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# Mood Fern: Exploring Shape Transformations in Reactive Environments

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**Figure 1.** Mood Fern Installation

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**Abstract**

We present *Mood Fern*: digital flora which responds to touch. Depending on the length and intensity of the touch a subset of leaves physically react. The leaves respond on a spectrum of slight oscillation, imitating the effects of swaying in a slight breeze, to complete deformation, as if they were physically trying to respond in a similar manner. *Mood Fern's* reference to nature highlights its appeal to calm computing. Painted capacitive sensors mimic the appearance of leaf veins and Flexinol SMA wire is used to actuate *The Mood Fern's* paper structures.

**Author Keywords**

Interactive Art; Kinetic User Interface; Tangible Interface; Organic User Interface; Paper Computing.

**ACM Classification Keywords**

H5.2. [User Interfaces] Direct Manipulation. H5.m. Information interfaces and presentation (e.g. HCI): Miscellaneous. J.5 Arts and humanities: Arts, fine and performing.

**Introduction**

When compared to traditional computing I/O devices, tangible interfaces have the potential to deliver a more visceral experience by employing actions instinctive to the user in the physical realm (pulling, bending,

squeezing) rather than learned procedures in a virtual environment (command lines, moving icons). In addition, when input and output are communicated over the same medium [7], the audience's immersion in the experience is further enhanced. With *The Mood Fern*, we take advantage of these aspects of Tangible and Organic User Interfaces in creating a physical reactive environment containing digital flora.

### Related Work

#### *In Art*

A number of robotic plant installations inspired *The Mood Fern*. Chief amongst them is the work of Akira Nakayasu [8], in particular his sculptures entitled *Plant* and *Himawari*. Both these pieces depict plants and respond to an audience's presence, eliciting a plant-like response. *The Memory of a Tree* [9] illustrates possible themes for an interactive fauna based piece by focusing on the narrative power of an interactive plant. *Animated Vines* [13] demonstrated the use of shape memory alloys in actuating plant-like paper structures. The concept of remotely triggering a shape transformation has been showcased in *A Flock of Birds* [15].

#### *In HCI*

Shape changing interfaces are increasingly gaining attention in the HCI community [14]. Coelho et al. [1] demonstrated how shape memory alloys can be used as actuators and applied to a programmable surface. Fabian Hemmert explored the design space of shape changing interfaces by augmenting devices with shape changing properties [5][5] for embodied interactions. Gomes et al. [3] presented a deformable smartphone, demonstrating the use of shape changes for notifications. Park et al. [9][11] illustrated the use of shape changes as additional information channels for couples in long distance

relationships and between close friends. Moving away from mobile devices we find a series of explorations of shape-changing tabletop displays [12][15] and interactive furniture [2][4].

### Installation

The structural core of *Mood Fern* (Figure 1) consists of found objects: pots and dead branches, everyday things one might find in a back yard or garage. These commonplace objects are augmented with paper leaves (Figure 2). *Mood Fern* uses materials most people are intrinsically familiar with and have an understanding of how they usually behave. This however is where the familiarity ends. The artificial plants created from these materials are actuated by a shape memory alloy (SMA). Each leaf has its own actuator, controlled remotely by an Arduino. Each leaf also has a sensing element, which is painted on with conductive ink (Figure 3).

When a user touches a leaf the plant reacts to the touch. Depending on the length and intensity of the contact a subset of leaves will react on a scale of slight and subtle movement as if in a calm breeze to more



**Figure 2.** Actuated Paper Leaf

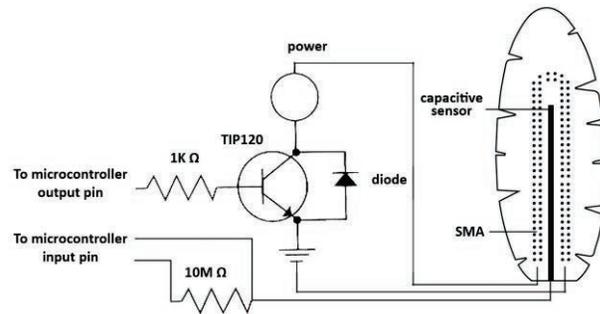


**Figure 3.** Detailed conductive ink sensor and sewn in flexinol wire.

violent and urgent deformations indicating an acute awareness of the human presence and interaction.

### Implementation

There are two major circuitry components of the *Mood Fern* plant, the actuation elements and the touch sensing elements. The circuitry governing the exhibit's actuation uses a TIP-120 transistor to regulate the power flow from an external source to the Flexinol SMA (Figure 4). By regulating the current passing through the SMA, the action of the leaves can be controlled since the contraction occurs as a result of resistive heating in the wire. The touch sensing circuitry is a simple surface capacitive sensor where the conductive ink on the leaf acts as the sensitive surface.



**Figure 4.** Mood Fern Schematics

### Conclusion & Future Work

*Mood Fern* makes for an intriguing and entertaining exploration of shape changing interfaces and responsive environments. It builds on inspiration from similar organic art pieces, seeking to provide a tangible and tactile experience of exploring an interactive space.

We see *Mood Fern* as an initial exploration rather than a finished project. We aim to investigate the effects of reactive environments and shape changing objects beyond the immediate environment of the computer. We believe that shape changing interfaces and interactive spaces can surpass what we currently expect them of them. With this belief, we hope that *mood fern* will serve as an inspiration to artists, architects, designers alike, as well as other creative professionals, starting a dialogue on interactive environments and shape changing objects.

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