

Sensing Through Structure: Designing Soft Silicone Sensors

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Interactive iPhone case. Stroke the downward-facing fur for “volume down”, and the upward-facing fur for “volume up”. Push its nose for “play/pause”. The mold slice shows the location of the hidden switches.



Cat Stretch! A simple cat toy giveaway. Switches embedded in its silicone body register where the cat is stretching, turning a hard continuous problem into a discrete one.

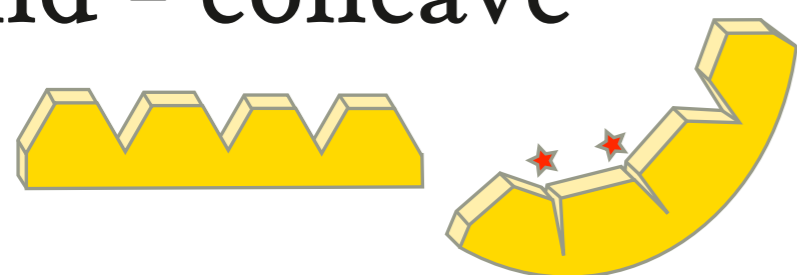
Motivation

Soft electronic toys can be made more rugged and intuitive for play when sensors are constructed as an integral part of their manufacture. With form factor and sensing designed in tandem, sensors can be optimized to directly match the affordances of the object.

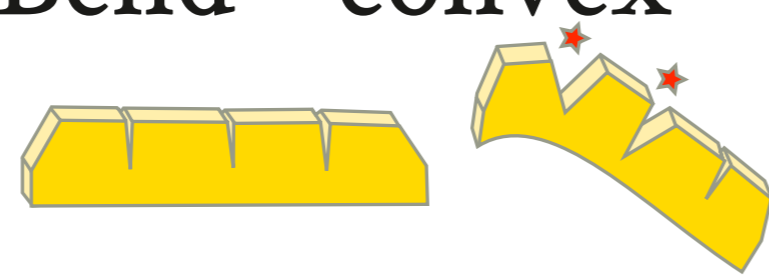
Approach

We formalize the ways one can manipulate a soft toy made of foam or silicone, and deduce simple structures for recording these motions.

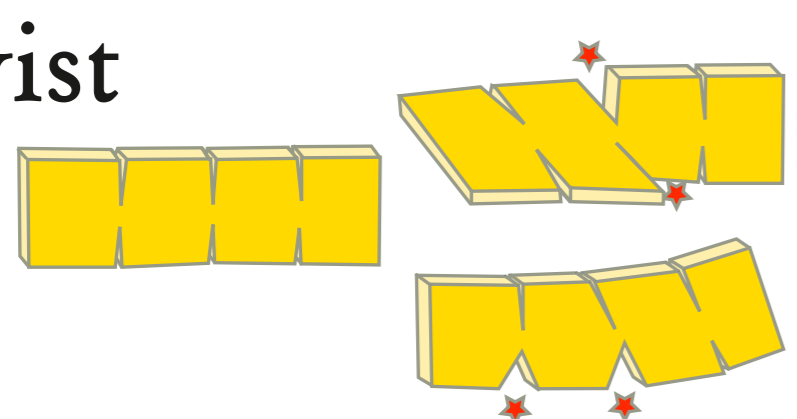
Bend - concave



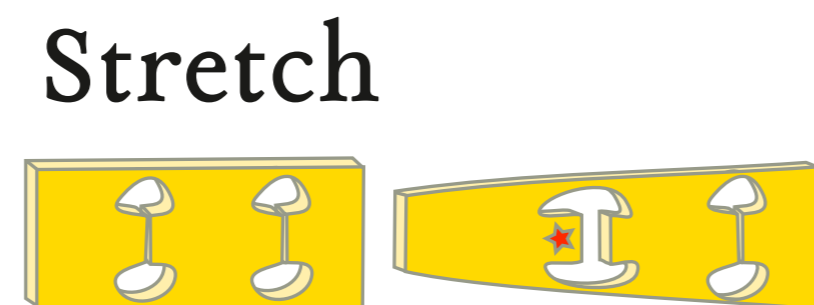
Bend - convex



Twist



Stretch

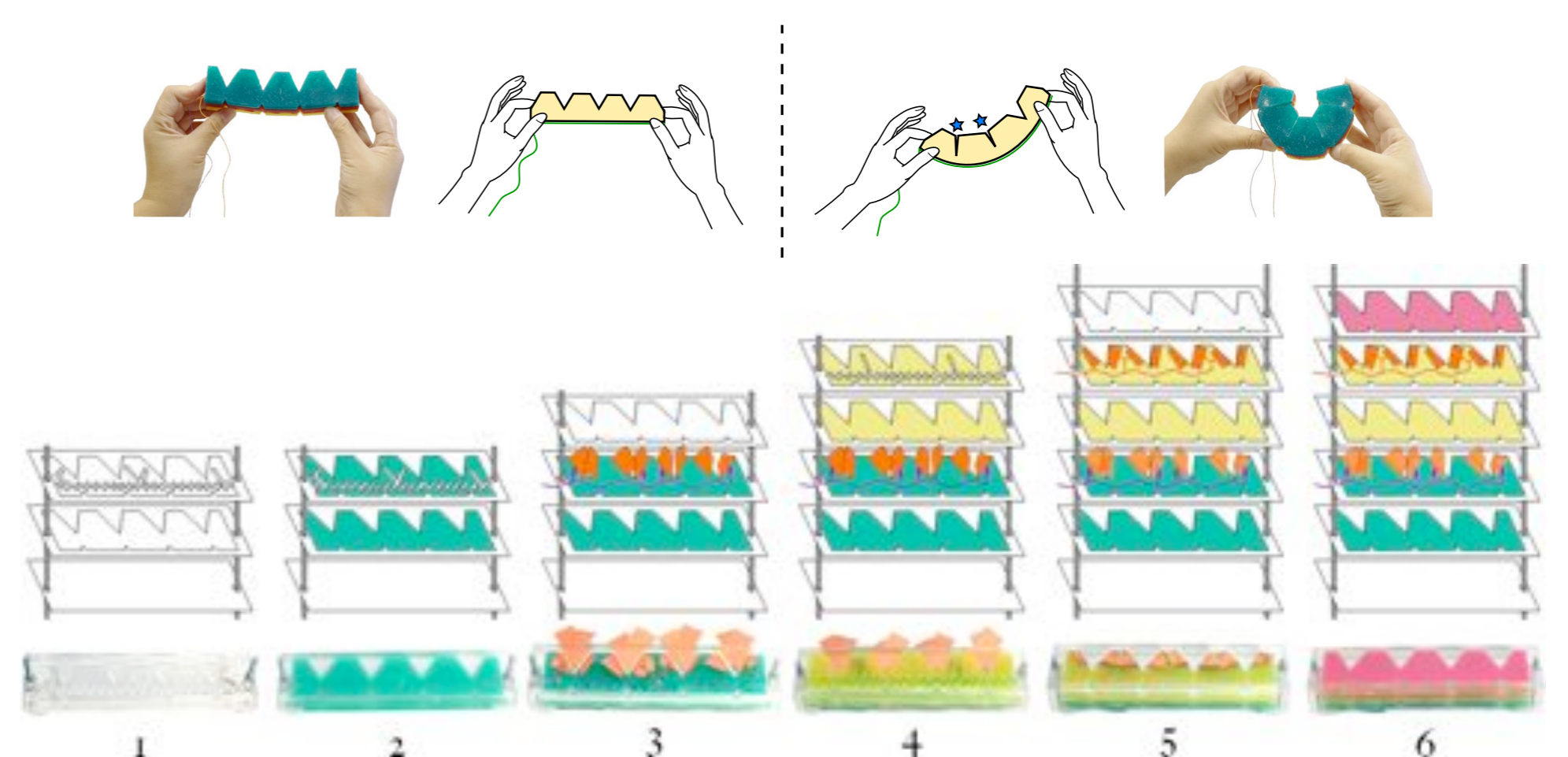


Pressure



Methods

We built silicone toys that included our switch structures as part of their manufacture. We developed a layered build process, shown for the bend sensor at the bottom of the page, which includes zig-zagging wires for strain relief and encasing in silicone the edges of the conductive-fabric switch contact pads, so they do not peel off.



Bend sensor and layered silicone molding process. Mold slices were constructed quickly and cheaply from laser-cut acrylic sheets.