

# Novel Infrared Touch-Screen Technology and Associated Artwork

Zachary Booth Simpson  
Mine-Contol.com

## 1. Introduction

Digital video imagery is rear-projected onto a translucent screen. A camera sensitive to the near infrared is also positioned on the opposite side of the projection screen. On the near side is positioned an array of infrared illuminators which flood the screen from oblique angles. Standing on the near side of the projection surface, participants touch the screen in order to interact. Because they stand between the illuminators and the screen they cast infrared shadows, one for each illuminator. These shadows converge on the projection screen creating dark infrared areas detectable by the camera. Using a previously computed calibration, the computer samples the camera image, de-warping and filtering it in order to extract where the participants are touching the screen. Unlike many other touch screen technologies, this system permits obtaining an image of how the participants are touching the screen as opposed to merely finding a contact point.

Three works of interactive art are displayed using this technology.

### “Calder”

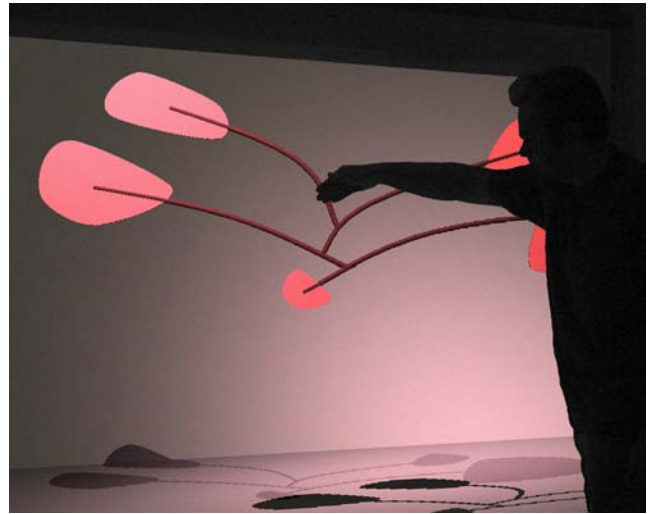
Participants create 3D mobile sculptures similar to those built by Alexander Calder (1898-1976). An intuitive drawing interface interprets the motions of the participants to create beams and fins. After creating a mobile, the users hold a beam to support it and a realistic 3D dynamic simulation including collision detection and self-balancing calculations brings the mobile to life, permitting the user to touch and play with it. When the participants step away the unsupported mobile falls to the ground and collapses on the floor.

### “Mondrian”

Participants divide a canvas into areas with thick black lines creating abstract canvas divisions similar to those by the artist Piet Mondrian (1872-1944). The topology of the lines is maintained so that the participants may then rearrange the lines without losing any connectivity. By placing their hand into an empty region they fill that region with color.

### “Interference”

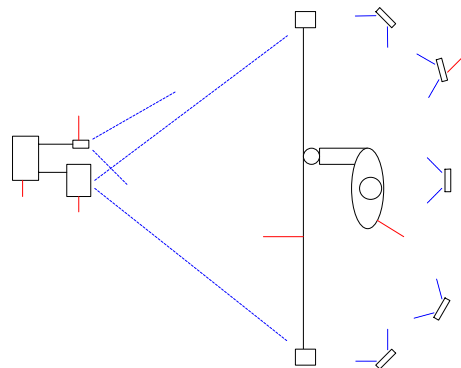
Participants place their hands on the canvas activating a virtual directional light source with a 10 cm wavelength. As the participants rotate their hands, the beams follow demonstrating that the infrared sampling technology can track shape as well as position. The combination of two or more virtual radio sources produce interference patterns exactly as would real RF sources placed in the same positions. Although the system is a faithful scientific visualization of radio interferometry, the result is a beautiful and intuitive interplay of wave phenomena which can be appreciated without any understanding of the underlying physics.



“Calder”



“Mondrian”



Top View of Setup