

Augmented Manipulation

Interacting with a Non-Newtonian Fluid Interface

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Figure 1: A participant is stretching the slime interface trying to separate facial parts.

ABSTRACT

Augmented Manipulation is a fluidic tangible interface designed to enhance the tactile and visual experience of interacting with one's own face, using slime as the primary medium. The non-Newtonian fluid properties of the slime encourage participants to experiment with various gestures, leading to creative manipulations of their face image. During observations, it was noted that engaging with the slime interface created an illusion where the image and the slime seemed to merge. This effect made it appear as though the

image was not merely projected onto the slime but had become an integral part of the slime.

CCS CONCEPTS

• Applied computing → Arts and humanities.

KEYWORDS

Slime, Projection, Interactive Art, Non-Newtonian Fluid, Interface

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1 INTRODUCTION

Augmented Manipulation introduces a new way of interaction between humans and interfaces by using slime as the medium for

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projection interfaces. Slime, as a non-Newtonian fluid (NNF) material, can act more like a liquid or a solid[2]. When acting more like a liquid, it can be shaped and stretched to a desired form, and it flows back to its original state when only gravity is applied. When acting more like a solid, it can be pinched, grabbed, and torn apart. For serving as an interface, slime creates a variety of creative interactions for people to manipulate the projected images.

2 MATERIAL

Slime, well-known as a children’s toy, is primarily made from a polyvinyl alcohol solution and a borax solution[1]. Its NNF properties make it behave like an elastic solid when subjected to rapid force, yet it flows like a liquid when exposed to gentle pressure or just gravity. For this work, we increased the proportion of borax solution in our mixture. This adjustment was made to reduce the slime’s stickiness while maintaining its stretchiness and ensuring it was easier to tear apart for participant interaction. We also colored our mixture white so that the projected images would be perfectly visible to participants and audiences.

3 FACE IMAGES AND THE ILLUSION OF BINDING

We chose to project face images as an example to demonstrate the features of using slime as the projection medium. Projecting a face image is particularly suitable in this scenario because humans are adept at recognizing tiny details and subtle changes in facial expressions. With slight distortions on the slime’s surface, the original face can appear to convey different emotions. Using face images highlights the dynamic adaptability of the slime interface, as even minimal distortions can significantly alter the projected expression, showcasing the medium’s malleable properties.

During an exhibition, we observed that people enjoyed grabbing their facial parts (eyes, noses, mouths) and lifting them up (Fig.1). Since the image is projected vertically, when lifting up a part of the slime, the projected image stays on the grabbed part. At the same time, from the participant’s perspective, the part of the image appears to be on the separated slime, rising with it, creating the illusion of object binding. This phenomenon made participants think that the image was not projected but was instead the skin covering a physical, tangible body.

4 INSTALLATION SETUP AND INTERACTION PROCESS

The installation includes a 35cm x 35cm x 15cm container filled with pre-mixed slime and a projector installed above the slime container (Fig.2). We discovered that, compared to strangers’ faces, participants are more engaged when their own faces are being manipulated. Therefore, we created a system allowing people to project their face images onto the slime.

At the exhibition, participants are invited to upload their portrait photos or take photos on-site. We created a website for photo uploads, which participants can access by scanning a QR code. They then upload the desired photo and trim it to a square ratio. Once the participants complete the process, the website sends the trimmed photo to the server, which then transfers the image to TouchDesigner, a node-based language used for projection mapping the

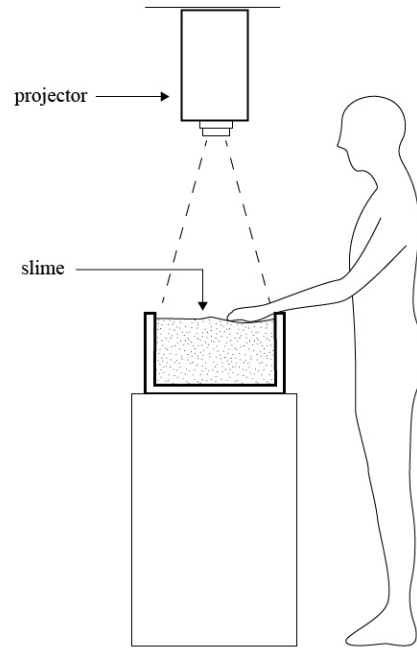


Figure 2: The installation setup

image onto the slime. Once projected, the participants can start interacting with the slime interface.

5 CONCLUSION

We presented an NNF material, slime, as a fluidic, tangible interface, allowing people to manipulate projected images in creative ways. The unique properties of slime, such as its ability to change viscosity in response to touch, provided rich and engaging tactile and visual experiences for participants.

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