

## Z-Ring Wearable Sensor

**The Z-Ring is a wearable input technology that leverages bio-impedance sensing to facilitate a wide range of interactions, including gesture input, object recognition, user identification, and interaction with passive user interfaces.**

### What is the Problem?

As technology seamlessly weaves itself into the fabric of our daily lives, the need for more intuitive and user-friendly interaction methods becomes increasingly important. Today's devices often depend on multiple sensors or intricate setups to recognize gestures, identify users, or interact with objects and interfaces. However, this complexity can sometimes be a double-edged sword. More sensors might mean more functionality, but it can also lead to bulkier devices, reduced user-friendliness, and increased potential for failure. It's clear that a balance needs to be struck between functionality and user experience.

### What is the Solution?

The Z-ring presents an elegant method for intuitive interaction and detection. Designed as a wearable ring, it uses electrodes on the finger to monitor the hand's electrical impedance. The impedance changes based on various factors such as finger movements, contact with different surfaces, or even the person using the ring. This allows the Z-ring, using only one sensor, to demonstrate a wide range of capabilities, including single- and two-handed gesture recognition, input using a set of passive UI elements, object recognition, and highly accurate user identification.

### What is the Competitive Advantage?

- The Z-ring uses only a single sensing methodology, a co-located electrode pair, making it well-suited for everyday use and future miniaturization
- The design of the ring is compact, using the hand as an antenna while still being able to collect a wide range of information.
- Spanning a wide breadth of tasks, the Z-ring demonstrated high accuracy in features such as single- and two-handed gesture recognition (up to 93% accuracy), tangible input with passive touch UI elements (91.8% accuracy), object recognition across six household objects (94.5% accuracy), and user identification among 14 users (99% accuracy)

### References

### Technology ID

BDP 8486

### Category

Hardware/Consumer  
Selection of Available  
Technologies

### Authors

Shwetak Patel

### Learn more



1. Anandghan Waghmare, Youssef Ben Taleb, Ishan Chatterjee, Arjun Narendra, and Shwetak Patel(45035), <https://dl.acm.org/doi/10.1145/3544548.3581422>,  
<https://dl.acm.org/doi/proceedings/10.1145/3544548>, 1-18