Graduate Student Research Seminar

Spring 2023

Modeling the Dynamics of Soft Vibrational Bristle Bots that Navigate Pipe Systems

Ian Stewart (master's student)
Advisor: Dr. Phanindra Tallapragada

Monday, January 30th
3:00 pm (EST) – 132 Fluor Daniel Building

Abstract

Soft vibrational robots are robots that incorporate compliant structures into their design and are driven by oscillating actuators. A recent, popular version of a soft vibrational robot is the bristle bot, which uses flexible bristles and a vibration motor to propel itself across surfaces and through pipes. This motion is primarily driven by Slip-Stick dynamics resulting from asymmetric frictional forces applied at the bristle tips. Depending on the frequency of vibration of the motor, the robot experiences various resonance regions allowing it to maneuver in different directions. Attaching bristles to all sides of the robot and placing it in a pipe, these resonance regions give the potential for such a robot to navigate a pipe system. While several papers cover the robotics side of this research interest and others the analytical side of a single bristle bot on a flat surface, the dynamics of a bristle bot in a pipe and its ability to steer through pipe bifurcations has little been explored. This presentation aims to cover the process of modeling the nonlinear, Slip-Stick dynamics of the bristle bot in a pipe and how to use the resonance regions of the system to reliably steer the robot through a pipe system.

Scan the QR code for more information and a schedule of upcoming speakers!

CLEMSON
MECHANICAL ENGINEERING