Abstract
We are developing a mesoscale robotic device that uses layered manufacturing techniques, like those seen in circuit design. The device is a lightweight and portable fingertip-mounted haptic device that aims to create more realistic touch by providing normal, shear, and torsional feedback to the fingertips. The device will be used to measure user experience and perception in virtual reality scenarios.

Fabrication
- Fiber glass used as rigid support material
- Kapton used as flexible material a joints
- Adhesive used to mount the device into final configuration

a) Laser cut layers

b) Bonding

When assembling the layers, we can add additional stabilizing features such as pins. The layers are bonded together at high heat.

c) Release cut

We propose adding additional layers, such that there are embedded linkages held together by pins that are added before the bonding step.

d) Additional layers

Virtual Reality Integration
- A virtual reality environment will be used to assess user interactions the 4 DoF device
- A haptic rendering algorithm will be used to calculate the appropriate forces that should be delivered to the device.

Conclusions
- Created an origami device with a rigid structure and flexible joints that applies forces to the fingertips for virtual reality interactions.
- The origami structure allows for incorporating sensing technology during the fabrication process.
- The fabrication process allows for creating complex haptic technologies at low cost.

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