ALV+IN: An Intelligent Stereoscopic Olfactory System for Autonomous Localization of Volatile Organic Compounds

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Electronic noses, or e-noses, are still a very new concept in modern research; and while few working prototypes exist, the implications of such devices are huge. Harnessing odor-tracking technologies could lead to increased food safety, workplace safety, and even early disease detection. In this study, we focused on the detection of airborne VOCs. The purpose of this study was to design, build, and test a proof-of-concept, bio-inspired odor localizing robot to track and locate the source of an airborne odor. Inspired by the functionality of a dog's nose as well as the odor tracking capabilities of lobsters and moths, the project was carried out in three sections: designing and building a robot base with a stereo-olfactory system, calibrating the olfactory system sensors to utilize normalized sensor readings, and creating a unique odor localizing algorithm to allow for autonomous localization of an odor source. ALV+IN, or the Autonomous Localization Vehicle with an Intelligent Nose, utilizes previous normalized sensor readings to determine a path of travel through a butane plume to its source. Though ALV+IN can successfully locate odors as they move with the robot, this study was limited by safety constraints. This was due to the feasibility of simulating large-scale odor plumes to produce fully autonomous results. In a real-world implementation, such a device could greatly improve efforts in detecting hazardous gas leaks. In a humanitarian setting, such a device could be used to assist in natural disaster recovery efforts.