



Figure 1. Tip-Tap showing 4x4 example: (a) arrays of discrete contact points along the index and thumb tips; (b and c) pressing thumb to index creates 16 different 2D inputs



Figure 2. RFID Tip-Tap device (a) on a glove (b) as an on-skin tattoo

## Tip-Tap: Battery-free Sensing, Feedback, and Input device for Wearables and other applications

### Background

### Description of the invention

Tip-Tap is an interaction technique and related RFID-based sensing method that simplifies finger input to a discrete set of input events. The technique creates an addressable matrix of discrete input events by detecting different pinch points at the intersection of two arrays of contacts, mounted near the tips of the index finger and thumb (Figure 1). A novel RFID tag design featuring two half-antennas and multiple RFID chips (Figure 2) enables detecting touch events. A glove embodiment of Tip-Tap (Figure 2 (a)) can communicate simple input commands with a range of up to 7 meters.

### Advantages

The device/method is robust, small, simple, and “battery-free” (no power source is attached to the wearable device). It can also provide different types of passive haptic feedback.

### Potential applications

Tip-Tap embodiments in gloves or on-skin tattoos are useful for issuing simple commands where:

- a user cannot easily hold an input device and the usage context is a defined area. For example, factory workers, surgeons, or people exercising in a gym.
- Interaction with small device form factors (eg. wearables, smart watch, auto infotainment systems, etc)
- a user would like to provide an input without unnecessarily touching certain surfaces such as elevator keys, medical equipment panels retail POSE terminals, etc. in a pandemic situation similar to COVID-19.

### Reference

10181

### Patent status

US Patent 11,397,864

### Stage of development

Prototype developed  
Ongoing research

### [Technology Video](#)

### Contact

Scott Inwood  
Director of Commercialization  
Waterloo Commercialization Office  
519-888-4567, ext. 43728  
[sinwood@uwaterloo.ca](mailto:sinwood@uwaterloo.ca)  
[uwaterloo.ca/research](http://uwaterloo.ca/research)