Making Digital Leaf Collages with Blow Painting!

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Abstract

We present a novel play interface called Blow Painting that enables people to create leaf collage paintings on a digital canvas by blowing at a toy windmill. The toy windmill detects the blowing action and direction with its embedded microphone and rotation sensor. Four kinds of leaf “stencils” (Red Maple, Sugar Maple, Hickory and White Oak) are embedded in the transparent RFID sheets to be placed under the windmill for the play interaction. We describe the motivation, system components, an informal pilot test, and discuss directions for future work.

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B.4.2 Hardware, D.m Software, H.5.2 User Interfaces, J.0 Computer Applications

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Design, Human Factors

Author Keywords
Blowing, painting, leaf stencils, tangible object, RFID, collage, daily experience, embodiment, interaction, play

BLOWING (IN) THE WIND

Blowing is a natural act. It is spontaneous. It is fun. A child may pick up a dandelion and blow it to see the seeds flying (Figure 1 left). Blowing dandelions is intuitive. Everyone knows how to do it. We don’t need special skills to master the interaction. Therefore, we chose blowing action as an interface to engage children of all ages (!) to create leaf collages in a playful manner.

Blowing is an intriguing act. The airflow or the wind is invisible, but it can be heard and felt. Our question is: what would it be like to create an embodiment experience with the act of blowing? Can we make the ephemeral visible? The answer, my friend, is not just blowing in the wind. Nature itself often makes beautiful collage of leaves (Figure 1 right). The colorful foliage, the variety of color and shapes are simply irresistible. It’s a magical experience that inspires artists of all ages. Therefore, we take this real world experience as an inspiration for our play design. We try to create a novel blowing interaction play to simulate the wind’s painting, to bring out one's creative genius, and perhaps capturing a little bit of the glory of the wonderful fall colors on the digital canvas for all to enjoy.

INTRODUCTION

Tangible interfaces are increasingly replacing the traditional window and pointing devices for interaction design. For example, people can now interact with augmented physical space with their emotions [4] and motions [1] or use the I/O Brush [6] to “pick up” colors, textures and movements in everyday materials and draw with it. The KidsRoom [3] tracks children’s positions and motions to transform the physical environment into virtual fantasy play space.

THE BLOW PAINTING SYSTEM

The Blow Painting system is inspired by the natural wind shaped leaf collages. It also leverages the cognitive benefits of using articulated joints that would help facilitate concept mapping and reflections of the real world phenomenon [2].

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Players can also rotate the windmill to change the position of the "paintbrush" (See Figure 2).

In this instance, the blowing action functions as a paintbrush. What then, are the “stencils” we may use to paint the collage?

We have chosen four kinds of leaves to be the “stencils” for the Blow Painting play (Figure 3). These are the most common trees in the region. Red Maple leaf is three lobed, sharply V-shaped with small teeth in red, while Sugar Maple leave is five lobed, smooth teeth margin with bright yellow-orange color. Hickory leaf has toothed leaflets with dark yellow-green color. White Oak leaf has nine lobes and smooth margins and a wine-red color that fades into different shades of brown.

**Figure 3. Four kinds of leaf stencils**

Using leaves as painting stencils has two advantages. First, it relates our real world experience in the nature to an artful painting interaction. Players can easily recognize the concept of a wind shaped painting by drawing from their daily experience. Secondly, having leaf-shape stencils assures a recognizable painting outcome. Players can then focus their attention on playing with leaf-shape stencils without worrying about their painting skills.

The leaf collage painting is instantly displayed on the digital canvas when a player blows at the windmill. In the initial scene, the canvas shows an image with some footprints and tree shadows on the snowfield to provide the context of a real world environment (Figure 4).

**Figure 4. The initial snowfield scene of the digital canvas**

A carefully orchestrated blow painting session would render a beautiful piece of leaf collage (Figure 5).

**Figure 5. Leaf collage on the digital canvas.**

The positions of the leaves are controlled by the direction of blowing. Players can rotate the windmill structure clockwise or anti-clockwise to change the blowing direction (Figure 6).

**Figure 6. Rotate windmill to change the blowing direction**

The opacity of each leaf is decided by the blowing intensity, and the blowing duration time controls the amount of leaves being painted. High intensity and long duration renders high opacity and more amounts of leaves. In addition, players can switch and swap four kinds of painting leaves by putting the RFID embedded leaf stencil sheet (Figure 7) under the toy windmill.

**Figure 7. Four RFID leaf stencil sheets for the toy windmill**

In short, the various parameters for blow painting, that is, the position, amount and opacity for each type of leaves are controlled by both the blowing actions and the manipulation of the physical objects – rotating the windmill, picking up a leaf stencil sheet and put it under the windmill (Figure 8).
The Blow Painting system has two main parts: Input (the tangible object) and output (the digital canvas). The tangible object has three components: the Blowing Awareness component, the Rotation Awareness component, and the ID Awareness component (Figure 9).

In the Blowing Awareness component, the windmill structure houses a microphone to detect the characteristics of the blowing action. The software then computes the parameters of blowing intensity and duration (Figure 10). These two parameters control the opacity and amount of leaves to be painted on the digital canvas.

In the Rotation Awareness component, there is a round plate under the windmill structure embedded with a rotation sensor that detects the degrees of rotation of the windmill structure. This parameter (Figure 11) represents the blowing direction and controls the X-axis position of leaves on the digital canvas.

The third part, the ID awareness component, is equipped with a RFID reader that identifies the RFID tags embedded inside the leaf stencil sheets to render the corresponding leaves on the digital canvas (Figure 12).

BLOW PAINTING PILOT STUDY

The Blow Painting system was demonstrated and played by over a dozen graduate students in the game design class at Georgia Tech. For each play session, we briefly introduced the components of the Blow Painting system and then let people simply “have fun with it.” All players embraced the idea quickly and found it “quite easy to work with.” They immediately blew at the windmill structure and watched the resulting painting displayed on the digital canvas. Everyone was able to produce a leaf painting with ease. However, we found an interesting similarity among all initial paintings. That is, all players initially only painted one kind of leaves at one X position (See Figure 13).
to change their blowing direction. They then quickly found that they could rotate the plate at the base of the windmill to change the leaf painting position. After satisfied with the distributions of the leaves on different locations, the players would then select and change to other kinds of leaves. It was easy for all players to locate the existing RFID embedded leaf stencil sheet under the structure of the windmill and to replace it with another one. After several changes of leaf stencils, each player would arrive at a unique leaf collage of their own (Figure 14).

Figure 14. The leaf collage made by one player

The interaction seems to sustain enough interest for a player to stay on blowing for several minutes. Several people commented that this is a "fun way to paint!" Some inquired how much it would cost to get one as a gift. A few people suggested selling it as an "exercise device" as they all "broke a good sweat" when making the painting! It appeared that a player would need some initial exploration time to get familiar with the system and to achieve intended painting results. However, during the play testing, all players figured out how to rotate the windmill, and once they recognized that, they seemed to have no problem controlling the windmill to reach the intended orientation and made their paintings. All players seemed happy and playful when they interacted with the Blow Painting system. Constant laughs and loud cheers were heard during the play test session. Many by-standers would make suggestions about where to put the leaves and which leaf stencil to choose. Several people waited in line to try out the system. People seemed to like it. Several people commented that "Hey, this is cool!" or "This is so cute."

FUTURE WORK AND DISCUSSION

From the informal pilot study we found that players would intuitively change the orientation of the windmill to affect the position of the leaves. A number of players suggested future improvement of the system could employ lightweight material for the pinwheel for faster rotations and higher mobility. One player thought blowing is a good "hands-free" interaction technique and suggested making the Blow Painting interactive play accessible to the disabled population. Another player suggested relating the airflow blowing intensity measurement to clinical data and peak flow meter for people with Asthma to monitor and manage their health conditions. Some players commented that the size and orientation of the laptop screen (Figure 15 left) is not optimal for full enjoyment of the Blow Painting play.

Figure 15. Using a laptop screen (left) and a 60 inch tabletop display (right) as the digital canvas for Blow Painting

To address this concern, we deployed a sixty-inch tabletop display (with mirrors and projector underneath) as the digital canvas for Blow Painting (Figure 15 right). In an informal pilot test all player participants found the tabletop setup "natural" in that the horizontal canvas facilitates a good spatial mapping between the painting positions of the leaves and the rotational orientations of the windmill. Future work could extend the digital canvas display to encompass a large-scale room size floor or wall surface.

We plan to engage young children as well as people of all ages to play with the Blow Painting system in the near future to gain insights about improvements for the system and to include new play variations.

In summary, this paper presents a project that combines a toy (the windmill) to a creative outcome (the painting of leaves) while using an embodied action - "blowing" as an interaction technique. The Blow Painting system is built to support an engaging experiment in play. Future work could extend the system to explore a variety of themes and other stencil options. The responses from the initial play sessions are encouraging. Everyone laughed when they were playing with the system. They all seemed to have fun!

REFERENCE