NYU TANDON SCHOOL OF ENGINEERING

PRESS OFFICE • 1 MetroTech Center, 19th Floor, Brooklyn, NY 11201

CONTACT • Kathleen Hamilton
646.997.3792 / mobile 347.843.9782
kathleen.hamilton@nyu.edu

Note: Images available at http://dam.engineering.nyu.edu/?c=2039&k=c81ba06d47
Immediate Release:
Wednesday, February 7, 2018

THE ROBOTS WILL SEE YOU NOW

NYU Tandon Researchers Publish First Experiments of Robotic Fish that Can See and Mimic Live Fish

BROOKLYN, New York – For more than a decade, biomimetic robots have been deployed alongside live animals to better understand the drivers of animal behavior, including social cues, fear, leadership, and even courtship. The encounters have always been unidirectional; the animals observe and respond to the robots. But in the lab of Maurizio Porfiri, a professor of mechanical and aerospace engineering at the NYU Tandon School of Engineering, the robots can now watch back.

Porfiri and a team of collaborators tapped advances in real-time tracking software and robotics to design and test the first closed-loop control system featuring a bioinspired robotic replica interacting in three dimensions with live zebrafish. The system allows the robotic replica to both "see" and mimic the behavior of live zebrafish in real time. The results of these experiments, which represent the first of their kind with zebrafish, were published in *Scientific Reports*.

The team tested the interaction of the robotic replica and live zebrafish under several different experimental conditions, but in all cases, the replica and the live fish were separated by a transparent panel. In preference tests, zebrafish showed greater affinity— and, importantly, no signs of anxiety or fear — toward a robotic replica that mirrored its own behavior rather than a robot that followed a pre-set pattern of swimming.

Porfiri noted that while mirroring is a basic, limited form of social interaction, these experiments are a powerful first step toward enriching the exchange between robots and live animals. "This form of mirroring is a very simple social behavior, in which the replica seeks only to stay as close as possible to the live animal. But this is the baseline for the types of interactions we're hoping to build between animals and robots," Porfiri said. "We now have the ability to measure the response of zebrafish to the robot in real time, and to allow the robot to watch and maneuver in real time, which is significant."

The researchers are now investigating social interactions among live zebrafish to better understand the animals' natural cues and responses. "We are learning what really matters in zebrafish social interactions, and we can use this information to help the robot interpret and respond appropriately, rather than just copying what it sees," he said.

The paper, entitled "Closed-loop Control of Zebrafish Behavior in Three Dimensions Using a Robotic Stimulus", is available at http://go.nature.com/2EhmZR1. Co-authors include NYU Tandon graduate students Changsu Kim and Tommaso Ruberto, and postdoctoral researcher Paul Phamduy.

-more-

This work was supported by the National Science Foundation.

About the New York University Tandon School of Engineering

The NYU Tandon School of Engineering dates to 1854, the founding date for both the New York University School of Civil Engineering and Architecture and the Brooklyn Collegiate and Polytechnic Institute (widely known as Brooklyn Poly). A January 2014 merger created a comprehensive school of education and research in engineering and applied sciences, rooted in a tradition of invention and entrepreneurship and dedicated to furthering technology in service to society. In addition to its main location in Brooklyn, NYU Tandon collaborates with other schools within NYU, the country's largest private research university, and is closely connected to engineering programs at NYU Abu Dhabi and NYU Shanghai. It operates Future Labs focused on start-up businesses in downtown Manhattan and Brooklyn and an award-winning online graduate program. For more information, visit http://engineering.nyu.edu.

###