

Demonstration of GestuRING, a Web Tool for Ring Gesture Input

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ABSTRACT

We present use cases for GestuRING, our web-based tool providing access to 579 gesture-to-function mappings, companion YouTube videos, and numerical gesture recordings for input with smart rings. We illustrate how practitioners can employ GestuRING for the design of gesture sets for ring-based UIs by discussing two examples: (1) enhancing a smart ring application for users with motor impairments with new functions and corresponding gesture commands, and (2) identifying a gesture set for cross-device watch-ring input.

CCS CONCEPTS

• **Human-centered computing** → **Gestural input; Ubiquitous and mobile devices.**

KEYWORDS

Smart rings, gesture input, GestuRING, web tool, applications.

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1 INTRODUCTION

Smart rings are versatile wearable devices that implement a diversity of gesture-based interactions, including touch [2], mid-air [7], grasping [12], bimanual [5], and body-referenced input [6]. Designing gesture sets for smart ring UIs may involve experts [1,3] or participatory approaches where end users are elicited for their preferences for intuitive ring gestures to effect system functions [4]. Our tool, GestuRING [11], available at <http://www.eed.usv.ro/~vatavu/projects/GestuRING>, provides resources to inform the design of ring gestures by featuring 579 gesture-to-function mappings and a companion YouTube video library. In this paper, we illustrate how practitioners can employ GestuRING for various goals. To this end, we adopt the UX approach of employing *user personas* and *user scenarios*¹ to showcase practical uses of GestuRING.

¹<https://www.interaction-design.org/literature/topics/user-scenarios>. In our user scenarios, users are the practitioners employing GestuRING.

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2 USER SCENARIO #1: SMART RING APP FOR PEOPLE WITH MOTOR IMPAIRMENTS

Most smart ring products feature NFC functionality that enables mobile users to authenticate, access premises, and make payments fast and effortlessly.² Such features are convenient for people with motor impairments, since they enable simple interactions compared to other types of public display UIs with heterogeneous levels of accessibility [10]. Moreover, the global market for Bluetooth and NFC smart rings is projected to reach US\$12.6 million by 2027, according to a September 2020 Global Industry Analysis report.³

In this context, we consider the following scenario. A company that develops and sells NFC rings designed for users with motor impairments wishes to incorporate extended functionality into their products; see Figure 1, left for the persona—Richard, the lead UX designer of the product—and the corresponding user scenario. Richard employs GestuRING to identify ring gestures to enable the extended functionality desired for the company's products from close up NFC interactions to remote control of home appliances (Figure 1, right). He uses the keyword “appliance” in GestuRING and identifies three gestures: move the ring close to an appliance [13] and point upwards/downwards the wearing finger to specify the next and previous appliance from a list [8]. Richard continues his search with the keyword “TV” and finds seventeen results representing touch, free-hand, and mid-air interactions. Based on this information, Richard sets a meeting with the engineering team to discuss possible sensing solutions to implement those gestures.

3 USER SCENARIO #2: CROSS-DEVICE WATCH-RING USER INTERFACE

As smartwatches become mainstream,⁴ users rely on their functionality for health and fitness tracking, digital wallets, and replacement for smartphones. At the same time, the number of connected wearables overall is expected to reach 1 billion devices in 2022.⁵ In this context, cross-wearable input becomes an interesting option.

Imagine the scenario where a company that specializes in smart-watch software wants to expand their existing line of products with a combined watch-ring application; see Figure 2, left for an illustration of the persona—Sophia, the lead software engineer of the new application—and the corresponding user scenario. Sophia employs GestuRING to discover smart ring gestures that are also

²For example, the NFC Ring (<https://nfcring.com>) can be used to make payments, access control, unlock & control mobile devices, and transfer information among other features, and the Xenxo S-Ring (<https://www.xenxo.pro>) enables gesture-based control of a music player, Bluetooth calls, data storage, NFC payments, and others.

³Smart Rings Global Market Trajectory & Analytics, <https://www.researchandmarkets.com/reports/4845886/smart-rings-global-market-trajectory-and>.

⁴According to a June 2021 Statista report (<https://www.statista.com/statistics/878144/>), smartwatches are forecast to exceed 259 million devices by 2025.

⁵<https://www.statista.com/statistics/487291>



Richard | 32 years old | UX designer

Context: Richard works for a company that develops and sells a smart NFC ring for users with motor impairments.

Responsibilities: makes sure that the product is functional, user friendly, and adapted to the end-users' needs.

Context and goal: The company is interested in extending the functionality of their NFC smart ring with gesture input for the remote control of home appliances. Richard receives the task to document about possible interactions.



Figure 1: User scenario #1: extending the functionality of a NFC smart ring with new gestures to enable remote control of home appliances. On the right, a wheelchair user touches the display of a smart washing machine with their NFC ring.



Sophie | 29 years old | Software engineer

Context: Sophie works for a company that specializes in software applications for smartwatch wearable devices.

Responsibilities: makes sure that the software products correspond to the clients' and users' needs and requirements.

Context and goal: The company is interested in cross-device watch & ring UIs to extend the functionality of their line of smartwatch applications. Sophie receives the task to investigate gestures that work across the two devices.



Figure 2: User scenario #2: extending the functionality of a smartwatch application with ring gestures for menu navigation. On the right, a user wearing a smartwatch and a smart ring, respectively, for cross-device watch-ring input.

suitable for a watch or that work in conjunction with a watch. She uses the keyword “watch” in GestuRING and identifies a number of sixteen gestures featuring touch, free hand, and mid-air interactions, such as pointing with the index finger to control a cursor on the watch [9] or moving the finger clockwise to scroll content [7]. In a matter of minutes, Sophia manages to overview a diversity of information, watch videos of gestures, and select papers to read in detail. That afternoon, Sophia presents her team a preliminary set of gestures for their first prototype of a cross-device watch-ring UI.

4 CONCLUSION

We described two use case scenarios of our GestuRING tool for ring gesture input, which complement its technical description from [11]. Our tool is freely available on the web to assist researchers and practitioners to easily locate and access information from academic publications to inform designs of ring gesture user interfaces.

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REFERENCES

- [1] Daniel Ashbrook, Patrick Baudisch, and Sean White. 2011. Nenya: Subtle and Eyes-Free Mobile Input with a Magnetically-Tracked Finger Ring. In *CHI '11*. ACM, New York, NY, USA, 2043–2046. <https://doi.org/10.1145/1978942.1979238>
- [2] R. Boldu, A. Dancu, D.J.C. Matthies, P.G. Cascón, S. Ransir, and S. Nanayakkara. 2018. Thumb-In-Motion: Evaluating Thumb-to-Ring Microgestures for Athletic Activity. In *SUI '18*. ACM, NY, 150–157. <https://doi.org/10.1145/3267782.3267796>
- [3] Ke-Yu Chen, Kent Lyons, Sean White, and Shwetak Patel. 2013. UTrack: 3D Input Using Two Magnetic Sensors. In *UIST '13*. ACM, New York, NY, USA, 237–244. <https://doi.org/10.1145/2501988.2502035>
- [4] Bogdan-Florin Gheran, Jean Vanderdonckt, and Radu-Daniel Vatavu. 2018. Gestures for Smart Rings: Empirical Results, Insights, and Design Implications. In *DIS '18*. ACM, New York, NY, USA, 623–635. <https://doi.org/10.1145/3196709.3196741>
- [5] Bogdan-Florin Gheran and Radu-Daniel Vatavu. 2020. From Controls on the Steering Wheel to Controls on the Finger: Using Smart Rings for In-Vehicle Interactions. In *DIS '20 Companion*. ACM, New York, NY, USA, 299–304. <https://doi.org/10.1145/3393914.3395851>
- [6] Bogdan-Florin Gheran, Radu-Daniel Vatavu, and Jean Vanderdonckt. 2018. Ring X2: Designing Gestures for Smart Rings Using Temporal Calculus. In *DIS '18 Companion*. ACM, NY, USA, 117–122. <https://doi.org/10.1145/3197391.3205422>
- [7] Chris Harrison and Scott E. Hudson. 2009. Abracadabra: Wireless, High-Precision, and Unpowered Finger Input for Very Small Mobile Devices. In *UIST '09*. ACM, New York, NY, USA, 121–124. <https://doi.org/10.1145/1622176.1622199>
- [8] Lei Jing, Yinghui Zhou, Zixue Cheng, and Tongjun Huang. 2012. Magic Ring: A Finger-Worn Device for Multiple Appliances Control Using Static Finger Gestures. *Sensors* 12 (2012), 5775–5790. <https://doi.org/10.3390/s120505775>
- [9] K. Park, D. Kim, S. Heo, and G. Lee. 2020. MagTouch: Robust Finger Identification for a Smartwatch Using a Magnet Ring and a Built-in Magnetometer. In *CHI '20*. ACM, New York, NY, USA, 1–13. <https://doi.org/10.1145/3313831.3376234>
- [10] O.-C. Ungurean and R.-D. Vatavu. 2021. Users with Motor Impairments' Preferences for Smart Wearables to Access and Interact with Ambient Intelligence Applications and Services. In *ISAmI '21*. Springer Nature, Switzerland, 10 pages.
- [11] R.-D. Vatavu and L.B. Bilius. 2021. GestuRING: A Web-based Tool for Designing Gesture Input with Rings, Ring-Like, and Ring-Ready Devices. In *UIST '21*. ACM, New York, NY, USA, 14 pages. <https://doi.org/10.1145/3472749.3474780>
- [12] Katrin Wolf. 2013. Ubiquitous Grasp Interfaces. In *TEI '13*. ACM, New York, NY, USA, 377–378. <https://doi.org/10.1145/2460625.2460702>
- [13] T. Zhang, X. Zeng, Y. Zhang, K. Sun, Y. Wang, and Y. Chen. 2020. ThermalRing: Gesture and Tag Inputs Enabled by a Thermal Imaging Smart Ring. In *CHI '20*. ACM, New York, NY, USA, 1–13. <https://doi.org/10.1145/3313831.3376323>