The long-acting walking control of a cockroach bio-bot for vision-aided pipeline navigation

Yao Li¹
Songsong Ma¹, Shen Liu, Songlin Yang, Yuansheng Chen and Bing Li¹
¹ Harbin Institute of Technology, Shenzhen

Many small bionic crawling robots have been invented for search and rescue missions in narrow spaces. However, their locomotion capability is far from that of insects of the same size. Transforming a cockroach into a bio-bot has been a hot topic in the past decade. Herein, we modified this insect to perform surveillance work in dark confined environments. The synergistic electrical stimulation for turning control was proposed by alternating electrical stimulation of the cerci and antennae every 5 trials. The result showed that this method was able to control cockroaches turning steadily 117 times. An electronic backpack was designed, which was capable of transmitting images in real-time, and a light emitting diode (LED) was installed on the backpack providing a light source for the camera. Thus, a vision-aided navigation system was formed for dark confined environments, e.g. pipelines. With a host computer software, the operator controlled the bio-bot to pass through a completely dark and closed pipeline. The electronic backpack and the host computer were connected via transmission control protocol (TCP), which allows the operator to manipulate the bio-robot remotely. This technology can be applied in pipeline surveillance in the future.