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A bio-inspired robot accounts for insect behavior

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Based on a biorobotic approach developed in our laboratory over the past 25 years, we have built several terrestrial and aerial vehicles controlled on the basis of Optic Flow (OF) cues [Rev. Franceschini, 2009, Acta Futura, 3, 15-34]. The LORA III robot is a miniature hovercraft that perceives the environment by means of neuromimetic OF sensors. To understand how honeybees may follow a wall [Serres et al., 2008, Naturwissenschaften, 95(10), 1181-1187], center along a corridor and adjust their speed to the corridor width [Srinivasan et al., 1996, J. Exp. Biol., 199, 237-244], we developed a vision-based autopilot, which consists of a dual OF regulator controlling the hovercraft’s translations [Serres et al., 2008, Autom. Rob., 25(1-2), 103-122]. Yaw disturbances introduce adverse rotational OF component, which do not depend on the distance to obstacles. The robot’s gaze therefore requires to be stabilized in yaw to make sure the robot will measure only the translational OF component, as suggested by several insects [Wagner, 1986, Phil. Trans. R. Soc. Lond. B, 337, 527-551] [Boeddeker & Hemmi, 2010, Phil. Trans. R. Soc. Lond. B, 277(1685), 1209-1217] [Zeil et al., 2008, Current Biol., 18(8), 320-323]. Our biorobotic approach allowed us to better appreciate the fundamental role of gaze locking in flying animals.