, after the pain reflex disappeared, then removed the scalp above the surgical field, followed by removal of the cranium with a dental drill and removal of the dura and arachnoid under stereomicroscopy. Electrical micro-stimulation (intensity=30 μA; pulse duration=1.0 ms; frequency=80 Hz) was applied to locate and verify the turning related brain regions. The most eligible location was marked using an anodal DC current (40 μA for 20 s) to deposit iron ions. After the histological localization, the brain regions related to turning behavior mainly focused in the formation reticularis medialis, tractus vestibulomesencephalicus and the nucleus vestibularis lateralis. In the chronic experiment (in freely moving conditions), microelectrodes were implanted into the brain regions determined in the acute experiment and then a brain computer interface was fixed on the pigeon's skull. After the pigeon recovery, via a wireless remote-control stimulator, we successfully induced turning behavior in freely moving pigeons. Our study suggested that pigeon's midbrain played an important role in modulating the pigeon's turning behavior. This work will provide new knowledge in flying bio-robot research and birds' locomotion induction.

Recent Publications

1.Cai L, Dai Z D, Wang W B, Wang H and Tang Y Z (2015) Modulating motor behaviors by electrical stimulation of specific nuclei in pigeons. *Journal of Bionic Engineering*; 12(4): 555-564.

2.Cai L, Mei H, Wang W B, Wang H and Dai Z D (2014) Research on morphology specificity of gecko feet at different scales. *Applied Mechanics and Materials*; 461: 284-290.

Biography

Lei Cai has completed his BS and MS degrees in the College Life Sciences, Shandong Normal University, Jinan and a PhD degree in Mechanical Design and Theory from Nanjing University of Aeronautics and Astronautics, Nanjing. He is the author of more than 20 articles and 6 China invention patents. His research interests include bio-robot, biosensors technology and animal locomotion control. He is a Member of the International Society of Bionic Engineering.

caileitcl@163.com

Notes: