
Intro to the Human Body: Wearability and Human Factors of Wearable Systems

Lucy E. Dunne
University of Minnesota
St Paul, MN, USA
ldunne@umn.edu

ABSTRACT

The traditional “human” model in human-computer interaction prioritizes the human brain, with physical and sensory interaction as secondary emphases. As wearable technologies proliferate and mature, the user experience and human factors of the rest of the body become increasingly important. This course will provide an overview of the basic foundations of wearability and human factors of wearable systems, from anatomy and physiology to body schema, physiological experience of on-body artifacts, and the ways in which dress affects and communicates identity and social relationships.

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CCS CONCEPTS

• **Human Centered Computing** →
Ubiquitous and mobile computing;
*Ubiquitous and mobile computing design
and evaluation methods*

KEYWORDS

Wearability; wearable technology;
human factors; functional clothing.

1 INTRODUCTION

Wearable systems present design challenges and human-computer interaction research questions distinct from those considered in screen-based technologies. Interaction between a digital system and the human body has implications both for the system design and for the experience of the wearer, and variables within these domains can be opposed and require creative solutions to navigate tradeoffs. In this course, human factors specific to wearable systems will be explored in the physical, sensory, cognitive, and emotional domains.

2 COURSE TOPIC OUTLINE

The topics covered in this course include:

1. Basics of body structures
 - a. Basic principles of human biomechanical, physiological, and sensory systems
 - b. Anthropometrics and population-scale variability
 - c. Definitions and drivers of physical comfort
2. Mobility and movement
 - a. Work, load, and experience of on-body masses/volumes
 - b. Geometry of clothing and wearable systems
 - c. Methods of analysis and design for physical wearability
3. Sensory perception
 - a. On-body visual, thermal, and haptic perception
4. Divided attention and wearability
 - a. Principles of body schema and peripersonal space
 - b. Habituation
5. Emotional and social effects of wearable systems
 - a. Performed identity: individual and group
 - b. Social construction of fashion trends
 - c. Interpersonal communication of meaning and identity

3 COURSE STRUCTURE AND METHODS

Concepts will be taught through lecture, video, short discussion, and targeted experiences/examples. The course design will be adapted to the audience size. It is unlikely that extensive hands-on experiences can be part of the course within an 80-minute structure, but targeted demonstrations and short illustrative experiences will be provided to contextualize the material (for reference when I teach this material with university students the course is typically ~20 students, so short experiences/demonstrations from my university lectures will translate in pairs if the audience is ~40).

4 INTENDED AUDIENCE AND PREREQUISITES

This course assumes no prior knowledge, although working familiarity with traditional HCI principles is useful. It is intended for a broad audience: students, researchers, designers, and practitioners interested in moving toward wearable or on-body systems, and/or broadening their understanding of the human user.

5 BENEFITS AND OUTCOMES

The course is expected to provide for participants:

- Basic working understanding of the major topic areas that affect wearability and human-factors of on-body systems
- Key methods and principles within each topic area
- Resources and communities for further investigation of each sub-area
- Open questions and research/design challenges for wearable systems

6 INSTRUCTOR BACKGROUND

Lucy E. Dunne is a Professor (academic home: Apparel Design; graduate faculty memberships: Human Factors and Ergonomics, Product Design, Computer Science, Electrical Engineering) at the University of Minnesota, where she directs the Apparel Design program and co-directs the Wearable Technology Lab. She has taught Apparel Design and Human Factors for 15 years, and has been an active researcher in wearable technology since 2001. Dr. Dunne holds degrees in Textiles and Apparel (BS), Apparel Design (MA), Electronic Technology (AAS), and Computer Science (PhD). She co-authored the foundational textbook on human factors and physics of on-body systems, “Functional Clothing Design: from Sportswear to Space Suits” [1]. Prior to joining the faculty at the University of Minnesota, she taught Engineering Design at Olin College. More about Dr. Dunne’s current research can be found at wtl.umn.edu.

REFERENCES

- [1] Susan M. Watkins and Lucy E. Dunne. 2014. Functional Clothing Design: From Sportswear to Space Suits. Bloomsbury, New York, NY.