Interaction with Deformable Displays

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Introduction

Technological developments in display technologies allow us to explore the design of mobile devices that extend beyond the rigid, flat screen surfaces with which we are familiar. The next generation mobile devices will instead include deformable displays that users can physically push, pull, bend or flex or have those actions performed by the device so that it physically mutates to better represent the on-screen content.

This workshop is interested in all aspects of Deformable Displays: from the methods, materials and alternatives for the construction of such displays to the design of input techniques for such devices and how shape change can be used as an additional channel for output.

This workshop will bring together product developers, interaction designers and academics to create a community around deformable displays. We will preview the state-of-the-art through case studies and identify key research themes in this area.

Author Keywords

Deformable displays; Shape-changing displays; Display Surfaces; Interaction;

ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces – Graphical User Interfaces

Background

Current research into deformable displays has generally followed two paths: user-based deformation through bending, flexing, twisting, squeezing and pushing and; device-based deformation through shape change.

User-based deformation has recently received attention [13], yet the promise of commercially available flexible displays has yet to materialise. Several researchers have proposed using such technology for interaction: Schwesig et al's Gummi suggested a range of non-WIMP interactions [12], Lee et al. proposed a set of deformation gestures for paper-like user interfaces based on non-functional prototypes [8], Lahey et al. produced a set of bend gestures for a display tied at two corners [7] and Kildal et al. [6] proposed a research agenda and suggested design guidelines for flexible mobile interfaces.

Device-controlled deformation has primarily focused on the support technologies: Feelex [4], Relief [9] and 2D-Tapering [3] used actuators, Lumen [11] used Shape-Memory Alloys and Harrison and Hudsen used air-chambers [2]. Blackshaw et al. [1] and Leithinger et al. [10] investigated interactions with such surfaces. In contrast, Kildal proposed a technique to modify the tangible mechanical properties of a rigid surface through programmable haptic illusions [5].

Workshop Goals

This is the first workshop that brings together researchers with an interest in the emerging area of deformable displays. With this in mind, we set the following goals:

1. *Establish a community for deformable displays:* research into deformable displays is cross-disciplinary (from material scientists to product developers) and spans both industry and academia. We wish to bring together people with a wide variety of backgrounds to, inform each other of their research efforts and if suitable, foster opportunities for collaboration.
2. *Identify research themes through case studies:* deformable display interaction is an emerging field, with key research themes and areas not fully identified. Case study-based discussions will aim to develop these themes enabling groups to identify important research areas.
3. *Identify support required from the research community:* many active areas of HCI have regular meetings (as workshops, fora, online meeting spaces and even whole conferences!). We will elicit from researchers support mechanisms deemed suitable for this novel and emerging field of HCI.

Workshop Organisers' Background

Jason Alexander is a lecturer at Lancaster University in the UK. His current interests lie in the design of innovative techniques for input and output on mobile devices.

Johan Kildal is a senior researcher at the Nokia Research Center (NRC) in Helsinki, Finland. His current work focuses on deformable user interfaces, and is responsible for interaction and UX studies in this area.

Kasper Hornbæk is a professor with special duties in human centered computing. His current work focuses on advanced interaction style and user experience.

Viljakaisa Aaltonen is a research leader in NRC in Tampere, Finland. Her current interests lie in organic user interfaces, new concepts and user experience related to emerging display technologies and user-centric innovations.

Andrés Lucero is a senior researcher at NRC in Tampere, Finland. He has a background in Visual Communication Design (MA), User-System Interaction (PDEng), and Human-Computer Interaction (PhD). His interests lie in the areas of user-driven innovation, mobile interactions, and design research.

Sriram Subramanian is a Reader in the Computer Science department of the University of Bristol. His research involves combining hardware electronics with design to create novel and engaging end-users experiences with computer mediated systems.

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