Robotics in hand objects manipulations by vibrations

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Robotics has been expanded rapidly in recent years. The use of robots with artificial intelligence is becoming common in a growing number of industries.

In the field of robotic arms, there is a need for the implementation of in-hand manipulations. There are many different solutions to these manipulations, mostly complex solutions of modern and sophisticated hands at high prices. Intra-manipulations have many uses in many industries. The high cost of the proposed solutions makes it difficult to use them extensively.

In the study I participate in, we use simple and inexpensive robotic hand for in-hand manipulations. The operation is possible by using a vibration motor inside the finger that holds the object. The vibrations allow control of it within the grip. For example, using force vibrations in the finger to perform a credit card slipping for repositioning.

During the project, I will build a program that will calculate displacement at the fingertip of the robotic hand. Based on classical beam theory, the finger is modeled as a beam with a load at the end.

First, write a python program that finds the beam curvature when a static load is applied at the end. Based on the knowledge and material from the course I studied in the first semester of solid mechanics. Afterward, learn about the theory of vibration and develop the program to calculate the curvature of the beam as a function of time according to the force applied at different frequencies/vibrations.