Licking this “lollipop” will let you taste virtual flavors

Demonstrating lollipop user interface to simulate taste in virtual and augmented reality environments. Credit: Lu et al, 2024/PNAS

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Virtual reality (VR) technology has long sought to incorporate the human senses into virtual and mixed-reality environments. In addition to sight and sound, researchers have been trying to add the sensation of human touch and smell via various user interfaces, as well as taste. But the latter has proved to be quite challenging. A team of Hong Kong scientists has now developed a handheld user interface shaped like a lollipop capable of re-creating several different flavors in a virtual environment, according to a new paper published in the Proceedings of the National Academy of Sciences (PNAS).

It’s well established that human taste consists of sweet, salty, sour, bitter, and umami—five basic flavors induced by chemical stimulation of the tongue and, to a lesser extent, in parts of the pharynx, larynx, and epiglottis. Recreating those sensations in VR has resulted in a handful of attempts at a flavor user interface, relying on such mechanisms as chemical, thermal, and electrical stimulation, as well as iontophoresis.

The chemical approach usually involves applying flavoring chemicals directly onto the tongue, but this requires room for bulk storage of said chemicals, and there is a long delay time that is not ideal for VR applications. Thermal variations

applied directly to the tongue can stimulate taste sensations but require a complicated system incorporating a cooling subsystem and temperature sensors, among other components.

The most mainstream method is electrical stimulation, in which the five basic flavors are simulated by varying the frequency, intensity, and direction of electrical signals on the tongue. But this method requires placing electrode patches on or near the tongue, which is awkward, and the method is prone to taste biases.

So Yiming Liu of City University of Hong Kong and co-authors opted to work with iontophoresis, in which stable taste feedback is achieved by using ions flowing through biologically safe hydrogels to transport flavor chemicals. This method is safe, requires low power consumption, allows for precise taste feedback, and offers a more natural human-machine interface. Liu et al. improved on recent advances in this area by developing their portable lollipop-shaped user interface device, which also improves flavor quality and consistency.

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