

Recompose – Direct and Gestural Interaction with an Actuated Surface

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1. Introduction

We present *Recompose*, a new system for manipulation of an actuated surface. By collectively utilizing the body as a tool for direct manipulation alongside gestural input for functional manipulation, we show how a user is afforded unprecedented control over an actuated surface. Our invention consists of the actuated surface and the interaction technique utilizing free-hand and touch gestures to manipulate the 3D geometry of the pin array, thus changing the shape of the virtual object.

Previous related work has utilized physical materials as a direct interface for CAD modeling. The physical material in these projects is modified by the user's hands, but cannot be programmatically changed. We propose to combine previous work in tangible CAD modeling and actuated tangible interfaces to overcome this limitation.

We believe that the combination of direct manipulation, I/O coincidence, an instantaneous feedback loop, and gestural input is a largely unexplored research area. *Recompose* explores this area, through a system, which leverages the strengths of these interaction techniques.

2. Implementation

Our system builds upon the Relief table, developed by Leithinger. The table consists of an array of 120 individually addressable pins, whose height can be actuated and read back simultaneously, thus allowing the user to utilize them as both input and output. Building upon this system, we have furthered the design by placing a depth camera above the tabletop surface. By gaining access to the depth information we are able to detect basic gestures from the user.

In order to provide visual feedback related to user interaction, a projector is mounted above the table and calibrated to be coincident with the depth camera. Computer vision is utilized to determine and recognize the position, orientation, and height of hands and fingers, in order to detect gestural input.

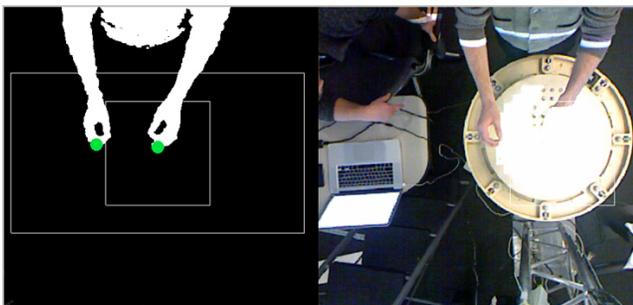


Figure 1: Image seen by the depth camera processed to extract gestures and same view with RGB camera



Figure 2: Sample interaction with the *Recompose* system

A grammar of gestures has been implemented to explore basic functions used to interact with an actuated surface. Initial explorations have found that the most fundamental set of gestures includes: selection of a subset of the surface, translation of the selection, rotation of the selection, and scaling of the selection.

3. Conclusion

Recompose moves digital modeling into the physical space adding the intuition of hands-on design. We believe that the *Recompose* system may contribute significantly to fields where rapid iteration and visualization are fundamental to the process of learning and creation; these fields could include but are not limited to architectural design, three-dimensional product design, and medical imaging.

References

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