Exploring insect adaptability with the insect-controlled robot

Noriyasu Ando[1] and Ryohei Kanzaki[1]

[1]Research Center for Advanced Science and Technology, The University of Tokyo, Japan

Insects have a capability to behave in accordance with a ceaselessly changing environment in their small and simple nervous systems. Since the adaptive behaviors are generated by interactions between brain, body and external environment, manipulation of the interactions are necessary for analyses of the insect adaptability. We have employed a robot to manipulate the interaction and developed an insect- controlled robot. The robot is driven by a male silkmoth, which performs pheromone plume tracking behavior. Using the robot, we can manipulate physical properties of the robot easily, and examine how the pilot moth reacts to the perturbations. We conducted experiments to evaluate 1) how the silkmoth compensates physical asymmetry and 2) significance of sensing spatial gradients of pheromone by switching olfactory inputs on right and left sides. The results indicated that the moth was capable to use visual information to compensate unintentional movements (optomotor response), and pheromone gradients were necessary for heading toward pheromone source but not for staying in the plume. We therefore think that the programmed behavior of the silkmoth is robust and capable to track pheromone plume even in the unnatural situations. This research was supported by Grant-in-Aid for Young Scientists (B), MEXT.