

Hacking the Flavor of Food With Electric Chopsticks

Who needs salt when you have electric taste augmentation?

By **Eliza Strickland**

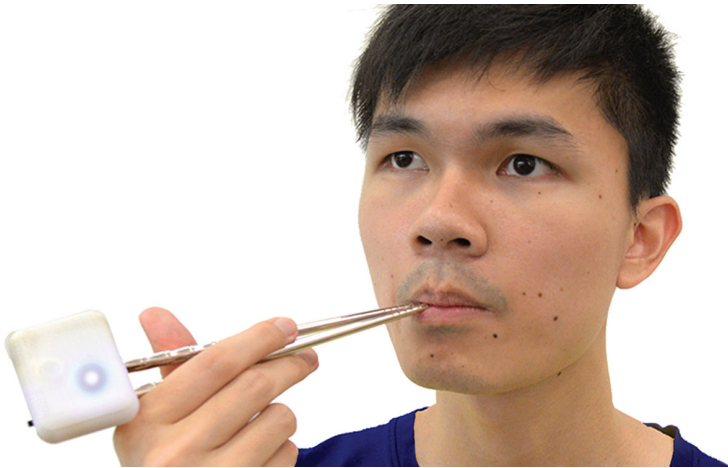


Photo: Nimesha Ranasinghe

Humans love salt, because salt makes food taste better. It's such a truism that a whole genre of folk tale exists on the theme.

But too much salt isn't good for the human body. In the United States alone, about 30 percent of all adults have high blood pressure, and should therefore reduce their sodium intake. Unfortunately, it's hard to convince people to eat bland food.

What if utensils could impart that salty flavor? That's the odd solution from Nimesha

Ranasinghe, who just joined the University of Maine as an assistant professor and director of the Multisensory Interactive Media Lab.

Ranasinghe created a pair of chopsticks with electrodes embedded in the tips, enabling them to gently zap the tongue to produce simulated flavors. Then he had people eat unsalted mashed potatoes with the chopsticks. In this study, which he describes in the journal *Food Research International*, he found that he could reliably increase the perception of saltiness.

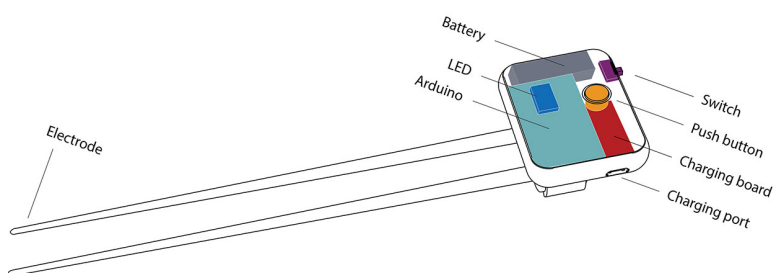


Illustration: Nimesha Ranasinghe

He imagines that such technology could one day let people hack the flavor of their food while sticking to a healthy diet. "The flavor would be external to whatever you're consuming," he says.

Ranasinghe started this work as a Ph.D. student at the National University of Singapore's CUTE Center. The center was founded by Adrian Cheok, a researcher devoted to transmitting sensations over the Internet. Cheok has sent hugs to chickens

and recently mentored a student who built a kiss transmitter.

For his Ph.D. project, Ranasinghe looked into the possibility of transmitting flavors over the Internet. He first dug up research from the 1970s about people with brain problems that caused them to lose their sense of taste. In that research, the subjects' tongues were stimulated with wires to determine how much taste sensation remained to them. The reports mentioned an incidental finding: The subjects said they also tasted something salty or sour when the electrodes were turned on.

Ranasinghe used that finding as a starting point, and started zapping tongues in the lab. "I experimented with the current's amplitude and frequency, with different materials, and with the placement of electrodes on the tongue," he says. He determined the parameters that could produce the simulated tastes of saltiness, sourness, and bitterness. The taste of sweetness is hard to produce, he says, and he couldn't test for the fifth basic taste, umami, because people aren't familiar enough with it.

Interestingly, Ranasinghe's findings have little to do with the "tongue map" you may have seen that shows each taste neatly mapped to a region of the tongue. "That's old-school," he says. Recent research shows that all regions of the tongue (except the very back) can detect all the five tastes, he says, though the thresholds for perception may be different.

Once he understood the parameters of simulated flavors, he worked on an unobtrusive way to send electric current through the tongue. "In my early experiments, when I had a lab setup with all these electrodes, people hesitated," he says. "They didn't want to put them on their tongues." So he worked on seamlessly integrating the electrical stimulation into the eating experience.



Photo: Nimesha Ranasinghe

The pair of electric chopsticks is one of his latest prototypes. For the current study, he also made an electric soup bowl that imparts flavors when people slurp directly from the bowl, as most do when consuming miso soup. (He tried to hack the flavor of miso soup using the bowl, but he thinks that even diluted soup was too salty to create a good experiment. He was able to make soup-slurpers perceive sourness and bitterness, though.)

Ranasinghe has also played around with flavor-enhancing water bottles, straws, spoons, and even an Internet-connected cocktail glass, which enables people to send virtual cocktails, or "vocktails," to distant friends.

There's one significant design constraint, however, which makes electric taste augmentation more of a geeky party trick than a viable solution for consumers. The taster's tongue must come into contact with two electrodes to complete the circuit and allow the current to flow through it.

That double contact happens fairly naturally with the rim of a glass or soup bowl, but it's less reliable with utensils. Imagine using a pair of chopsticks to pick up a piece of sushi; assuming you're adept with them, your tongue probably wouldn't touch the tip of either chopstick. That's why Ranasinghe used mashed potatoes in his experiment, he says, because people had to basically lick the mushy food from the sticks.

No matter. Ranasinghe says it's early days for this technology: "It's like TV in the 1950s." Right now, the picture might be in grainy shades of gray, he says, but one day virtual flavors will burst onto the tongue in glorious technicolor.

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