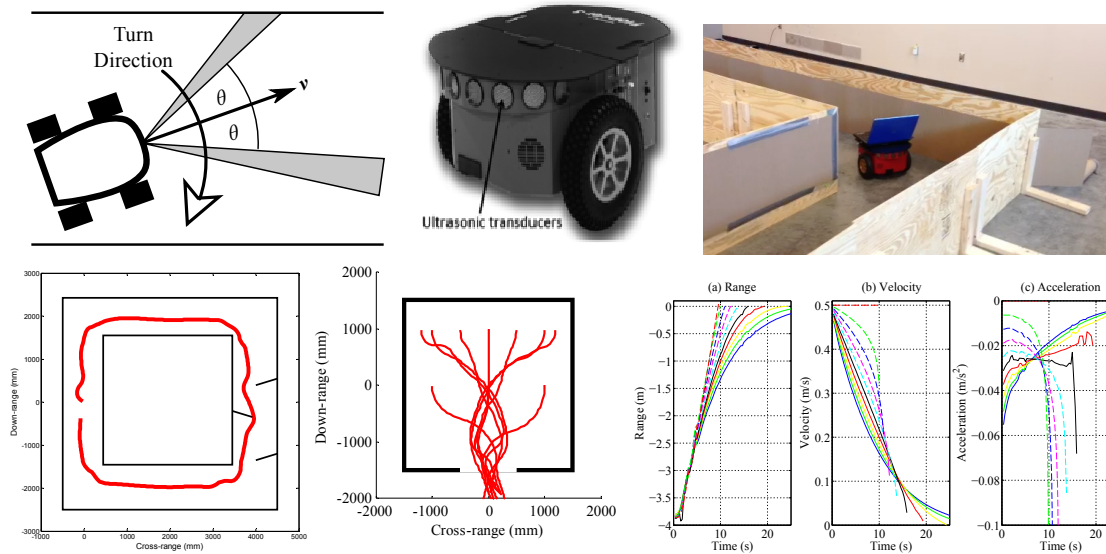


# Echoic Flow Cognitive Radar for Robotic Vehicles

**PI:** Graeme E. Smith, and Christopher J. Baker, The Ohio State University  
**Sponsor:** ElectroScience Lab Consortium On Electromagnetics & Radio Frequencies



Flow theory is a concept proposed by perception researchers, to explain how mammals, like bats, whales and humans, perceive their environment [1]. Recently, researchers from The Ohio State University applied the concept of echoic flow to cognitive radar sensors. The proposed echoic flow is defined [2], as the ratio of a sensor measurable parameter to a change in that parameter over a unit of time. We have built an experimental system to demonstrate that a cognitive radar utilizing echoic flow is able to guide a robotic vehicle around a corridor, avoid obstacles, successfully traverse apertures and control braking. The echoic flow aided cognitive radar relies on a perception-action cycle in which echoic flow is the perception, and steering instructions are the actions. By using the cognitive, bio-inspired approach the need for performing complex kinematic calculations is avoided. Rather the system mimics the cognitive processes of biological organisms and thus requires only simple control rule. Furthermore, the motions of the robotic vehicle have a naturalistic form consistent with the use of control concepts similar to those found in nature.

## Further Reading:

- [1] D. Lee, "General tau theory: evolution to date," *Perception*, vol. 38, pp. 837–858, 2009.
- [2] C. J. Baker, G. E. Smith, A. Balleri, M. Holderied, and H. D. Griffiths, "Biomimetic Echolocation With Application to Radar and Sonar Sensing," *Proc. IEEE*, vol. 102, no. 4, pp. 447–458, Apr. 2014.